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WASHINGTON, D.C. 20505

7 February 1978

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MEMORANDUM FOR: The Director of Central Intelligence

FROM : John N. McMahon
Deputy Director for Operations

SUBJECT : MILITARY THOUGHT (USSR): The Use of Mathematical Network Planning Methods in Military Affairs

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 describes how network diagrams can be used to produce models of planning procedures and troop control in order to streamline these processes and select the best alternatives. Other applications include the determination of technical specifications for new equipment, planning of training, and establishment of research priorities. The article includes an illustrative network diagram of the steps involved in the launch of one missile. This article appeared in Issue No. 1 (80) for 1967. [redacted]

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 [redacted]

[redacted]

John N. McMahon

[redacted]

[redacted]

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Intelligence Information Special Report

COUNTRY USSR

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DATE OF INFO. Early 1967

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SUBJECT

MILITARY THOUGHT (USSR): The Use of Mathematical Network Planning Methods in Military Affairs

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 1 (80) for 1967 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal "Military Thought". The authors of this article are General-Mayor G. Pospelov, Colonel N. Zubkov and Captain 3rd Rank V. Barishpolets. This article describes how network diagrams can be used to produce models of planning procedures and troop control in order to streamline these processes and select the best alternatives. Other applications include the determination of technical specifications for new equipment, planning of training, and establishment of research priorities. The article includes an illustrative network diagram of the steps involved in the launch of one missile.

End of Summary

[redacted] Comment:

A Colonel N. Zubkov also contributed to "Automation of Troop Control Processes Must be Comprehensive" in Issue No. 3 (64) for 1962, [redacted]

[redacted]

[redacted]

The Use of Mathematical Network Planning Methods in Military Affairs

by

General-Mayor of Engineer-Technical Service G. POSPELOV
Colonel N. ZUBKOV
Captain 3rd Rank V. BARISHPOLETS

Recently, in all technically developed countries, the use of mathematical network planning methods has been constantly increasing. Many prominent specialists believe that their development was the most important contribution to the science of control in the last 20 to 30 years.

Network planning methods did not come into being accidentally. They have been brought about by technical progress and, in particular, by such factors as the growth in scope and complexity of the systems being controlled, the increase in demands on the quality of control, and the expansion of control capabilities resulting from the development of cybernetics and computer technology.

The most important distinguishing characteristic of network planning methods is that they provide a systems approach to the problems of organizing and performing complex sets of interrelated processes (actions, operations, tasks). The essence of the systems approach is that the system to be controlled is viewed in all its complexity, considering both the internal relations between individual parts and their relations with other external systems.

The results of the behavior of each individual part are evaluated in terms of how the part affects the achievement of the ultimate goal. Also taken into consideration is the greater or lesser indeterminacy of the behavior of various parts of the system resulting from human participation in its functioning or the impact of accidental factors.

There is no need to prove that it is extremely necessary to have such a systems approach in military affairs, since all the processes of the organization and preparation of combat actions, of the control of troops and combat means, and of the waging of armed combat are complex sets of interrelated and interdependent actions of different forces, means, and control and support organs, united by a single concept. Also, all these processes must be organized in such a manner that the least possible amount of time and resources is spent and the maximum results are ensured when carrying out the overall combat task.

The purpose of the present article is not to acquaint the reader with the basic concepts of the mathematical network planning methods. The Journal has already presented material of this nature. What we wish to examine is where and how these methods can be used in military affairs.

It is quite obvious that in the military field, just as in the national economy, by applying mathematical network planning methods, information systems can be set up for the network planning and control of the processes involved in the development and production of new models of weapons and combat equipment, the construction of different large military installations, etc.

This area of application of the methods of network planning, which was examined in detail in the article of General-Mayor of the Engineer-Technical Service I. PENCHUKOV and Engineer-Colonel A. VASILYEV,* is unquestionably of interest. However, it is not difficult to deduce that the principles of using the methods under consideration in the above-mentioned area are approximately the same as in the national economy.

Of greatest interest to us, though, is the discovery of specific military ways of using network planning methods and -- what is particularly important -- determination of the specific features of their application during the organization of troop combat actions and while they are in progress.

A study of network planning methods has demonstrated that with their aid, diverse problems in the area of the use of the forces and means of armed combat and of the organization of troop control can be solved.

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* "Military Thought", 1965, No. 12.

Since these methods enable us to find ways of economizing forces, means, and time when carrying out a set of different tasks, they should first of all find extensive application in the planning and preparation of front and army operations. Using network planning methods, we can put together a calendar plan for the preparation of an operation, coordinate the problems of cooperation, plan the regrouping of troops, monitor the movement of units and large units to designated areas, and solve many other problems.

As is generally known, regardless of what is being planned, priority should be given to achieving the optimum allocation of the available forces and means. To solve this problem, such operational research methods as linear and dynamic programming, queuing theory, game theory, etc. are used. However, there is another side to planning that is inseparably linked with the allocation of forces and means -- this is calendar planning, i.e., the optimum allocation of time for the measures to be carried out and the determination of such times of beginning and completing them which ensure that the assigned task is carried out in a timely manner with the maximum economy of human, materiel, financial, and other resources. Until recently, calendar planning was done basically with the use of bar graphs. As is known, they are widely used in staff work when putting together calendar plans of the preparation of front and army operations, and by the troops to coordinate the work of personnel during the preparation of weapons and equipment for combat actions.

However, bar graphs can show only the sequence and performance time of the work of each executor taken separately. They provide no way of showing the logical interdependency of the different measures or the best way of coordinating the work of individual co-executors. Network planning methods, however, open up additional possibilities in this respect: with their aid, it is possible to put together a network diagram of the performance of the array of measures which visually depicts logical interrelationships and the sequence of all the tasks performed by the different co-executors. It is precisely for this reason that network methods can also be an extremely dependable tool in achieving optimal planning when preparing front and army operations. By making network diagrams of all the tasks relating to the organization and preparation of combat actions, it can be determined which tasks are on the critical path and constitute the biggest bottlenecks in the troop control system, and how much time is left for the rest of the tasks. This type of analysis enables all preparatory measures to be planned in the best possible way, the sequence of tasks to be changed when necessary, and a redistribution of the available forces and means to be done.

Under certain circumstances, a <u>front</u> or army operation will be planned while the preceding operation is being completed. As a rule, there will be little time for the organization of combat actions. Therefore, to speed up the processes of planning and organizing combat actions, it is advisable while it is still peacetime to prepare standard network diagrams of the tasks of commanders and staffs under the most typical conditions of a combat situation, with due regard for the disparate amounts of time available for the organization of combat actions.

It is especially important that network diagrams be made for the conduct of combat actions at the very beginning of a war in case of a surprise attack by the enemy, with due regard for the different variants of their development. Using network methods, it is possible, while it is still peacetime, to determine the optimum variants of the deployment and concentration of troops, of the allocation of the means of nuclear attack according to enemy targets, and of the implementation of protective measures, etc. So-called emergency situations can be taken into consideration and network diagrams made for the organization of operations in the event that different responsible persons, control posts, and other installations are put out of action. The visual representation on network diagrams of the substance of tasks, the sequence in which they are carried out, and their interrelationship ensure that new responsible persons are quickly fitted into the control system, the remaining forces and means are redistributed, control is transferred from some control posts to others, etc. At the same time, the use of network planning methods increases not only the efficiency, but also the flexibility of the control of troops and combat means.

Network methods can also be quite extensively used in the planning of materiel, technical, medical, engineer, and other types of support and in the organization of the work connected with preparing weapons for combat actions.

Using these methods, it was determined at the Military Artillery Academy that the preparation of missile systems for launching, to cite one example, can be organized more efficiently. A network diagram that was made and then optimized by a group of officers under the direction of Colonel V.S. PERESAD made it possible to conclude that eight of the persons engaged in the preparation of one of the missile systems at a technical site can be released, i.e. the diagram permitted a determination to be made that the work can be done by 21 men rather than 29.

The optimal placing of personnel that was arrived at through network planning has been confirmed during subsequent testing among the troops, which showed that the indicated result was achieved through a more efficient organization of labor, and not at all by increasing the physical load on personnel.

Instructions on the preparation of combat equipment and weapons for battle can be more graphically and concisely presented in the form of network diagrams, and the latest experience can be disseminated to the forces more quickly in this manner. Judging by comments from the troops, a diagrammatic form of instructions allows the technological sequence of the operations to be mastered more quickly, facilitates monitoring, and makes it possible to show visually the interrelation of tasks and their duration.

In our opinion, network diagrams can also be used when drawing up other types of instructions and directions. Thus, it is desirable that, in the Field Service Manual for Staffs, the sections devoted to the functional duties of the responsible persons be illustrated with network diagrams of the tasks.

An extremely large field of the application of network planning methods is their use during research into the processes of armed combat. The need to use network methods in this field is especially clear-cut since the traditional methods of researching many problems of operational art and tactics and of planning and troop control have substantial drawbacks. Recommendations about the efficient structure of control organs, staff work methods, and the forms and types of combat actions are at the present time still frequently adopted solely on the basis of logical judgments and deductions and the practice of troop exercises.

Of course, as Marxism-Leninism teaches, practice is the criterion of evaluating the correctness of our knowledge. However, regardless of how well exercises are conducted, it is impossible in them to create the situation that will actually exist in a war, especially with the use of means of mass destruction. Therefore, when researching the processes of armed combat, now as never before, along with live experiments it is necessary to make extensive use of analytical models that provide the greatest approximation to an actual combat situation. Network planning methods enable such models to be created and valid recommendations on an extremely broad range of questions of operational art and tactics to be arrived at. However, this area of application of network methods has been studied least of all and there has been almost no discussion of it in print.

As is known, under the conditions of a missile/nuclear war, one of the most important problems is the struggle to gain time. Network planning methods, when used in conjunction with other mathematical methods, enable us to research one of the most important indicators of the troop control system -- the efficiency of its work.

Let us take the most important indicator of the efficiency of troop control -- timeliness of making the decision to combat enemy means of nuclear attack -- and we shall see how network planning methods can be used to research the processes involved in preempting the enemy in the delivery of missile/nuclear strikes during an operation.

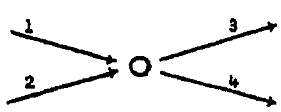
We have made network models of the operations performed by the responsible persons of the headquarters of the division, army, and front from the time the enemy means of nuclear attack are detected to the time they are destroyed. The diagram (on page 28) represents one of these models. The arrows represent the tasks performed by the front commander, the chief of the rocket troops and artillery of the front, and by the other responsible persons of the front staff, the staff of the rocket troops and artillery of the front, the reconnaissance organs, and the combat crews of the missile systems. The other symbols show the interconnections and interrelations of the tasks in question, i.e., events are depicted as the moment of completion of one group of tasks and beginning of another. The network model presented in the diagram reflects the present methods of control of the <u>front</u> rocket troops.

Since the process under study is stochastic, i.e. the substance, sequence, and duration of the tasks performed by the different responsible persons to control combat against enemy means of nuclear attack will largely be determined in each case by the specific situation that has arisen, accordingly a stochastic network model with probability estimates of the duration of tasks was obtained.

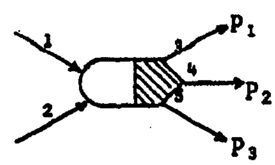
At present, both here and abroad, the basic principles have been worked out for using mathematical network planning methods for research analysis and optimization of only the determinate processes involved in performing a set of interconnected tasks for which the scope and sequence of the tasks and the final and intermediate objectives have been clearly specified. Determinate processes occur during the creation of complex technical systems and new weapons models, the construction of large military and civilian installations, the preparation of combat means, etc.

However, in the military field the largest role is played not by determinate processes, but by stochastic processes. Until now, research and optimization of such processes using network methods proceeded as follows. The most likely variant of performing a given set of tasks was chosen and a determinate network model was constructed for it.

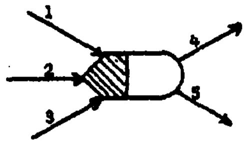
It is not always possible or correct to use this approach since it does not enable us to obtain generalized parameters of the process as a whole. We have therefore developed a methodology for making and analyzing a stochastic network model based on the following concept. While only one type of event is needed in a determinate network model, to signify that all preceding tasks have been completed and all subsequent tasks may begin, we believe that several types of events must be used in constructing a stochastic network model, namely:

1 

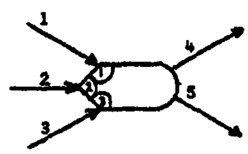
The type of event used in determinate network models.

2 

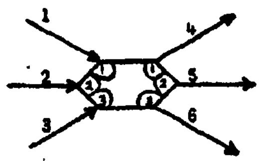
The event is considered completed only if all the tasks included in it (1 and 2) have been finished. The completion of the event signifies the possibility of beginning task 3 with probability P_1, or of beginning task 4 with probability P_2, or of beginning task 5 with probability P_3.

3 

The completion of the event is regarded as the fact of finishing any one and only one of the tasks (1, 2, or 3) coming into it. After the event is completed all the tasks proceeding from it (4 and 5) may begin.

4 

It is considered that the event is completed if, out of several preceding tasks (1, 2, and 3), at least one has yielded results. The completion of the event signifies the possibility of beginning all the tasks (4 and 5) which follow it.

5 

The completion of the event is regarded as the fact of finishing at least one of the tasks (1, 2, and 3) preceding it. If the event is completed as the result of finishing task 1, which comes in to the first vertex, then as the outcome, only task 4, which proceeds from the first vertex, will begin, etc.

Obviously, the critical path cannot be depicted as clearly in a stochastic network model as in a determinate model, since it exists only in each separate realization. The critical path determined for one realization will differ from the critical path in another realization both in the length and the make-up of tasks. Therefore the main problem in analyzing a stochastic network model is to determine the law of the distribution of time to perform a set of tasks, and the coefficient of criticality of the tasks, which specifies the probability of a given task being a part of the critical path in an individual realization. Tasks with a high coefficient of criticality characterize the biggest bottlenecks of the stochastic process of performing a set of tasks.

Once the distribution law has been obtained, the other numerical characteristics of the time of performing a complex of operations -- the mathematical expectation, the dispersion, etc. -- can be easily determined. The problem of determining the parameters of the stochastic network model can best be solved with the aid of the statistical testing method.

This model, which reflects the work methods of commanders and staffs to control combat against enemy nuclear means of attack, makes it possible to find the distribution function and the mathematical expectation of the amount of time spent in the preparation and delivery of a strike against the enemy when given methods of control are used.

By combining network planning methods with other methods of operations research and, in particular, with the methods of research of conflict situations, the effectiveness of the existing organization of combat against enemy means of nuclear attack can be determined.

If the appropriate data on enemy expenditures of time in preparing nuclear strikes and in removing launchers from the launching (fire) sites are available, the probability of preempting the enemy in the delivery of strikes and the probability of destroying his means of nuclear attack before they are removed from the launching (fire) sites can be calculated.

If the probabilities obtained are too small, this constitutes evidence that the organization of the control of combat against enemy means of mass destruction needs to be radically altered.

In addition, the given model makes it possible to determine the coefficient of criticality for each task and to ascertain what causes the greatest delay in the control of combat against enemy means of nuclear attack.

After obtaining specific quantitative indicators of the efficiency of a task with existing means and methods of control and ascertaining by modelling which are the biggest bottlenecks in the system of control of combat against enemy means of nuclear attack, other methods of control can be suggested, with appropriate changes being made in the network models.

Thus, by successively remodelling proposed methods of control of combat against enemy means of nuclear attack, one can select the work methods for the responsible persons of the control agencies which ensure the greatest probability of destruction of the enemy before he delivers his nuclear strikes or before he removes his combat means from the launching (fire) sites.

In approximately the same way, using network planning methods, one can research the efficiency of control of the units and subunits of the other branch arms and of the troop control system as a whole.

To do this, it is necessary to construct models of the planning of combat actions and of the functioning of the control organs and control posts during the conduct of a battle and operation. It will be necessary to describe in detail and break down into component parts, after determining the interdependency among them, such control processes as the collection, processing, and presentation of information on the situation, the making of operational-tactical calculations relating to the use of forces and means, the making and formulation of the decision, the planning of combat actions and the organization of cooperation, and the assignment of combat tasks and drawing up of combat documents.

The first experiments in constructing network models for troop control, which were conducted at the Military Academy i/n M.V. Frunze and at the Central Scientific Research Institute No. 27 of the Ministry of Defense, show that this work is quite complex.

In our opinion, the modelling of the processes of control of armed combat can be done in different ways. Stochastic network models of the work of commanders and staffs can be constructed for each typical set of conditions of a situation, for instance, models for planning of the first offensive operation and for troop control during the offensive, during the commitment to the engagement of the second echelons and reserves, and during the repulsing of an enemy counterattack, etc. Then the control processes in a defensive battle, in a meeting engagement, during a pursuit, and during other types of troop combat activities can be modelled in the same way. On the basis of the research conducted, conclusions are drawn about efficiency of troop control on the whole.

Another way of using network methods to research troop control processes is to ascertain the most typical tasks performed by a commander and his staff under any conditions of a situation and to construct on this basis a stochastic network model that reflects the most typical work methods at this or that level of control. Such standardization is feasible since control methods under any conditions have a certain constancy, and the responsible persons of control organs always fulfil definite responsibilities, which are fixed by the appropriate manuals and regulations.

With the aid of network methods, concrete quantitative indicators descriptive of the efficiency of a troop control system can be obtained by using any of these methods. Research of stochastic network models of troop control using the statistical testing method enables us to ascertain which tasks are found most often on the critical path and require a maximum expenditure of labor and time to perform. In this way it can be discerned which sectors of the control system are in need of automation, and the degree of automation advisable at this or that level of control can be determined.

The possibilities of using network methods to research the processes of the control of troops and combat means are not limited to this.

In addition to efficiency, the quality of the tasks performed and the cost expression of a control system, taking into account the direct and indirect economic effect, are highly important indicators of the effectiveness of the troop control system.

Network methods can be used to obtain quantitative values for these indicators as well. In our opinion, the quality of many troop control operations can be expressed in terms of the quantity of information processed by a given operational-tactical information organ. For example, it can be assumed that a decision made by a given responsible person will be more sound if a larger number of all the different possible factors that characterize the situation are taken into consideration when it is made, i.e., if the necessary minimum of operational-tactical information has been gathered and processed. And once this has been done, it becomes possible to construct a network model of the circulation of information in the given control system and to make a model of its flow, with due regard for the structure and capabilities of the technical means of control and for human psychological and physiological capabilities. With the aid of such a model, the most important part of the troop control system -- the communications system and means -- can be analyzed in great detail.

Under modern conditions, it is important that the cost expression of a control system be taken into consideration not only when new technical control and communications means are being developed, but also when any works aimed at increasing the effectiveness of troop control are in progress. When developing these or other means and methods of control, it is important to ascertain not only what operational-tactical effect the introduction of the new element will have, but also the price of achieving this effect. Network planning methods in conjunction with other methods can be a research tool in this area.

Using these methods, it can be determined what is required of the technical means of control and communications. For example, to discover the best design for an electronic computer to be used at this or that level of control, it is quite feasible to construct several network models of the flow of operational-tactical information and of the work of the responsible persons of the control level in question with different designs of electronic computers.

It can be determined from an analysis of these network models which would be better: the variant in which all operational-tactical information necessary for troop control at a given level is collected and processed by one multi-purpose electronic computer whose function it is to satisfy the control needs of all the responsible persons, or to construct a variety of small specialized electronic computers.

Network planning methods make it possible to choose the most reasonable variants of specialization for these computers. With the aid of these methods, it can be determined whether the efficiency of troop control would increase if the electronic computers were specialized by services and branch arms or whether it would be better to construct specialized computers according to the types and urgency of operational-tactical information and the specific character of the solution of calculation problems. Also, the cost of each variant of computer circuit design can be taken into consideration.

Thus, with the aid of network models, the effect of using automated systems for the control of troops and combat means can be determined and the cost expression of a single unit of time saved can be ascertained.

By successively testing different network models, one can select the automated control system structure which produces the maximal operational-tactical effect and which is also more acceptable for economic reasons.

Use of network planning methods in automated systems extends the sphere of problems that can be solved by automated means. Specifically, computers can be used to develop variants of the plan of combat actions and combat (operational) support measures, to coordinate problems of cooperation, etc.

Network models of troop control tasks enable one to determine faster and more accurately the sequence for solving problems on the computer. On the basis of these models, the priority structure of the problems to be solved by automated means and algorithms for the solution of these problems can be systematically refined.

Thus, when network methods are used, all three aspects of the troop control system lend themselves to research. In other words, network methods can be used:

1) to work out the problems involved in providing technical equipment for the control system for troop and combat means;
2) to research the structure of the control organs and control posts;
3) to study the work methods used by commanders to plan

combat actions and control troops during a battle (operation).

The use of network methods may also yield encouraging results when the forms and methods of armed combat are being researched. For example, the network model of the control of combat with enemy means of nuclear attack shown in the diagram can be substantially expanded by working out in detail the processes of reconnoitering the enemy means of nuclear attack and by developing a more detailed model of the actions of our combat means. At the same time, even this expanded network model may be considered merely a component part of the overall model of armed combat, which reflects not only the processes of control of combat against enemy means of nuclear attack, but also the actions of the different forces and means of armed combat of our own troops and of the enemy, as well as the processes of troop control on the whole and the problems of combat support.

This model with the use of the statistical testing method affords the possibility of judging the effectiveness of proposed types of combat actions and enables one to select scientifically valid norms for the troops. Using them in conjunction with other methods will make it possible to test, for example, recommendations as to the rate of advance of the troops, the depth of combat tasks, the width of the offensive and defensive zones, etc.

An extremely important trend in the use of network methods in scientific research work is their use to work out the tactical-technical specifications for weapons and combat equipment. For example, a network model of all the tasks connected with the preparation of a missile for launching can be constructed and, after it has been determined which actions lie on the critical path, it can be ascertained which assemblies and mechanisms generate the greatest losses of time. On the basis of this determination, and with due regard for the amount of time remaining for all the other tasks, some specifications for the assemblies and mechanisms can be formulated in such a way as to minimize the time to prepare a missile for launching.

Another extremely important trend in the use of network planning methods is use of them to plan the combat and operational training of troops and to organize the training process in the military educational institutions.

The experience gained from the use of network planning and control systems in the Military Air Engineering Academy i/n N.Ye. Zhukovskiy demonstrates that with the aid of network planning methods, new training plans and programs can be developed which provide a more efficient distribution of time among the academic disciplines and ensure the careful coordination of the contents, sequence of studying, methodological structure, and time spent in all the academic courses.

Network methods can also be extensively used in planning scientific research. All major scientific-research and experimental-design work in the armed forces of our country not only can, but must be planned and coordinated with the aid of these methods. It is by using them that ways can be found of substantially increasing the economic efficiency of our scientific-research and experimental-design work and of avoiding duplication of effort.

This is a very large field of application of the methods under consideration and it requires thorough research. It is especially important that a methodology be developed for using network planning to efficiently assign scientific research efforts and to predict their subject matter, times of performance, resources, and executors.

The planning and organization of scientific research in the armed forces is in need of further improvement. This is especially true of complex scientific-research and experimental-design work in which numerous teams of specialists and tens and sometimes hundreds of institutions, establishments, and enterprises of different types participate.

The use of network planning methods in this area makes it possible to combine all the diverse research efforts into one whole, to work out scientifically valid recommendations for coordinating the activities of individual executors, and to direct efforts in advance to the most demanding areas of work.

The main advantage of using network methods in planning and organizing scientific research in the military field is that they make it possible to substantially reduce the amount of time to carry out scientific-research and experimental-design work and, moreover, to decrease economic expenditures on them. Use of these methods makes it possible to predict more accurately the development times of projected means of combat. The results of these predictions will be the basis for developing and refining armament plans, which will be able to be worked out for a longer period.

LIST OF TASKS IN THE NETWORK MODEL OF CONTROL OF MISSILE LARGE UNITS AND UNITS OF A FRONT DURING COMBAT WITH ENEMY MEANS OF NUCLEAR ATTACK

(Key to diagram on page 28)

Task No.	Designation of Task
1	Delivery of information on a detected enemy means of nuclear attack from the reconnaissance organ to the *front* intelligence directorate
2	Processing and assessment of the information on the detected enemy means of nuclear attack in the *front* intelligence directorate
3	Delivery of information on the detected enemy means of nuclear attack from the chief of the intelligence directorate to the *front* commander
4	Transmission of the instruction of the chief of the intelligence directorate for final reconnaissance of the detected enemy means of nuclear attack
5	Final reconnaissance of the enemy means of nuclear attack
6	Delivery of the results of final reconnaissance to the chief of the *front* intelligence directorate
7	Delivery of information on the detected enemy means of nuclear attack by an officer of the intelligence directorate to the staff of rocket troops and artillery of the *front*
8	Assessment of the enemy means of nuclear attack by the *front* commander
9	Issue by the *front* commander of an order to the chief of the intelligence directorate for final reconnaissance of the enemy means of nuclear attack
10	Assessment by the *front* commander of the position and status of the units and large units of rocket troops and artillery
11	Information request by the *front* commander about the position, status, and capabilities of the units and large units of rocket troops and artillery
12	Report to the *front* commander about the position, status, and capabilities of the units and large units of rocket troops and artillery

Task No.	Designation of Task
13	Assessment by the *front* commander of the position, status, and capabilities of the units and large units of rocket troops and artillery
14	Assessment by the *front* commander of the wind direction and other weather conditions
15	Assessment by the *front* commander of the nature of the terrain and hydrological conditions
16	Adoption by the *front* commander of the decision on hitting the enemy means of nuclear attack
17	Assignment of the task by the *front* commander to the staff of rocket troops and artillery to hit the enemy means of nuclear attack
18	Preparation and encoding of the command to hit the enemy means of nuclear attack in the staff of rocket troops and artillery of the *front*
19	Transmission of the command to hit the enemy means of nuclear attack from the staff of rocket troops and artillery of the *front* to the missile brigade or missile battalion or to the launching battery on alert
20	Assessment of the enemy means of nuclear attack by the chief of rocket troops and artillery of the *front*
21	Issue by the chief of rocket troops and artillery of the *front* of an order for final reconnaissance of the enemy means of nuclear attack to the chief of intelligence of the staff of rocket troops and artillery
22	Delivery of the instruction of the chief of intelligence of the staff of rocket troops and artillery of the *front* for final reconnaissance of the detected enemy means of nuclear attack
23	Delivery of the results of artillery final reconnaissance to the chief of intelligence of the staff of rocket troops and artillery of the *front*
24	Processing and assessment of the information on the detection of enemy means of nuclear attack by the chief of intelligence of the staff of rocket troops and artillery of the *front*
25	Delivery of information about the detected enemy means of nuclear attack from the chief of intelligence of the staff of rocket troops and artillery to the chief of rocket troops and artillery of the *front*

'ask lo.	Designation of Task
26	Assessment by the chief of rocket troops and artillery of the front of the position and status of the units and large units of rocket troops and artillery
27	Assessment by the chief of rocket troops and artillery of the front of the position, axis, nature of actions, and tasks of his troops
28	Assessment by the chief of rocket troops and artillery of the front of the wind direction and other weather conditions
29	Assessment by the chief of rocket troops and artillery of the front of the nature of the terrain and hydrological conditions
30	Preparation by the chief of rocket troops and artillery of the front of proposals on the destruction of the enemy means of nuclear attack
31	Reporting by the chief of rocket troops and artillery of the front of proposals on the destruction of enemy means of nuclear attack to the front commander
32	Approval by the front commander of the proposals of the chief of rocket troops and artillery on the destruction of the enemy means of nuclear attack
33	Delivery of information on a detected enemy means of nuclear attack from the artillery reconnaissance organ to the chief of intelligence of the staff of rocket troops and artillery of the front
34	Delivery of information on the detected enemy means of nuclear attack from the chief of intelligence (an intelligence officer) of the staff of rocket troops and artillery to the intelligence directorate of the front
35	Request of the chief of rocket troops and artillery of the front for more specific information on the detected enemy means of nuclear attack
36	Receipt by the chief of rocket troops and artillery of the front of more specific information on the detected enemy means of nuclear attack
37	Assessment of the enemy means of nuclear attack by the division commander
38	Assessment by the division commander of the position and status of the units and large units of rocket troops and artillery
39	Assessment by the division commander of the position, axis, nature of actions, and tasks of his troops

Task No.	Designation of Task
40	Assessment by the division commander of the wind direction and other weather conditions
41	Assessment by the division commander of the nature of the terrain and hydrological conditions
42	Issue by the division commander of an order to the chief of intelligence for final reconnaissance of the enemy means of nuclear attack
43	Delivery of the instruction of the chief of intelligence of the division for final reconnaissance of the enemy means of nuclear attack to the reconnaissance organs
44	Delivery of the results of final reconnaissance to the chief of intelligence of the division
45	Processing and assessment of the information on the detected enemy means of nuclear attack in the intelligence section of the division
46	Delivery of information about the detected enemy means of nuclear attack from the chief of intelligence to the division commander
47	Delivery of information about the detected enemy means of nuclear attack from the reconnaissance organ to the intelligence section of the division
48	Information request of the division commander about the positions, status, and capabilities of the units and large units of rocket troops and artillery
49	Report to the division commander on the position, status, and capabilities of the units and large units of rocket troops and artillery
50	Assessment by the division chief of artillery of the enemy means of nuclear attack
51	Assessment by the division chief of artillery of the position and status of the large units and units of rocket troops and artillery
52	Assessment by the division chief of artillery of the position, axis, nature of actions, and tasks of his troops
53	Assessment by the division chief of artillery of the wind direction and other weather conditions
54	Assessment by the division chief of artillery of the nature of the terrain and hydrological conditions
55	Assessment of the enemy means of nuclear attack by the army commander

Task No.	Designation of Task
56	Assessment by the army commander of the position and status of the units and large units of rocket troops and artillery
57	Assessment by the army commander of the position, axis, nature of actions, and tasks of his troops
58	Assessment by the army commander of the wind direction and other weather conditions
59	Assessment by the army commander of the nature of the terrain and hydrological conditions
60	Information request of the army commander about the position, status, and capabilities of the units and large units of rocket troops and artillery
61	Report to the army commander on the position, status, and capabilities of the units and large units of rocket troops and artillery
62	Issue by the army commander of an order to the chief of intelligence for final reconnaissance of the enemy means of nuclear attack
63	Delivery of the instruction of the chief of intelligence of the army for final reconnaissance of the enemy means of nuclear attack to the reconnaissance organs
64	Delivery of the results of final reconnaissance to the chief of intelligence of the army
65	Processing and assessment of the information on the detected enemy means of nuclear attack in the intelligence department of the army
66	Delivery of information on the detected enemy means of nuclear attack by the chief of intelligence to the army commander
67	Assessment of the enemy means of nuclear attack by the chief of rocket troops and artillery of the army
68	Assessment by the chief of rocket troops and artillery of the army of the position and status of the units and large units of rocket troops and artillery
69	Assessment by the chief of rocket troops and artillery of the army of the position, axis, nature of actions, and tasks of his troops
70	Assessment by the chief of rocket troops and artillery of the army of the wind direction and other weather conditions
71	Assessment by the chief of rocket troops and artillery of the army of the nature of the terrain and hydrological conditions

Task No.	Designation of Task
72	Adoption by the army commander of the decision on hitting the enemy means of nuclear attack
73	Preparation by the chief of rocket troops and artillery of the army of proposals on destruction of the enemy means of nuclear attack
74	Assignment by the army commander of the task to the staff of rocket troops and artillery for hitting the enemy means of nuclear attack
75	Preparation and encoding of the command to hit the enemy means of nuclear attack in the staff of rocket troops and artillery of the army
76	Reporting by the chief of rocket troops and artillery of the army of proposals on the destruction of the enemy means of nuclear attack to the army commander
77	Approval by the army commander of the proposals of the chief of rocket troops and artillery on the destruction of enemy means of nuclear attack
78	Adoption by the division commander of the decision on hitting the enemy means of nuclear attack
79	Preparation by the division chief of artillery of proposals on the destruction of the enemy means of nuclear attack
80	Assignment by the division commander of the task to the staff of artillery to hit the enemy means of nuclear attack
81	Preparation and encoding of the command to hit the enemy means of nuclear attack in the staff of artillery of the division
82	Reporting by the division chief of artillery of proposals on the destruction of the enemy means of nuclear attack to the division commander
83	Approval by the division commander of the proposals of the chief of artillery on the destruction of the enemy means of nuclear attack
84	Delivery of the order of the <u>front</u> commander on hitting the enemy means of nuclear attack to the army commander
85	Delivery of the instruction of the staff of rocket troops and artillery of the <u>front</u> on hitting the enemy means of nuclear attack to the staff of rocket troops and artillery of the army
86	Delivery of the order of the army commander on hitting the enemy means of nuclear attack to the division commander

Task No.	Designation of Task
87	Delivery of the instruction of the staff of rocket troops and artillery of the army on hitting the enemy means of nuclear attack to the staff of artillery of the division
88	Delivery of information on the detected enemy means of nuclear attack from the intelligence section of the division to the intelligence department of the army
89	Delivery of information on the detected enemy means of nuclear attack from the intelligence department of the army to the intelligence directorate of the front
90	Delivery of information on the detected enemy means of nuclear attack from the reconnaissance organ to the intelligence department of the army
91	Report of the division commander on the detected enemy means of nuclear attack to the army commander
92	Report of the army commander on the detected enemy means of nuclear attack to the front commander
93	Transmission of the command to hit the enemy means of nuclear attack from the staff of rocket troops and artillery of the army to the missile brigade or missile battalion or to the launching battery on alert
94	Transmission of the command to hit the enemy means of nuclear attack from the staff of the artillery division to the missile battalion or to the launching battery on alert
95	Decoding of the command to hit the enemy means of nuclear attack in the missile brigade
96	Assessment of the position and status of battalions by the brigade commander
97	Preparation and encoding of the command to hit the enemy means of nuclear attack in the missile brigade
98	Transmission of the command to hit the enemy means of nuclear attack from the missile brigade to the missile battalion
99	Decoding of the command to hit the enemy means of nuclear attack in the missile battalion
100	Assessment of the position and status of the batteries by the battalion commander
101	Preparation and encoding of the command to hit the enemy means of nuclear attack in the missile battalion
102	Transmission of the command to hit the enemy means of nuclear attack from the missile battalion to the launching battery

Task No.	Designation of Task
103	Decoding of the command to hit the enemy means of nuclear attack in the launching battery
104	Assignment by the battery commander of the task to the chief of the launcher to prepare the initial launch data
105	Assignment by the battery commander of the task to the crew
106	Preparation of the launcher
107	Preparation of the initial data at the launcher of the battery
108	Transmission of the initial data from the launcher of the battery to the crew
109	Aiming of the launcher at the target
110	Flight of the missile

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TOP SECRET

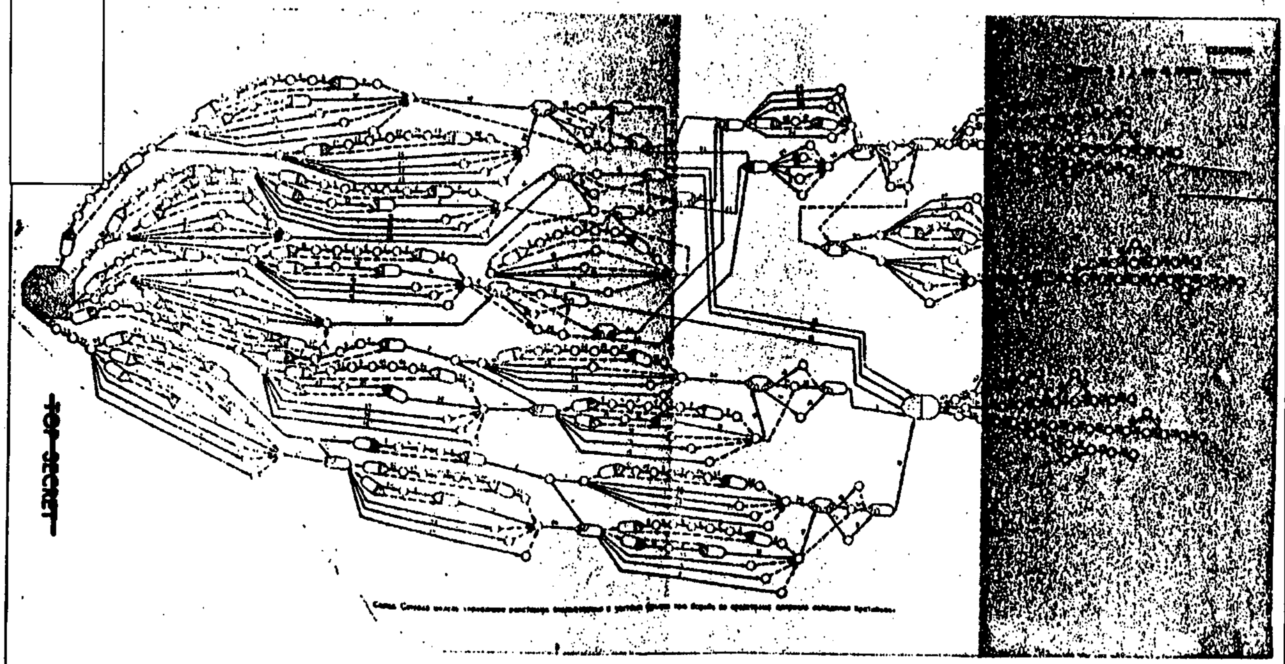

Diagram. Network model of the control of the missile large units and units of the *front* when combating enemy nuclear means of attack.

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