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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

16 November 1976

MEMORANDUM FOR: The Director of Central Intelligence

FROM : William W. Wells
Deputy Director for Operations

SUBJECT : MILITARY THOUGHT (USSR): Work of a Computation and Analysis Station

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 deals with the mechanism for assessing and reporting on the radiation and chemical situation in a nuclear war which was derived from the experience of exercises conducted by several military districts in the early 1960's. The tasks of a computation and analysis station in forecasting the situation, performing calculations, and processing and plotting incoming data for reports are outlined and further described as they apply to the computation and information sections within a station. The article highlights the use of an analog computer for calculating radiation doses, forms devised for computing doses and recording incoming data, mapping and reporting procedures, and a proposal to subordinate the computation and analysis station to the chief of chemical troops. This article appeared in Issue No. 5 (66) for 1962. [redacted]

[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]

William W. Wells

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Intelligence Information Special Report

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SUBJECT

MILITARY THOUGHT (USSR): Work of a Computation and Analysis Station

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 5 (66) for 1962 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought". The authors of this article are General-Mayor of Technical Troops N. Rumyantsev, Lieutenant Colonel K. Dudko, and Major Yu. Vaulin. This article deals with the mechanism for assessing and reporting on the radiation and chemical situation in a nuclear war which was derived from the experience of exercises conducted by several military districts in the early 1960's. The tasks of a computation and analysis station in forecasting the situation, performing calculations, and processing and plotting incoming data for reports are outlined and further described as they apply to the computation and information sections within a station. The article highlights the use of an analog computer for calculating radiation doses, forms devised for computing doses and recording incoming data, mapping and reporting procedures, and a proposal to subordinate the computation and analysis station to the chief of chemical troops.

End of Summary

[redacted] Comment:

Lieutenant Colonel Yu. Vaulin describes more recent experience with this subject in the article, "Improving the Work of Computation and Analysis Stations", in Issue No. 2 (84) for 1968 [redacted] After 1962 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. [redacted]

[redacted]

Work of a Computation and Analysis Station

by

General-Mayor of Technical Troops N. Rumyantsev
Lieutenant Colonel K. Dudko
Major Yu. Vaulin

Guaranteeing the safety of troop actions and prompt protective measures during massed employment of nuclear and chemical weapons requires that commanders and staffs be provided early with complete and reliable data on the nature of the radioactive and chemical contamination.

A rapid assessment of the radiation and chemical situation allows an earlier warning of troops against the danger of contamination by radioactive and chemical agents. This involves the execution of a large number of special calculations and requires a continuous collation of data on the radiation and chemical situation.

As the experience of the operational training of staffs and the combat training of troops has shown, all of these tasks can be handled more rapidly by a computation and analysis station incorporated within the tables of organization of the headquarters of a combined-arms (tank) army and front in time of war.

The purpose of a computation and analysis station is to compile and process data on the radiation and chemical situation, make calculations that are used during the organization and execution of measures for the protection of troops against weapons of mass destruction, as well as to report to the staffs of the units, large units and formations on the radiation and chemical situation.

On the basis of experience gained in exercises conducted in the Group of Soviet Forces, Germany, in the Kiev, Carpathian, Baltic and Turkestan military districts, and in command-staff exercises and war games held in the military academies, a computation and analysis station can perform the following tasks:

-- forecast the radiation and chemical situation in the zone of troop operations of an army (front);

-- collect and process data from the air and ground radiation and chemical reconnaissance conducted by army or front means, and by units and

subunits of all the branch arms, as well as the reports received from adjacent units;

-- make the calculations required by the staff of the army (front) for determining the possible effect of the radiation and chemical situation which has developed on the combat effectiveness of the troops and the operation of the rear services;

-- prepare the initial data for organizing safety measures for personnel during the delivery of nuclear and chemical strikes by their own troops and during the actions of the troops of the army (front) on contaminated terrain;

-- report to the departments of field headquarters and the staffs of the large units (formations) and adjacent units on the forecast and actual development of the radiation and chemical situation;

-- make calculations for the determination of the effectiveness of our employment of chemical weapons and of the radiation contamination as a result of our ground nuclear bursts.

Since the computation and analysis stations of a front and army are identical in make-up and perform analogous tasks, we shall generally confine our considerations to the operation of the army station.

A computation and analysis station consists of computation and information sections, a communications platoon, and a motor transport section. The available radio equipment allows it to maintain communications with the staffs of divisions (R-103), subunits of the army air radiation reconnaissance (R-824), and the front computation and analysis station (R-118) from only one position of a command post, although a station, depending on the number of its personnel, could operate simultaneously at two command posts in the army.

Initially, the assessment of the radiation and chemical situation is obtained by the forecasting method and is then refined in accordance with the factual data coming in from the units, large units and special radiation and chemical reconnaissance subunits. The forecast data are, of course, only approximately accurate. Nevertheless, reports on the magnitude and nature of the contamination, received shortly after the delivery of the nuclear or chemical strike, are necessary for preliminary assessment of the radiation and chemical situation.

The value of the forecasting method lies in the fact that it makes it possible to provide a timely warning to the troops of the possible radioactive contamination of the areas in which they are operating, to make a preliminary decision on the most desirable methods for conducting troop

actions and protective measures, as well as to purposefully and correctly assign tasks to ground and air radiation reconnaissance.

The initial data for forecasting the radiation situation are the reports on the coordinates and parameters of the nuclear bursts and the direction and velocity of the average wind at different altitudes.

At the present time a computation and analysis station can receive reports on the coordinates and parameters of the nuclear bursts only from the units and large units that have the optical means that can be used to determine these data. In this connection, the problem of developing an automated system for plotting the nuclear bursts on the basis of improved technical equipment has not yet been solved.

The information on the direction and velocity of the average wind is obtained from the front meteorological service or from army rocket troops and artillery that have their own means for high-altitude sounding of the atmosphere. The chemical service can provide information on the meteorological situation in the air at ground level.

The work of the computation and analysis station is structured as follows when data are received on the coordinates and parameters of nuclear bursts.

The computation and information sections plot these data on their working maps and prepare the material for the chief of the chemical troops for subsequent reporting to the commander and chief of staff, as well as for informing the departments of the army field headquarters, the staffs of divisions and of army units.

The information section first reports to the army field headquarters departments and to the staffs of the branch arms on the coordinates and parameters of the nuclear bursts and the general direction of propagation of the radioactive cloud, and secondly reports more precise information on the boundaries of the zones of radioactive contamination, radiation levels, and possible doses sustained by the personnel. Within the army field headquarters, loudspeaker communications can be used, with mandatory backup of the broadcast information with graphic representation of the radiation situation on a paper or transparent overlay. Then, as more complete data come in and are processed in final form, the radiation and chemical situation which has developed in the army zone as of a particular time is plotted on a paper overlay, reported to the commander, and reported to the primary departments of the staff (triplicate reporting).

Parallel with the first report sent to the army staff, information is sent to the staffs of the divisions and staffs of the army units on the coordinates and parameters of only those nuclear bursts the radioactive cloud of which is spreading in the direction of the disposition or operating area of these large units and units.

The computation section, until the precise boundaries of the radioactive contamination zone are determined, computes the probable radiation doses for the units of army subordination and divisions that are threatened with radioactive contamination, and prepares the data for deciding what actions the troops in this zone should take.

The speed at which the radioactive situation is forecast depends on proper organization of the work of the information and computation sections. At one of the command-staff exercises at the Military Chemical Defense Academy (in February 1962) the first report on the forecast radiation situation as a result of 18 ground nuclear bursts was issued 15 minutes after the data on the bursts were received. The paper or cellophane overlay with the recorded radiation situation was reported to the army commander and then was transmitted to the operations department, the chief of the rocket troops and artillery, and the chief of the army rear. The second report -- containing the limits of the zones of radioactive contamination -- was sent out 20-25 minutes after the first report.

In order to reduce the time required for plotting the radiation situation, we suggest that the computation and analysis station have previously prepared, 1:200,000-scale templates which differ somewhat from those recommended by the official guide,* based on the TNT equivalents of the nuclear warheads and the most typical wind velocities. Exercises in the Kiev Military District (in June 1962) showed that the use of this type of template can reduce the time for plotting the radiation situation to approximately one third. In this case, also, the use of special tables** is unnecessary since the templates proposed by us are made up with these data already taken into account.

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* Method of Assessing the Radiation Situation During Massed Employment of Nuclear Weapons and Certain Questions of Protecting Troops Operating on Contaminated Terrain, Moscow, Military Publishing House, 1960.
** Tables for Assessing the Radioactive Contamination of Terrain During Atomic Explosions, Moscow, Military Publishing House, 1960.

The reproduction of the paper (transparent) overlay with the plotted radiation situation can be done by the draftsmen of the information section and by using reproducing equipment (staff printer or ERA-1 electrographic reproduction equipment). We should consider the experience of the Group of Soviet Forces, Germany with the reproduction under field conditions of maps (diagrams) with a plotted situation, by the personnel of the mobile cartographic unit, a method that could be used also for reproducing maps (paper overlays) with the radiation situation.

Signal-code devices will be used extensively for reporting on nuclear bursts.

In addition to the various types of tables and the DD-1 dosimetric rule, the electronic computer will play an important role in the work of the computation section for calculating the radiation dose. A type of electronic computer developed by the staff of the Baltic Military District -- an analog computer with fixed program -- can be used to determine the following elements: the radiation level at any point in the fallout pattern of the radioactive cloud; the radiation dose sustained by personnel both at the time the fallout pattern is being negotiated and during the time the troops are on contaminated terrain, with the radiation attenuation coefficient taken into account; the time for the radiation to drop to a safe level at a particular point in the fallout pattern; the distance to which at a given moment the fallout pattern of the radioactive cloud can be negotiated so that the radiation dose will be tolerable.

The operator used fixed switches to input the initial data into the computer manually. The time required to output the results is determined by the time required to set the initial data, and amounts to a few seconds for a well-trained operator.

The testing of this computer in exercises in the Baltic and Kiev military districts produced positive results.

The availability of previously prepared forms on which the initial data and the results of the calculations are recorded is important for speeding up the work of the computation section in computing radiation doses, both with the use of the electronic computer and, especially, with the use of tables. On the basis of a number of exercises we have devised, and submit, the following form.

Name of large unit (unit, subunit)	Number of Burst	TNT Equivalent, kilotons	Distance to Burst Sites, km	Bistance to Intersection of Route of March with Axis of Fallout Pattern, km	Time Motorized Rifle Regiment Crosses Fallout Pattern, hours after burst	Radiation Dose, roentgens: in tanks	Radiation Dose, roentgens: in armored personnel carriers	Radiation Dose, roentgens: in motor vehicles
Example of Entries								
25th Motorized Rifle Division, 10th Motorized Rifle Battalion	1 2	100 300	24 40	80 70	4 3.5	3.4 5 8.4	8.5 12.5 21	17 25 42
11th Motorized Rifle Battalion, etc.	.....	.....	.....	.....	.....	.....	.....	.....

Such a form to be filled in allows several people to make use of the initial data and perform calculations at once, which considerably shortens the time for computing the radiation doses.

Experience gained in exercises shows that in an army, as well as in a front, there should be a single center for assembling and processing all the information on the radiation and chemical situation that is required by the army commander in making the decision on the combat actions of his troops on the basis of the analysis of the radiation situation which has actually developed. This center should be the computation and analysis station of the army (front).

It is extremely important that, at the moment of detection of radioactive contamination in the disposition and operating areas of units and large units, the information characterizing the actually developing radiation situation be sent to the computation and analysis station first. Thus all information on the radiation situation should have its own indicator (code), on the basis of which it would be routed immediately to the computation and analysis station.

The information section keeps a log for recording the incoming data and marks on the map only the number of the point where the radiation level has been measured. An example of the log could be as follows.

Point number	Measurement site (coordinates)	Unit, large unit, installation	Radiation Levels and Time of Measurement							
			1st Measurement		2nd Measurement		r: standard		3rd Measurement	
			r/hr	hr, min	r/hr	hr, min	r/hr	hr, min	r/hr	hr, min
			Example of Entries							
1	Bridge 21 785	10th Motorized Rifle Regiment	18	12.10	35	12.30	23	12.43		
2	47 245	Command Post, 5th Motorized Rifle Regiment	13	12.15	30	12.40	27	12.45		

In order to ensure normal operation of the computation and analysis station and not overload the radio nets with unnecessary information, there should be set up a strictly specified order of submitting information reports: the first report is on the detection of radioactive contamination in the disposition or operating area of the subunit, unit or large unit; the second report is sent after radiation levels have begun to drop in the given area and indicates the radiation levels and the place and time they were measured. Later information on the radiation levels can be sent only when there is an abrupt change in the radiation situation or at the request of the computation and analysis station.

Upon receiving the first report the computation and analysis station determines the approximate direction of propagation of the radioactive cloud and the degree to which it corresponds to the forecast, and on the basis of the second report -- determines the actually developing radiation situation. In processing the data all radiation levels are reduced to a standard for the same time after the burst. In so doing the data received from sectors of the terrain which are not of interest for defining the overall radiation situation are excluded from further processing.

The computation and analysis station of the army informs the computation and analysis station of the front of the coordinates and parameters of ground and low-altitude air nuclear bursts occurring in the zone of the army troops, of the areas in which chemical weapons have been employed and of the radiation levels and times they were measured in the disposition or operating areas of the large units and units of the army in areas of command posts and on the main march routes on the army road network. These data, and the data on the actual radiation situation in the army zone are best sent by photofacsimile. In one of the exercises the LADOGA facsimile device was used; it can transmit images in 680 x 490-mm format, which would take in the entire army zone on a 1:200,000 scale map.

If the propagation of the radioactive contamination from ground bursts that have been delivered in the army zone threatens the troops of an adjacent army, the appropriate information is transmitted to its staff via the cooperation net.

The information section prepares the map of the radiation and chemical situation, on which are displayed the forecast and actually established radiation and chemical situation and its changes within the army zone at a particular time. On the map are plotted the boundaries between the large units and the point of contact of the troops of the two sides at the time the radiation and chemical situation is depicted; the ground zeros of the

low-altitude air bursts and the centers of the ground nuclear bursts for radiation levels of 0.5, 5.30, and 100 roentgens per hour; the actual radiation situation in the areas of the units, large units and on the routes of march on the road network of the army according to data of the ground and air reconnaissance (concrete value of the radiation levels and time of measurement are shown on a table on the map); areas of massed employment of chemical weapons by both sides, limits of propagation of the toxic vapors, and the meteorological situation in the 1 to 30-kilometer layer and the surface layer of the atmosphere.

The computation section prepares the working map, on which are plotted the operational-tactical situation with an accuracy sufficient for making specific calculations (according to reports from the operations department of the army staff), the centers of the ground bursts and ground zeros of the low-altitude air nuclear bursts, the directions of the fallout pattern of the radioactive cloud produced by these bursts, and the areas in which chemical weapons are employed.

At the exercises in the Kiev Military District (in June 1962) maps with film overlays were used as the working maps; one such map could show the change of the radiation situation during the entire operation. The use of such maps would be advisable for the future.

The computation and analysis station also forecast chemical contamination. On the basis of the specific meteorological conditions in the area where chemical weapons were employed, the station determines the depth to which the cloud of contaminated air has spread, the persistence of the toxic agent and the approximate period of time that gas masks will have to be worn by the personnel of the units and large units that are within the zone of propagation of the toxic vapors, and reports this to the army staff. A group of two or three persons in the computation section is specially trained to assess the chemical situation.

In many ways the successful work of the computation and analysis station largely depends on the timeliness with which it is assigned the tasks of performing calculations. When data on enemy nuclear strikes come in, the station prepares only the preliminary calculations. When a decision is being worked out, however, an army commander can assign specific tasks with respect to the determination of the effect of the radioactive or chemical contamination on the operations of the large units and units of the army. For example, at one of the command-staff exercises the army commander, deciding to remove certain units from the areas threatened with strong radioactive contamination, assigned the station the

task of determining the areas of terrain in the zone of radioactive contamination where the personnel present would receive the lowest radiation dose in a certain period of time. The computation and analysis station was able to handle this task.

At the same exercise the computation and analysis station performed calculations on the advisability of employing ground and air variations of our own nuclear strikes for the purpose of inflicting maximum damage on the enemy, of making it difficult for him to maneuver and of guaranteeing the safety of our own troops at the moment they were to arrive at the zone of radioactive contamination.

Generalization of the operating experience of the computation and analysis station in a series of exercises has shown that the speed of calculations and the reliability of the prepared data in many ways depend on the correct distribution of the functional responsibilities, a high degree of special training, and the possibilities of complete interchangeability of the personnel of the computation and information sections.

The complexity and great number of special calculations require of station personnel specific skills in handling calculations and the ability to understand the operational-tactical situation. In the exercise in the Kiev Military District that we mentioned, a computation and analysis station was operating in which officers served who were performing calculations connected with an assessment of the radiation and chemical situation for the first time.

It is obvious that a computation and analysis station must not just be manned during the period of conversion to wartime T/O, but must have part of its personnel previously prepared in peacetime, who would form the nucleus for bringing the station up to full T/O.

For the purpose of researching the matter of the subordination of the computation and analysis station, in the exercises of both the Turkestan and Kiev military districts (in May and June 1962), within the operations and chemical departments of the army were established separate computation and analysis groups (stations at reduced strength). The parallel work of these groups led to the point where part of the information on the coordinates and parameters of the nuclear bursts was sent to one group, and part to the other group. The results of the calculations of the groups did not coincide and succeeded only in misleading the staff. The commander of the tank army (Kiev Military District), seeing that parallel forecasting

was undesirable, in the very course of the exercise combined these groups into a computation and analysis station and put it under the chief of chemical troops of the army.

Being a specialist in the subject at hand and using the calculations of the computation and analysis station under him, the chief of chemical troops of an army, as the experience of many exercises has shown, is the one best qualified to assess the developing radiation and chemical situation, draw the appropriate conclusions and report his proposals to the army commander. For this reason it would be best to consider the variant whereby the computation and analysis station is subordinate to the chief of the chemical troops of an army, who effectively uses the results of the station's calculations and provides competent supervision of its work.

An analysis of the first experience leads to the conclusion that the computation and analysis station, under the conditions of a modern operation, is an important component of the field headquarters of an army and is able to collect and collate data on the radiation and chemical situation in a comparatively short time.

A carefully thought out organization of the work of a computation and analysis station will afford the possibility of providing a commander and staff on a timely basis with all the necessary data for reaching a decision regarding the organization and protection of troops during massed employment of nuclear and chemical weapons.