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CENTRAL INTELLIGENCE AGENCY  
WASHINGTON, D.C. 20505

20 June 1980

MEMORANDUM FOR: The Director of Central Intelligence  
FROM : John N. McMahon  
Deputy Director for Operations  
SUBJECT : USSR GENERAL STAFF ACADEMY LESSONS : Study of the  
Basic Diagram of the Mathematical Model of a  
Front Offensive Operation

1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on a collection of 29 lessons, classified TOP SECRET, prepared in 1977 for use in the Soviet General Staff Academy. The lessons are broken down into two parts: the first 19 lessons deal with the staff preparation of a front offensive operation with conventional and nuclear weapons; the remaining 10 lessons deal with the conduct of an offensive employing conventional weapons at first with a transition to the use of nuclear weapons. This report is a translation of the lesson involving the development, structure, processing by electronic computer, and practical application of the mathematical model of a front offensive operation in its non-nuclear and nuclear stages.

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.

John N. McMahon

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Page 1 of 14 Pages

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# Intelligence Information Special Report

Page 3 of 14 Pages

COUNTRY USSR

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SUBJECT

GENERAL STAFF ACADEMY LESSON NO. 6 : Study of the Basic Diagram of the Mathematical Model of a Front Offensive Operation

SOURCE Documentary

Summary:

The following report is a translation from Russian of a lesson, classified TOP SECRET, prepared for use at the General Staff Academy of the Armed Forces of the USSR. This lesson is for the instruction of students acting as front chiefs of staff and operations officers and deals in very generalized terms with the formulation, development, content, electronic computer processing, evaluation, and employment of the mathematical model of a front offensive operation in its non-nuclear and nuclear stages. The modeling makes it possible to determine the average rates of troop advance, the probable balance of forces, and the average anticipated losses. The lesson presents two very simple planning forms dealing with modeling areas, time factors, and movement speeds, and with strength and activity data. Although some time, distance, rate, and strength factors are presented, the lesson contains little substantive data, thus making it difficult to evaluate the degree of sophistication of Soviet mathematical modeling for military operations.

End of Summary

Comment:

Although not specifically identified, the colors representing NATO countries in this lesson probably equate as follows:

- Brown -- West Germany
- Green -- United States
- Blue -- Great Britain
- Lilac -- Belgium



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LESSON No. 6

I. Lesson Subject. Study of the basic diagram of the mathematical model of a front offensive operation.

II. Training objectives of the lesson:

-- teach the students the proper understanding of the purpose of the mathematical model of a front offensive operation, its structure, and its possible use in planning the operation;

-- give students practice in formulating the tasks to carry out modeling of the operation, filling out the basic query forms, and in analyzing the results of the modeling.

-- investigate the most expedient methods of using the variant of the model to be examined in the process followed by a formation commander in making a decision and by a front staff in planning the operation.

III. Training topics and time for their completion.

Item No.	Training topics	Allotted time (in minutes)		
		Group training period	Individual study by the students	Total
1	Theoretical matters	35	45	80
2	Assignment of the task for modeling.	10	--	10
3	Filling out query forms and critique of the sequence of calculations.	45	--	45
4	Analysis of modeling results and preparation of conclusions based on it.	40	--	40
	Critique of the lesson	5	--	5
	Total	135	45	180

TS #808136  
Copy # 3

~~TOP SECRET~~

FIRDB-312/01559-80

Page 5 of 14 Pages

IV. Method of conducting the lesson is a group exercise using the results of actual calculations on an electronic computer.

V. Methodological recommendations on the preparation of the students for the lesson.

At the start of individual study, the lesson director will define the tasks of the students more precisely and will ensure:

-- they study the assignment and the training methods material for lesson No. 6;

-- they prepare reports about the function, principle of calculations, and basic characteristics of the model under examination (the operational principles of its structure, characteristics of the constant and variable input data, the criteria, the structure of the model, and the operating principles of its basic units).

As a result of individual study, the students should be prepared:

-- in the capacity of a front chief of staff, to assign the task to the operations directorate on the handling of the mathematical modeling of the front offensive operation;

-- in the capacity as operations officer, to fill out the basic query forms, to analyze the results of the modeling and prepare conclusions based on them for a report to the front chief of staff.

VI. Procedure for conducting the lesson.

Opening address by the instructor. He will emphasize the requirements of the Minister of Defense and the Chief of the General Staff concerning the development and extensive employment of mathematical models using electronic computers to forecast the development of a situation and to evaluate the variants of the possible decision and operation plan. He will point out the training objectives of the given lesson.

First training topic (theoretical). The function and general characteristics of the mathematical model of a front offensive operation.

TS #808136  
Copy # 3

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FIRDB-312/01559-80

Page 6 of 14 Pages

The student's plan for the report on this topic may be as follows:

- purpose of the model and its classification features;
- operational bases for the design of the model;
- description of the constant and variable input data;
- criteria to be used for evaluating the effectiveness of the operation and their meaning;
- what can be obtained as a result of modeling.

Approximate contents of the report.

The given mathematical model of a front offensive operation is intended principally for a comparative evaluation of the possible variants of the decision on the conduct of an operation and support of its planning.

The model, according to the accepted classification, is: staff, operational in scale, two-sided (the actions of the enemy are described in the same detail as the actions of our side), quasi-regular (the average strength of the sides and their rate of advance at small intervals of time in the conduct of the operation are assumed to be equal to their actual value; partially-optimized (just some of the elements of the decision on the conduct of the operation are optimized, specifically, the choice of targets for destruction with the given total expenditure of means of destruction for the initial strike and for the immediate and follow-up tasks, and so forth); and approximate (the precision of the calculations of the criteria of the effectiveness of the operation is  $\pm 5$  to 10%).

The following are classed as the operational bases for the development of the model:

- formal description of the diagram for conduct of the operation, based on a zonal representation of the location of the targets and groupings of the sides;
- definition of the feasible strengths of the troop groupings and a description in necessary detail of their organizational structure;

TS #808136  
Copy # 3

~~TOP SECRET~~

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FIRDB-312/01559-80

Page 7 of 14 Pages

-- establishment of the list of data to be taken into account concerning the terrain and its engineer preparation, and concerning meteorological conditions;

-- determination and formal description of the methods of actions of the forces and means of the sides;

-- selection of criteria (indices) of the effectiveness of the operation;

-- systematization of the basic norms which characterize the destruction of targets and other processes being modeled;

-- determination of the extent, form, and content of input and output information;

-- determination of the time requirements for modeling one variant of the conduct of the operation.

For convenience and acceleration of the preparation of the modeling data, all input information is divided into two parts: the constant and the variable. Constant information refers to data that remain constant for different variants of computation (organizational structure of troops, characteristics of weapons and combat equipment, norms, etc.). Variable information refers to data that change with a change in the computation variant (operational disposition of troops, axis of the main attack and other attacks, distribution of means of destruction by axes and by tasks of the operation, etc.).

The following criteria (indices) will be used in a comparative evaluation of the variants for the conduct of the operation:

-- average anticipated rate of advance of front troops in the initial disposition zones of the first-echelon divisions;

-- probable balance of forces and means of the sides during the operation by specified components;

-- average anticipated losses of basic resources in front troops on given days of the operation.

TS #808136  
Copy # 3

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FIRDB-312/01559-80

Page 8 of 14 Pages

As a result of modeling, the front commander and his staff will be able to obtain a variety of valuable data which do not lend themselves to determination by manual /calculation/ and whose use will help them choose the best variant for the conduct of the operation and the formulation of its plan under the prevailing conditions.

The second training topic. The assignment by the front's chief of staff to the chief of the operations directorate of the task of carrying out the mathematical modeling of the operation.

Operational time will be 0830 hours 1 September, students in the capacity of chief of staff of the front will issue instructions to the chief of the operations directorate.

#### Plan of instructions

1. To whom will modeling be entrusted and what is required to be done overall.
2. Who will be involved in the preparation of data.
3. The basic indices of the operation in conformity with the concept.
4. Grouping of troops (armies and large units) on the axis of the main attack and other attacks.
5. Distribution of means of destruction and the basic support of the operation.
6. Specified stages of the modeling, their duration, and the step of modeling.
7. The data required to be obtained as a result of the modeling.
8. Time for the report about the results of the modeling and the conclusions based on them.

#### Contents of instructions

1. The operations directorate is to accomplish, on /an/ electronic computer at the front staff computer center, mathematical modeling of two variants for the conduct of the planned operation and arrive at a conclusion from the results obtained.

TS #808136  
Copy # 3

~~TOP SECRET~~



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FIRDB-312/01559-80

Page 9 of 14 Pages

2. For the preparation of input information, officers of the intelligence directorate and the necessary staff officers (of the directorates) of branch arms and special troops will be allocated.

3. The indices for the operation according to the concept are as follows:

-- a depth of 500 to 600 kilometers, a duration of 10 to 12 days, and an average rate of advance of 50 to 60 kilometers per day;

-- depth of the immediate task is 280 to 300 kilometers, duration is five to six days, average rate of advance is 40 to 50 kilometers per day.

4. The grouping of front troops and enemy troops will be in conformity with the estimate of the situation that is carried out and the proposals concerning the decision.

The 7th and 9th armies will be deployed on the axis of the main attack of the front; the 4th Army will be in action on the axis of the second attack. It is to be assumed that in the first-echelon armies, the 3rd and 7th motorized rifle divisions, the 4th Motorized Rifle Division, the 5th and 10th tank divisions, and the 18th Motorized Rifle Division will deliver the main attacks.

5. The allocation of nuclear warheads for the initial nuclear strike, fulfillment of the immediate and follow-up tasks, delivery of air and artillery support, and also the remaining types of basic support will be in accordance with the concept of the decision.

6. Modeling will be divided into stages: the first non-nuclear stage will be three and a half days, the second stage -- the exchange of nuclear strikes -- two hours, the third stage -- three days, the fourth stage -- six days. The modeling step in the first stage will be six hours, in the second stage 15 minutes, in the third stage eight hours, and in the fourth stage 12 hours.

Calculations will be carried out for two variants of the exchange of nuclear strikes: the first variant -- enemy time lag will be zero minutes, the second variant -- enemy time lag will be 15 minutes.

The approach speed for troops of the sides is assumed to be 20 kilometers per hour, the movement speed of tanks and BMP's /infantry combat vehicles/ in open, easily traversed terrain is 15 kilometers per hour.

TS #808136  
Copy # 3

~~TOP SECRET~~

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FIRDB-312/01559-80

Page 10 of 14 Pages

As a result of the modeling of the two variants, for D1, D4, D6, and D12, the following will be determined:


- the average anticipated rate of advance of front troops;
- the probable balance of forces and means;
- the average anticipated losses of front troops.

The results of modeling and conclusions drawn from it will be reported by 1230 hours 1 September.

Third training topic. Filling out the main query forms and critique of the sequence of calculations.

Operational time, 0900 hours 1 September. Students in the capacity of officers of the operations directorate will fill out the main query forms (forms No. 1 and No. 2, which are shown as supplements to the assignment). In filling out the forms, the instructions of the front's chief of staff and the map of the decision (its outline is inserted in the assignment)\* will be used.

Correctly filled out forms appear as follows:

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 comment: The map was not received.

TS #808136  
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FIRDB-312/01559-80

Page 11 of 14 Pages

Form No. 1

General Data on the Parameters of the Operation

Item No.	Designation	Unit of measure	Variant number		
			1	2	3
1.	Number of zones for the first-echelon large units	--	10	10	--
2.	Duration of first stage	24 hour period	3.5	3.5	--
3.	Duration of second stage	hours	2	2	--
4.	Duration of third stage	24 hour period	3	3	--
5.	Duration of fourth stage	24 hour period	6	6	--
6.	Modeling step for first stage	hours	6	6	--
7.	Modeling step for second stage	minutes	15	15	--
8.	Modeling step for third stage	hours	8	8	--
9.	Modeling step for fourth stage	hours	12	12	--
10.	Enemy time lag in a nuclear strike	minutes	0	15	--
11.	Average movement speed of troops of the sides during the approach	kilometers per hour	20	20	--
12.	Average movement speed of tanks and BMP's over easily traversed open terrain	kilometers per hour	15	15	--

TS #808136

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Formal Diagram of the Disposition of Troops of the Sides in the Operation

		Enemy			Our Troops				
Large units and units of the second echelon of the army group	Large units and units of the second echelons of the army corps	λ**	First-echelon divisions of the army corps	No. of large unit zones	First-echelon divisions of the armies	λ**	Armies (large units of their second echelons)	Armies and large units of the second echelon of the <u>front</u>	
Northern Army Group  one Green motorized infantry division  five Lilac motorized infantry divisions  Brown army corps (two infantry divisions, one tank division)	one Brown motorized infantry division	1	one Brown mtz inf div	1	3rd MtzR Div	1	4th Army (2nd Tk Div, 14th MtzR Div)	Coastal <u>Front</u>  13th MtzR Div -- from D3 in the 4th Army zone  20th Tk Div -- from D2 in the 7th Army zone  30th Abn Div -- from D7 in the 10th Tank Army zone  10th Tank Army (3 tk divs, one mec /sic/ div -- from D6 in the 6th and 7th army zones)	
		1	one Brown mtz inf div	2	7th MtzR Div	1			
		0	one Brown mtz inf div	3	8th MtzR Div	0			
	two Brown mtz inf divisions, one Brown tank division	0	one Brown mtz inf div	4	1st MtzR Div	0	7th Army (9th Tk Div, 1st MtzR Div)		
		1	one Brown tk div	5	4th MtzR Div	1			
		1	one Brown mtz inf div	6	5th Tk Div	1			
	one Blue armored division	1	0.6 Brown tk div	7	10th Tk Div	1	9th Army (6th MtzR Div, 26th Tk Div)		
		1	0.6 Brown tk div 0.3 Blue armd div	8	18th MtzR Div	1			
		0	0.7 Blue armd div	9	21st MtzR Div	0			
		0	one Blue armd div	10	23rd MtzR Div	0			
	<u>Front Zone</u>	Army Zone	Tactical Zone	<u>ZNS*</u>	Tactical Zone	Army Zone	<u>Front Zone</u>		

Footnote: \*ZNS -- Zone of close contact of the troops.  
 \*\*λ -- Indicator of actions of large units on the axis of the main efforts of the troops of the sides. (1 - active, 0 - inactive).

~~TOP SECRET~~

FIRDB-312/01559-80

Page 13 of 14 Pages

When filling out form No. 2, it is advisable for one of the students to report the essence of the zone method of locating targets adopted in the model (see page 7 of the training methods material of the assignment).

After filling out the query forms and checking the accuracy of their contents, a critique of the sequence of calculations during modeling of the operation will be carried out.

It is advisable for the students to pattern the critique in the form of a report (reports) in the following sequence:

- the essence of the accepted method of modeling;
- the main sections of the model, their function, and the principles of calculation.

Possible variant of a report

\* The method of "dynamics of averages" has been established as the basis for the model of the front operation, the essence of which amounts to the following:

1. The projected time for the conduct of the operation is divided into three to four stages which differ from one another by the nature and intensity of the combat actions that are conducted (initial nuclear strike, fulfillment of the immediate task, and so forth). \*

2. Each designated stage will be given its own step of modeling  $\Delta t$ , which, on the basis of the recommendations which are to be entered in the guide on the employment of a model in the staff, will be determined to be the greatest possible interval of time during which the rate of change in the strength of the sides and in the displacement of the front line in the zones of the large units may be considered uniform for all practical purposes.

3. The location (zone) and the composition of each target to be modeled will be fixed at the start of each step.

TS #808136  
Copy # 3

~~TOP SECRET~~

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FIRDB-312/01559-80

Page 14 of 14 Pages

4. The number, types, and distribution of the means of destruction to be expended by the sides at a given step of modeling will be determined by the value of  $\Delta t$  relative to one another and, on the basis of these data, the average rate of change in the composition of the targets of the sides and the rate of displacement of the front line in the zones of the first-echelon large units will be calculated.

5. Multiplying the rates obtained by the value of modeling step  $\Delta t$ , one will obtain the gains in the average strengths of the sides with respect to the groups of targets and the average displacements of the front line for the step under consideration, and these gains and displacements are taken to be the actual ones.

6. In a new step, one will determine the changed initial strengths of the sides and the new initial location of the front line, and then a decision will be made concerning the allocation of the reserves or the withdrawal of troops and the entire process of modeling will be repeated according to the above-described arrangement, and so on up to the end of the given overall time for modeling the operation.

In structure the model consists of nine units (for the function of the units and their principles of operation -- see pages eight through 11 of the training methods material).

Fourth topic. Analysis of the results of modeling and the preparation of conclusions based on them.

Students will carry out an analysis of the results of modeling individually based on tables No. 1, 2, and 3 of the supplement to the assignment following the procedure shown on page 12 of the training methods material.

The variant of the report will be refined at the methodological conference.

Critique of the lesson. The lesson director will remind the students of the lesson subject and its objectives, and he will discuss how these objectives were attained.

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