

TOP SECRET



5 MAR 1962

MEMORANDUM FOR: Deputy Director (Intelligence)

SUBJECT: Soviet Articles on Strategic Missiles

REFERENCES: (a) [redacted] (6 March 1962)
(b) [redacted] (5 March 1962)

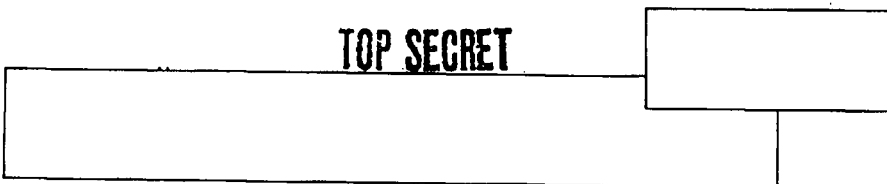
1. This memorandum is for your information and provides initial Guided Missile Task Force views on the first two articles from the Soviet Top Secret Information Bulletin of the Rocket Troops (mid-1961) obtained by the NSA. These articles appear genuine, are rich in details, and should broaden our understanding considerably. The more significant article describes the operational procedures for a Soviet R-12 (1,100 n.m.) missile unit; the other describes protective measures to be taken by strategic missile units. Summarized below are the most important points and implications of these articles as we see them now.

2. "The R-12 article: a) strengthens our estimates of the general organization, operational concepts and of ICBM force levels; b) implies that ICBM reaction capabilities are substantially poorer than estimated; c) provides our first detailed information on the role of secondary ("alternate") sites; d) suggests that the system employs all-inertial guidance. Although the article is concerned with R-12 missile units, the operational procedures probably apply also to the 700 n.m. missile system.

Launching Sites and Equipment

3. It is clear that the numerous fixed four-pad ICBM launch sites which have been detected during the past year are primary launch sites for missile regiments. In addition to these primary sites, each regiment has one or two designated secondary launch areas about 15 km away. The primary sites have hard-surfaced roads and permanent buildings and storage facilities for missiles, accessories, support equipment and fuel. The secondary sites, which this new information may help identify, are field type installations with only minimum advanced preparation. "It seems clear from

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SUBJECT: Soviet Articles on Strategic Missiles

the article that Soviet NSBM systems function best and most rapidly from the well-prepared primary sites. The considerable discussion of settings and calculations for inertial guidance components of the R-12 missile and the absence of any reference to radar tracking equipment suggest that the primary guidance system for the R-12 is all-inertial.

Refire Capability

4. " The article clearly implies that each regiment has three or more missiles for each launch battery and that the firing of a second or third missile by a launch crew is standard operating procedure. Current estimates project an inventory of 3 missiles per launcher.

Combat Readiness and Reaction Time

5. " The article provides, for the first time, concrete definitions of alert conditions in Soviet terms based on actual exercises, and should permit meaningful estimates of combat readiness and reaction times to be developed. The Soviet 1,100 n.s. system is not designed to provide the rapid reaction times of US strategic systems. Even under the highest degree of alert, about 30 minutes are required to launch the 1,100 n.s. missile, and as much as 18 hours could be required depending on combat readiness of the regiment. It appears that the normal day-to-day combat readiness of the regiment is not geared to rapid reaction times, but that during periods of tension a higher degree of alert - about 1 hour to launch - could be maintained for a few hours. A readiness of about 3 hours could be maintained for some time.

Command and Control

6. A regimental commander receives combat orders and instructions directly from the Main Staff of the Commander in Chief of the Rocket Forces; orders may also come through regular channels via the divisional commander. Both wire line and high frequency radio communications are provided for. There is, however, no discussion of plans and procedures for executing a coordinated first-strike salvo, although there appears to be

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SUBJECT: Soviet Articles on Strategic Missiles

nothing in the design and operation of the R-12 system to preclude such a strategy.

Targets

7. "Eastern strategic missile sites are first on the list of targets in the article." Apparently, primary and secondary targets are assigned in advance to a regiment, and the unit prepares and maintains aiming and other data on these targets. However, considerable attention is given to the problem of dealing rapidly with entirely new targets which the Main Staff of the Rocket Forces may assign. This requires a great deal of time-consuming calculation at the launch site; a need for computers, not yet available, was recognized.

Logistics

8. "Missiles, warheads and propellants may be stored at the primary launch site, but under certain conditions this material would have to be transported to the site from central or regional depots which may be as much as 100 km away."

Force Protection

9. "Survival of the ICBM force has not been sought through hardening of sites, which is not even mentioned in either article. Rather, the Soviets have counted on a large force, dispersal of facilities and equipment, secondary firing positions, air and ground defense and concealment." The second article discusses many aspects of both active and passive protection of strategic missile sites. Considerable emphasis is placed on protecting such sites from saboteurs and spies. It also states, "The enemy also makes use of secret agents, diplomatic representatives, balloons, reconnaissance planes, and reconnaissance satellites to obtain intelligence on these installations." Furthermore, it states, "Transmitting by radio and radio relay sets from a siting area in peacetime must be categorically forbidden."

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SUBJECT: Soviet Articles on Strategic Missiles

Camouflage and Concealment

10. The articles discuss camouflaged and dummy sites in the context of combat conditions and recognize the difficulties involved in concealing large installations like missile complexes. Reference is made to concealing structures, setting up dummy targets and making sitting areas resemble fuel depots and enterprises of timber and food industries. Sufficient evidence is available from a variety of sources to indicate that most, if not all, strategic missile complexes identified to date are genuine rather than elaborate dummies. Furthermore, repeated observation of many complexes over a considerable period of time has revealed no indication of an effort to camouflage these facilities.

Operational Concepts

11. The articles give the impression that operational concepts for Soviet ICBM forces are an extension and outgrowth of artillery concepts and differ significantly from US concepts. The contrasts are sharpest in the Soviet refire capability, relatively long reaction times, and survivability through redeployment to secondary sites. These and other contrasts highlight the substantial differences in the way the USSR and US are going about the development of strategic missile capabilities, and point out the importance of having and assessing information in Soviet terms.

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EDWARD W. PROCTOR

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CENTRAL INTELLIGENCE AGENCY
WASHINGTON 25, D. C.

6 MAR 1962

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : STRATEGIC MISSILE BULLETIN: "The Preparation
for Combat Operations of a Regiment Armed
with R-12 Missiles"

1. Enclosed is a verbatim translation of an article which appeared in a Soviet Ministry of Defense publication called Information Bulletin of the Missile Troops (Informatsionny Byulleten Raketnykh Voysk). This publication is classified TOP SECRET by the Soviets and was first issued in 1961. It is intended for generals and officers of the Missile Troops.

2. In the interests of protecting our source, this material should be handled on a need-to-know basis within your office. Requests for extra copies of this report or for utilization of any part of this document in any other form should be addressed to the originating office.

Richard Helms

Richard Helms
Deputy Director (Plans)

Enclosure

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Original: The Director of Central Intelligence

cc: Military Representative of the President

Special Assistant to the President for
National Security Affairs

The Director of Intelligence and Research,
Department of State

The Director, Defense Intelligence Agency

The Director for Intelligence,
The Joint Staff

The Assistant Chief of Staff for Intelligence,
Department of the Army

The Director of Naval Intelligence
Department of the Navy

The Assistant Chief of Staff, Intelligence
U. S. Air Force

The Director, National Security Agency

Director, Division of Intelligence
Atomic Energy Commission

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The Deputy Director of Central Intelligence

Deputy Director for Intelligence

Assistant Director for National Estimates

Assistant Director for Current Intelligence

Assistant Director for Research and Reports

Assistant Director for Scientific Intelligence

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1 March 1962

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COUNTRY : USSR
SUBJECT : STRATEGIC MISSILE BULLETIN: "The Preparatic
for Combat Operations of a Regiment Armed
with R-12 Missiles"
DATE OF INFC: July 1961
APPRAISAL OF
CONTENT : Documentary
SOURCE : Reliable source (B).

Following is a verbatim translation of an article titled "The Preparation for Combat Operations of a Regiment with R-12 Missiles", which appeared in the 1961 First Issue of a TOP SECRET Soviet publication titled Information Bulletin of the Missile Troops (Informatsionny Byulleten Raketrykh Voysk). The 1961 First Issue was sent to press on 16 July 1961.

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The Preparation for Combat Operations

of a

Regiment Armed with R-12 Missiles

(Based on experience gained in exercises)

According to the concept of the higher command, a regiment equipped to launch R-12 missiles is used mainly for the performance of strategic tasks. These tasks are performed through the participation of the regiment in missile operations (in massed nuclear/missile strikes), carried out at the start of or during a war. The basic targets for destruction by the regiment may be:

- strategic missile launch sites;
- sites for the production, assembly and storage of nuclear weapons and of means for delivering them to the target;
- large airfields, air force and naval bases;
- centers of political administration and of military industry;
- large communications centers;
- large factories and power centers;
- arsenals and depots with strategic stocks of armaments, military equipment or strategic raw materials;
- strategic reserves and other targets of strategic significance in the deep rear of the enemy.

In individual cases the missile regiment may be used to destroy the most important targets of operational significance.

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The preparation of a regiment for combat operations embraces a variety of measures which are carried out by commanders, staffs and services at all levels, and also by the subunits of the regiment. Basic among these measures are:

- the determination and allocation of combat tasks;
- the selection and preparation of siting areas and of the road network;
- the transport and stockpiling of missiles, nose cones and missile fuel components;
- the movement of subunits into the siting area and their deployment in combat formation;
- the organization of communications and control;
- combat, geodetic, meteorological, engineer and medical support;
- the organization of coordination with the technical repair base (remontno-tekhnicheskaya baza - RTB) supporting the combat operations of the regiment;
- the advance planning of nuclear/missile strikes against enemy targets;
- the systematic carrying out of exercises with the subunits, aimed at increasing the smooth functioning, clarity and speed of their operation in the fulfilment of fire missions;
- organization of the carrying out of combat duty and advance preparation of the procedure and sequence for the receipt of signals (orders) on transition to the appropriate stage of readiness or on the preparation of missiles for launching, and also of the order for reporting on the fulfilment of the signals and commands to the commander of the large unit.

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The sequence of accomplishment of the measures mentioned above depends on the specific conditions of the military and political situation, on the establishment (ukomplektovaniye) and level of training of the subunits, and also on the significance of the combat tasks entrusted to the regiment.

The preparation of the regiment for the performance of tasks in an operation during the initial period of a war must be carried out in advance, in accordance with the plan of the higher command, with the aim of delivering the first nuclear/missile strikes against the enemy immediately and of reducing to the minimum the time necessary to deploy the regiment in combat formation, the primary siting area is equipped in advance with launching mounts, with storage facilities for missiles, nose cones, and missile fuel, with shelters for personnel, for command posts and combat equipment, and with other stationary structures and hard surface roads. The command post of a regiment is prepared in the siting area of one of the battalions.

Besides the primary siting area, one or two alternate areas are prepared for the regiment, equipped with field-type engineer structures.

The high combat readiness of a missile regiment, and the availability of prepared siting areas, is best ensured by allocating combat tasks to it in advance and by precise performance of combat duty.

Subunits with a high level of special tactical training, with combat equipment in excellent condition, with appropriate materiel and technical support and with a prepared siting area will be allowed to go on combat duty. To perform combat duty is to carry out a combat task. Permission for subunits to go on combat duty is granted by a commission of the Commander-in-Chief of Missile Troops.

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In order to ensure firm and constant control of the regiment and RTB on combat duty, and for the operational control of the rousing (podyem) and assembly of subunits during a combat alert, round-the-clock duty is organized for specially detailed combat crews at the command posts of the regiment and of battalions. The duty shift of a combat crew at a regiment command post usually includes a regimental duty officer (otvetstvennyy dezhurnyy), an RTB duty officer, a communications duty officer, radio-telegraph operators, telegraph operators, communications center telephone operators and radiorelay technicians. A complete combat crew is assigned to the command post each day, when the regiment is announced as being at readiness Nos. 3, 2, or 1, or at the order of the higher command. The number of officers, NCO's and soldiers allotted to the combat crew of a command post is determined by an order to the regiment or by the Regulation on Combat Duty.

A regiment is put on combat duty on the basis of a combat order from the Main Staff of the Missile Troops (Glavnyy shtab raketnykh voysk). In allocating tasks for combat duty the following are indicated to the regiment:

- the purpose of the duty and the degree of combat readiness;
- the number and composition of the subunits put on combat duty;
- the fire missions, the number and degree of readiness of missiles and nose cones intended for the first and for subsequent launchings (at readiness Nos. 2 or 1);
- the sequence of organization and the operation of communications with the Main Staff of the Missile Troops, with the staff of the large unit (formation), with the district headquarters and with subordinate subunits;
- the regimental stocks of missiles, nose cones, missile fuel, and other materiel supplies and the periods for their stockpiling;

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-signals and the procedure for reporting the carrying out of signals (commands, orders);

-readiness periods.

Fire missions for the destruction of objectives (targets), the coordinates of aiming points, the expenditure of missiles for each objective, the order or the sequence of the destruction of targets are determined by the Main Staff of the Missile Troops.

Depending on the situation, and on the nature and importance of the tasks being performed, the personnel and combat equipment of a regiment and of an RTB may be found in various degrees of combat readiness (Nos. 1, 2, 3 or 4). The following are related to the various degrees of combat readiness:

-the specific technical condition of missiles and nose cones, and of ground and fueling equipment; the areas appointed for their disposition and storage.

-the specific disposition of the personnel carrying out combat duty;

-a specific system of communications and of the control of regiments and RTB;

-the accumulated stocks of missiles, nose cones, missile fuel and of other supplies of materiel.

On the basis of the particular situation and of the decision of the higher command, the preparation of a regiment for launching missiles may be carried out by means of a successive transition from one degree of combat readiness to another or all at once, regardless of the degree of readiness of the regiment subunits at the time the alert was announced.

Readiness Nos. 1, 2 and 3, as they have been established for the regiment, ensure the launching of the first missiles in $\frac{1}{2}$ to $2\frac{1}{2}$ hours, and in 6 to 20 hours from readiness No. 4.

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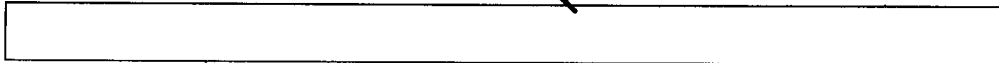
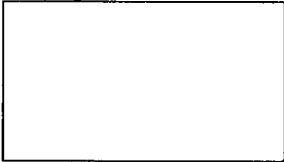
Preparation and execution of the first missile launchings in $\frac{1}{2}$ to 2 $\frac{1}{2}$ hours are ensured by the timely performance of a number of measures in technical preparation for the launchings and also by having personnel on constant combat duty at the launch and technical sites. The number of personnel assigned to combat duty is determined by the total volume of high priority tasks involved in preparing the missiles for launching, in organizing their immediate storage and in the carrying-out of other measures to ensure attainment of the combat readiness specified for the regiment.

Thus, for example, to ensure combat readiness No. 4, the personnel of a regiment and RTB may be situated in the primary siting area (completely or partially) or in their permanent location. All regimental personnel are occupied in conformity with the plan for combat and political training. Subunits remaining at the disposition site are at constant readiness to move to the primary siting area. When readiness No. 3, 2 or 1 is announced the missile regiment and RTB are moved to the siting area at full strength.

In the regiment's primary siting area the requisite stocks of missiles, component parts, nose cones, ground equipment, missile fuel and of the other materiel supplies needed to ensure the specified degree of readiness and the successful conduct of combat operations are set up in good time. The size of the stocks established in the regiment is determined by a decision of the Commander-in-Chief of Missile Troops.

In the primary siting area the necessary astronomical and geodetic work and calculations are carried out in good time, a system of communications and control is organized, the combat training of personnel is carried out, and special tactical exercises for the subunits and the training of the regiment and RTB are carried out.

The operations of the regimental subunits on combat duty must be determined by instructions worked out for each subunit, taking into consideration the specific conditions of their disposition.



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The occupation by the regiment and RTB of the primary siting area, the transition from one degree of combat readiness to another, and combat operations, will start, as a rule, when a combat alert signal, prearranged by the Main Staff of the Missile Troops, is received from the central command post of the Commander-in-Chief of the Missile Troops.

For this purpose direct communications are organized between the Commander-in-Chief and each missile regiment. The existence of such communications should ensure the minimum expenditure of time in assigning combat missions and in calling for the first nuclear/missile strikes, because it is the regiment itself which is able to ensure the constant combat readiness of those who will directly carry out the fire missions - the launching subunits - and to accomplish independently the fire missions assigned to it. The allocation of tasks to the regiment's subunits must be carried out by short signals and by commands sent from the command post.

The actions of regiment and RTB subunits in an alert must therefore be planned carefully and in good time. The plan of action for a regimental subunit in an alert, with its deployment into combat formation, is evolved with this goal; in the plan are given the target, the combat alert signals, the order for the reception of signals and for their transmission to the subunits, the order for assembling and moving the subunits to the siting area, the movement routes, the attack positions, the control posts, the sequence for deploying the regiment in combat formation and for bringing it to the degree of combat readiness which has been determined, the order for the move of the RTB to the technical position, the questions of control and communications, the transport schedule for missiles and fuel components from the supply station, the schedule for issuing and receiving missiles, nose cones, missile fuel and other materiel and technical supplies, and also measures for support in combat. In working out the plan it is necessary to consider conditions for the disposition and security of the regiment, the probable nature of enemy actions, the time of year, the time of day and other conditions.

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Systematic training must be conducted with all personnel, with the goal of carefully working out the duties and the sequence of actions in an alert. An account of the personnel for action in an alert is made in each subunit daily, taking into consideration fatigue details, and administrative and other work. The actions of personnel, from the announcement of the alert and after assembly at their work positions, must be worked on to the stage at which they are automatic, and the expenditure of time in moving to and assuming work positions, in deploying ground equipment and in preparing it for operation, and in preparing and launching missiles, must be reduced to a minimum.

The Deployment of Regimental Subunits and of the Technical Repair Base in an Alert at Readiness No. 3

As has already been indicated, given the availabilities of siting areas prepared in good time, and the stockpiling in them of missile weapons, of nose cones and of means for ensuring their use, the combat actions of missile units (subunits) will begin with immediate deployment in combat formation at the alert, with transition to a greater degree of readiness or with the preparation of missiles for launching from any degree of readiness. Everything will depend on the particular situation, on the support, preparedness and degree of the regiment's combat readiness and on the decision of the higher command.

If the regiment's subunits are located in the primary siting area while at readiness No. 4 it is then necessary to do the following for transition to readiness No. 3:

-to transmit the alert signal to all personnel of the regiment and to assemble them at their work positions (notifying and assembling personnel in an alert should be done in 5 to 10 minutes);

-to deploy the ground equipment, in 1 to 1½ hours;

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-to carry out the transition of the missiles from readiness No. 4 to readiness No. 3, the nose cones from SG-4 (condition of readiness - sostoyaniye gotovnosti) to SG-5, to transport the nose cones to the launching areas and to mate them with the missiles (not more than 9-10 hours should be used to fulfil these operations);

-to fill the fueling trucks and tank trucks with missile fuel components simultaneously with the preparation of the missiles and nose cones.

Thus, if the regimental subunits are located in the primary siting area, the regiment's transition from readiness No. 4 to readiness No. 3 can be carried out in 10½ to 11 hours.

However, various initial conditions may conform with combat readiness No. 4, causing a different sequence and duration for the fulfilment by the regiment of the basic measures for transition to readiness No. 3.

The combat situation may make it necessary to bring the missile regiment to readiness No. 3, when the construction of storage facilities and structures in the primary siting area is not yet completed. In this case, the regimental subunits will, as a rule, be located in the permanent disposition area, and the regimental stocks of missiles, nose cones and missile fuel may be stored at the closest depots.

In order to bring the regiment to readiness No. 3 in these conditions it is necessary:

- to notify the personnel of the alert;
- to move the missile battalions, the servicing and supporting subunits of the regiment and the RTB into the assembly areas and to organize and carry out the march of these subunits to the primary siting area;
- to deploy the regiment and RTB subunits in combat formation and to prepare them for the receipt and checking of missiles and nose cones, and also for the receipt of missile fuel;

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the transport and fueling subunits of the Battalion to missile and nose cone unloading points located in the Directorate of the EWG Supply Dumps of the Ministry of Defense (Upravleniye snabzheniya gonyachim Ministerstva oborony - USG MOE).

-to receive the missiles, nose cones and missile fuel from the depots and to deliver them to the siting area;

-to check the missiles and nose cones and to bring them to readiness No. 3.

The total time needed to bring the regiment to readiness No. 3 under these conditions will consist of the time necessary:

-for notification of and assembly for the alert (up to 1 hour);

-for the execution of a march of up to 100 km by the transport and fueling subunits of the battalion, for the loading of the first group (partiya) of missiles on ground carriers (gruntovaya telezhka) (up to 10 hours), the transport of nose cones and of missile fuel must be carried out simultaneously with the transport of missiles;

-for the technical preparation of the missiles and nose cones after transport (up to 6 hours).

Simultaneously, the missile battalions march for 20-50 km to the siting area and deploy the ground equipment in the siting area (up to 5 hours).

Up to 17 hours is required to bring a regiment to readiness No. 3 under these circumstances; missile battalions will be ready to receive missiles 6 hours after an alert is announced.

In order to ensure readiness No. 4, the subunits of a regiment may also be located in the primary siting area

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or at the permanent disposition area when the regimental stocks of missiles and nose cones are set up directly in the siting area and the missile fuel components are stored at the closest USG MO dumps (at a distance of up to 100 km). Under these conditions, the time necessary to bring the regiment to readiness No. 3 will be determined by the time necessary for the transport and fueling subunits of the battalion to march to the USG MO dumps, to receive the missile fuel components and to transport them to the siting area. Depending on the distance to the USG MO dump, on the condition of the roads, the weather, and sometimes on other conditions, the time will total 10 to 15 hours and sometimes more.

The deployment of a regiment in combat formation and the transition to readiness No. 3 may be carried out under conditions in which personnel are located simultaneously in the primary siting area and at the area of permanent disposition. In consequence, the initial conditions which may precede the bringing of the regiment to readiness No. 3 may be very varied. Therefore, the time necessary to reach readiness No. 3 depends on the particular situation and may vary between 6 and 20 hours.

The principles mentioned above are essentially confirmed by the results of the exercises which have been carried out. In general, the initial situation of subunits, before the start of the exercise, conformed to the version which was originally stated.

The regimental headquarters took 10 minutes to transmit the "Alert" signal to the subunits, the battalion headquarters - about 1 minute. However, this signal was transmitted to the technical position only after 34 minutes because of the lack of direct communications between this position and the command post of the battalion.

The assembly of subunit personnel at their places of work was accomplished in 8 to 20 minutes.

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The deployment of ground equipment by the launching batteries was not carried out in uniform periods of time (from 1 hour 33 minutes to 2 hours and 19 minutes); this is explained by the different levels of preparedness of the subunit personnel and mainly by the different conditions for the deployment of the launch batteries.

One of the reasons for the differences in preparedness between the subunits was that the evaluation of their work is made not for each operation on the technological schedule, but as a whole, using the total time needed to bring a battery to a particular readiness, which is, of course, wrong. As the basis for an evaluation of all work in bringing a subunit to a certain degree of readiness, it is essential to evaluate not only the total time needed but also that taken for each technological operation.

The whole of the preparatory work was completed by the launch batteries in 2 1/2 to 3 hours and the calculations for the independent checking of the technical battery were completed in 5 1/2 hours. The total time for bringing the missile regiment to readiness No. 3 was more than that allowed (15 hours), because during this stage the RTB was working below its potential level, having spent 13 hours in preparing 4 nose cones (instead of 9 to 10 hours). The notification to and assembly of the subunits of the regiment and RTB for the alert was intolerably slow. The organization of the assembly of personnel in an alert must be thoroughly perfected, using not more than 30 seconds for the notification of the subunits of the regiment located in the primary siting area and 5 to 7 minutes for this assembly. The notification should be carried out by technical means, using selective loudspeaker communications, sound and light signal devices (electric bells, signal lights, etc.), the installation of which must be carried out in all places where the personnel are disposed. The technical means of notification should be activated instantly by the pushing of a button. A similar system of signals must be set up by the forces and means of units and subunits.

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Exercises have shown that a missile regiment needs 12 to 13 hours for transition to readiness No. 3 from the previously mentioned initial position. However, the time necessary to convert the missile regiment to readiness No. 3 can be almost halved if the productivity of the RTB's assembly brigades bringing nose cones to SG-5 corresponds to the productivity of the missile battalions of the regiment in the technical preparation of missiles for launching.

Preparation of Data for Missile Launchings

When a regiment is on combat duty, initial data for the launching of missiles are prepared beforehand for all targets scheduled for destruction by the regiment, and the documents required by the launching regulations are formulated. The preparation beforehand of data for launchings against each target includes:

-calculation of the spherical azimuth and of the range of the launchings;

-filling out data preparation form No. 1;

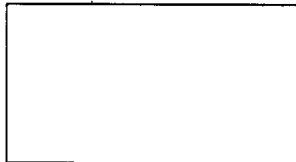
-the compilation of the launching card, of aiming cards and of the initial geodetic data.

The preparation of initial data for the launching of missiles at the start of combat operations consists of carrying out calculations for the second phase, which are performed directly before the fueling of the missile. In this process, the following are determined:

-the feasibility of firing on the planned targets, given the specific gravities of the oxidizer and fuel;

-the time setting for the accelerometer (vremya zaryadki integratora) in accordance with the main and preliminary commands for engine shutdown;

-fuel loadings of the missiles by weight and volume.



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In the exercise, the preparation of data for the second phase was carried out by the data-preparation section (otdeleniye podgotovki dannykh - OPD) of the battalion, augmented by data-personnel (vychislitel) from a battalion which was not taking part in the exercise. It is necessary to strengthen the OPD of the battalion with reserve data-personnel from among the senior geodesists of the geodetic support platoon, whose training must be organized and carried out beforehand under the direction of the chief of the OPD of the regiment. In their degree of training, the senior geodesists approximate very closely to the data-personnel of the data preparation sections and are capable of mastering this specialty (which is related to their own) in a short period of time.

Since the geodetic preparation of the sitting areas of a regiment is carried out in advance, and since the senior geodesists of the geodetic support platoon are free of work in their specialty by the time combat operations begin, it is possible to use them as data-personnel. In this process it is advisable to set up a non-organic OPD for the regiment with the 6 to 8 reserve data personnel and to entrust them with the performance of the following main tasks:

-checking the accuracy of the calculations made by the OPD of the battalions;

-making first phase calculations in the preparation of data for launchings against targets that were not on the plan, in cases when the battalion OPDs are busy with the preparation of second phase data for launchings against planned targets;

-reinforcing the battalion OPD (when necessary).

Exercises have shown that in preparing subunits for the launching of missiles directly from readiness No. 2, the battalion OPD carrying out the computation of second phase data in accordance with the instructions of the Temporary Firing Tables (Vremennaya Tablitsa Strelby), delays the launching of the missiles for 12 to 17 minutes, because the loading with fuel components begins seven to nine minutes after the signal to launch the missile is given, and

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calculation of the volume of the fuel components takes 20 to 25 minutes. This fault can be eliminated by advance completion of Form No. 2 on the series of possible temperature values (znacheniya temperatur) of the fuel and the oxidizer. The availability at the battalion of a table, calculated in advance, showing the possible temperature values of the missile fuel components has been shown by the experience of exercises to permit a reduction in the time needed to calculate their volume by 12 to 17 minutes, and to allow the advance issue of data for the loading of missiles with fuel and oxidizer.

In addition, the exercises disclosed:

-the advisability of advance calculation, by the data preparation sections of the battalions, of the angle for the preliminary aiming of the missile (the angle between the basic direction and the line connecting the center of the pad of the launching mount with the point where the guidance theodolite (teodolit navodki) is standing, which ensures the timely computation of the first phase of the initial data for the launchings;

-the possibility, in principle, of increasing the launch sector of a launch site by 49° (19° to the left of the basic direction and 30° to the right) without relocating the ground equipment assemblies, but changing the point where the guidance theodolite stands. However, the launch sector for each launch site depends on the particular features of its equipment and may have widely differing dimensions. The possibility of increasing these dimensions must therefore be determined for each launch site individually;

-the need to strengthen the data-preparation section of the regiment with non-organic, reserve data-personnel, because its organic composition does not permit the organization of control over the work of the OPDs of the battalions;

-the need to supply each member of the working data-personnel with a separate copy of the launching tables;

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-the need to establish time norms for the transmission of initial data for launchings to all the subunits, from the battalion data-preparation section to the launch batteries;

-the possibility that calculation by the battalion data-preparation section of the initial data for all launching mounts for launchings against an unscheduled (neplanovoy) target will take 3 hours and 30 minutes, which greatly exceeds the time taken for the technical preparation of missiles for launching from readiness Nos. 3, 2 and 1. To eliminate this fault it is necessary to use accelerated methods for the calculation of initial data, for example, the method developed by the Artillery Academy i/n F. E. Dzerzhinskiy.

It is also necessary to develop widespread rationalizing and inventive work in units, in scientific research institutes and in the military higher education institutions, designed to evolve more accurate and more rapid methods for the calculation of initial data. Use should be made of all opportunities for a more rational distribution of functional duties in the OPD, for the use of available calculating equipment, for the improvement of existing methods of computing data and for the development of new ones, and also for the wider introduction of electronic computers.

The Transition of a Regiment to Readiness Nos. 2 or 1 and the Preparation of Missiles for Launching in the Primary Siting Area

After transition to readiness No. 3, the missile regiment may remain at this state of readiness for some time, or, upon a signal from the central command post, it may pass to a higher degree of readiness, or may prepare missiles directly for launching.

On reception of the signal to pass from readiness No. 3 to readiness No. 2, the missiles and nose cones are transported to the launching platforms from prelaunch storage (predstartovoye khranilishche), are mounted on the launch

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pads, and are brought to readiness No. 2. Missiles and nose cones, which were checked at the technical position, are handed over to prelaunch storage, are mated (sostykovyvat) and are brought to readiness No. 3. The necessary fueling capacity (zapravochnaya emkost), filled with missile fuel components, is delivered to the launching platforms and readied for the fueling of the missiles. Missiles are aimed at first volley targets, the accelerometers are set for the flight time. Duty combat crews must be located at their places of work at this time.

The launching of missiles from readiness No. 2 must be carried out not more than an hour after the regimental commander receives the command to launch.

From readiness No. 2 the subunits of the regiment may prepare the missiles directly for launching or bring them to readiness No. 1.

On receipt of the signal for transition from readiness No. 2 to readiness No. 1 the following steps are carried out:

- the fueling of missiles with fuel and oxidizer;
- a check of the aiming of the first volley at the target;
- the transport of missile fuel components by the regiment's surface transport resources, which are free after fueling the missiles.

Duty combat crews must be permanently located at their places of work.

The launching of missiles from readiness No. 1 must be accomplished not more than 30 minutes after the moment when the regimental commander receives the signal to launch.

The actions of regimental subunits in the exercise, after deploying at readiness No. 3, consisted of subsequent

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transitions from one readiness to another, of preparation for launching and of the simulated launching of missiles from the primary launching positions, at readiness Nos. 3, 2 and 1, and also of the preparation of missiles at the technical position.

The total time for converting missiles to different stages of readiness and for their preparation for launching, according to the results of the work of four launching batteries in one of the exercises, is shown in Table 1.

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TABLE 1

Description of Technical Operations	Average Time for Completion of Operation
Transition of the regiment to readiness No. 3 from the moment the alert is given (according to the report of the last battery)	15 hours 01 minute
Conversion of missiles from readiness No. 3 to readiness No. 2.	2 hours 50 minutes
Conversion of missiles from readiness No. 2 to readiness No. 1.	48 minutes
Preparation of missiles for launching from readiness No. 1.	30 minutes
Conversion of missiles from readiness No. 4 to readiness No. 3.	2 hours 20 minutes
Preparation of missiles for launching from readiness No. 3.	3 hours 14 minutes
Conversion of missiles from readiness No. 4 to readiness No. 2.	3 hours 10 minutes
Preparation of missiles for launching from readiness No. 2.	50 minutes
Conversion of missiles from readiness No. 4 to readiness No. 1.	3 hours 40 minutes
Preparation of missiles at the technical position.	4 hours 38 minutes

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The operations of subunits at a given stage of the exercise, in fulfilling the tasks allocated by the Main Staff of the Missile Troops, showed that the times taken for checking at the technical position - for the preparation of missiles for launching, and for transition from one stage of readiness to another, were basically shorter than the times established as normal (the transition from readiness No. 3 to readiness No. 2 by 1 hour and 20 minutes, the transition from readiness No. 2 to readiness No. 1 by 22 minutes, etc.). The time taken to perform certain technological operations at launching and technical positions was reduced to a minimum thanks to the combination of separate operations.

The experience of exercises has shown that the existing time norms for the carrying out of a series of technological operations are in need of review. It is advisable, for example, to carry out the self-contained (avtonomnyy) tests of the system for regulating apparent speed (kazhushchayasya skorost) in conjunction with the checking of the system for normal and lateral stabilization, which reduces the length of time taken to prepare a missile for launching by 10 to 15 minutes; to allot 15 minutes instead of 5 for the uncovering of the missile; 15 minutes instead of 20 for testing insulation resistance and the integrity of the circuits; 20 minutes instead of 30 for the assembly of the independent testing circuit; 30 minutes instead of 25 for final operations on the engine assembly.

In addition, it is advisable to include in the technical schedule as a separate, independent operation the adjustment of the gyroscope-stabilized platform (giroplata), allotting 5 minutes for its fulfilment. The adjustment of the gyroscope-stabilized platform must be carried out after the instruments have been installed on board the missile. It is also advisable to install storm lashing (shtormovoye krepleniye) on the missile before its erection.

The Movement of a Regiment to an Alternate Siting Area

The advance preparation of the primary siting area of a regiment creates favorable conditions for the complete engineer preparation of elements of the combat formation,

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which significantly raises their viability. In addition, the prolonged presence of a regiment in one siting area greatly increases the probability of discovery of its elements of combat formation by reconnaissance, which makes it possible for the enemy to deliver nuclear/missile strikes at the beginning of combat operations.

The problem of increasing the viability of the combat formations of missile troops must therefore be resolved by skilfully combining the concealment of preparations for combat operations with the engineer preparation and the concealment of combat formations, with broad maneuvers, with the deception of the enemy by the creation of simulated siting areas, with the carrying out of false regroupings, transfers, etc. When the actual threat of an enemy nuclear attack arises it is essential to take measures to move the regiment from the primary siting area and to relocate it in an alternate siting area or in another area which provides an opportunity for the further performance of combat tasks.

The need to change the primary siting area and to relocate the regiment in an alternate siting area may also arise:

-in the event that it is impossible to fulfil combat tasks, for example, because of enemy fire;

-on the reception of new and unscheduled fire missions, which cannot be fulfilled from a particular siting area;

-when it is impossible for personnel to remain in a particular area for a prolonged period because of high radioactive contamination;

-in the event that several launchings have been carried out from the primary launch sites, which increases the likelihood of their being located by intersection by the enemy, and in other cases.

Thus, the need to transfer the regiment during combat operations, from the primary siting area to an alternate area (or to another) may arise quite often. This task

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can be performed successfully only with a high degree of march training, and also when there is a high factor of technical preparedness in the motor pool of the subunits, of the regiment and of the RTB. Therefore march training must be kept in the center of attention by commanders and staffs and must occupy one of the important places in the system of unit and subunit combat training.

During the exercises a situation was created in which the regimental commander decided to change the siting area and to move the regiment to an alternate siting area.

The launch batteries took 2 hours and 18 minutes to pack up their equipment and to prepare for the march, the technical battery 35 minutes, and the assembly brigade of the RTB 1 hour and 16 minutes.

A march of about 15 km was carried out by the subunits of the regiment and the RTB along one route, taking an hour and 20 minutes. Simultaneously, the battery fueling, transporting and fueling sections were directed to the field dump of the USG MO to collect missile fuel. The sections took 10 hours to collect the missile fuel components and to carry out a march totaling 99 km.

Upon arrival at the alternate siting area the subunits of the regiment and RTB began to set up the equipment. The launch batteries took 3 hours for this, the technical battery 1 hour and 32 minutes, and the RTB 2 hours and 20 minutes. For the march and for setting up in the alternate siting area a total of 5 hours and 23 minutes was used. The advance movement of some of the vehicles and personnel of the technical battery and of the RTB facilitated quick deployment by ensuring the erection of tents and the carrying out of some preparatory measures before the arrival of the subunits.

The launching of missiles directly from readiness No. 3 was carried out in 2 hours and 6 minutes and in 2 hours and 12 minutes.

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The experience of exercises has shown that the organization and carrying out of a march by a regiment equipped with medium range missiles involves considerable difficulties. The great weight of the convoys (poyezd), which runs into tens of tons, the large dimensions of the missiles, of the means for their transport and of the means for transporting fuel make exceptionally great demands on the roads. The success of a march will depend to a considerable degree on the availability of wide hard-surface roads, of bridges with high load-bearing capacity, on the configuration of the terrain, and on the training of personnel and other conditions.

The maneuverability of missile units may be increased by reducing the weight and dimensions of the missiles and of the means for their transport.

One possible way to resolve this problem would be to build solid fuel missiles. The solid fuel strategic missiles which are already in existence (uzhe sushchestvuyushchaya) have considerably lower launching weight and dimensions in comparison with missiles of the same class which have liquid rocket engines. However, on the march, solid fuel missiles are considerably heavier than liquid missiles which have not been fueled, and thus they have no perceptible advantages in maneuverability.

It is also possible to follow the path of setting up mobile launching platforms (start) on railroad cars or on the mobile means of the maritime (river) fleet. The advance preparation of several siting areas (areas for parking (mesto stoyanki) or deployment in combat formation) for such subunits, the systematic changing within short periods of siting areas separated by considerable distances, would ensure the concealment of their deployment and of their preparation for combat operations, and would create conditions increasing their viability.

However, mobile launching platforms also have a series of serious faults, basic among which are:

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- their confinement to railroads and waterways, which simplifies their detection by enemy intelligence;

- their location away from cover, which increases their vulnerability;

- the sharp diminution of the possibilities of maneuver during combat operations if the railroads and waterways should be destroyed to a considerable degree;

- the insufficient accuracy of launchings from mobile river (maritime) launching platforms.

The Control of Regimental Subunits During an Exercise

The control of the subunits of a regiment includes all the activity of commanders and staffs in the direction of the training, organization and conduct of the combat operations of the subunits, and envisages:

- the maintenance of a high level of political morale among personnel and of the constant combat readiness of the subunits;

- the timely allocation of combat tasks;

- the firm and unbroken direction of the combat activities of the subunits;

- the organization of unbroken coordination;

- comprehensive support for the combat operations of the subunits;

- constant control over the execution of combat orders, instructions and commands and over the technical condition of armament and combat equipment.

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The control must ensure the concealment of preparation for combat operations, the surprise and the high effectiveness of nuclear/missile strikes, the possibility of transferring nuclear/missile strikes from certain areas to others, and the simultaneous and high-grade performance of measures for the protection of subunits from enemy means of mass destruction.

The control must be unbroken, firm and flexible.

The control of regimental subunits is organized in advance with the aim of ensuring constant combat readiness and the speedy delivery of nuclear/missile strikes against the enemy. It consists of the formulation of basic combat documents, the allocation of specific tasks to subunits, the organization and preparation of command posts, of working areas for battery commanders and of communications centers and nets, the organization of radio nets and of directional radio nets (radionapravleniye), the comprehensive support of subunits and their maintenance at the appropriate readiness for combat operations, and the unbroken direction of their combat operations.

Having received the combat order to move the regiment's subunits to the siting area and for the organization of combat duty, the regimental commander explains the task and makes a decision which shows:

- combat duty tasks and the degree of combat readiness;
- the number and composition of the subunits put on combat duty;
- the distribution of launch and technical sites, the procedure and time for their occupation;
- the arrangement and time for the reception of missiles, stores for building up to prescribed strength (komplektuyushcheye imushchestvo), missile fuel components and other materiel supplies;
- the arrangement for the receipt of data for the aiming of the missiles and for the preparation of the missile guidance system;

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- the arrangement for the organization of coordination between the launching subunits and the RTB assembly brigades;

- the supply station (unloading points), the location of the USG MO depot, the routes and the procedure for the transport of materiel means to the siting areas;

- the location of the regimental command post and the arrangement for the organization of communications;

- the signals and the arrangement for reporting the carrying out of signals (commands);

- the readiness periods.

In addition, in his decision, the regimental commander provides measures for combat, geodetic, meteorological, engineer and materiel and technical support.

The regimental commander passes his decision on to those who are to implement it in the form of a combat order and of combat instructions. On the basis of the commander's decision, the headquarters staff of the regiment, together with the special armaments service (sluzhba spetsialnogo vooruzheniya), with the deputy regimental commanders of the rear services and of the technical unit, carries out the planning of the comprehensive support of the combat operations of the subunits and works out measures for carrying out the plans.

Having deployed the subunits in combat formation and at the combat readiness specified, the commander and the staff of the regiment organize:

- the concealment of all measures for the preparation of subunits for combat operations;

- a check on the maintenance of the specified combat readiness and on the performance of duty by personnel;

- all types of combat support;

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-support with materiel and everyday necessities (materialno-bytovoy);

-study and training with the subunits, striving to achieve the minimum expenditure of time on their preparation for the execution of fire missions;

-more precise definition (revision) of the planning documents, when necessary.

On receipt of the signal to go from readiness No. 4 to readiness No. 3 (2 or 1) the regimental commander must immediately announce a combat alert, report on the signal he has received to the large unit commander and organize:

-a check on the carrying out of the signals (commands) and on the plan for the transition of the subunits to the specified combat readiness;

-the preparation of personnel and of ground equipment for the execution of fire missions;

-a check of the missiles and nose cones and on their delivery to the launch sites;

-the transport of missiles, nose cones and missile fuel to the siting area;

-the strengthening of the security of the siting area and of the routes for the transport of materiel means;

-the reliable control of subunits and of the unbroken operation of communications;

-the timely preparation of missiles for launching (aiming at the target, fueling, etc.).

With the beginning of combat operations the control will be effected by the transmission of short signals, specifying the previously determined sequence of work for the subunits on transition to the appropriate readiness or to the direct preparation of missiles for launching.

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More precise definition or the partial revision of combat tasks must be carried out by short enciphered combat orders over technical means of communications, and when there is time - by the issue of oral combat orders and instructions.

The experience of exercises has shown that, in order to ensure the dependable control of regimental subunits at the beginning of combat operations and during their course, it is necessary to compile the following combat documents and to have them at the regimental headquarters (at the command post):

1. The plan of action for the subunits of the regiment in an alert, during deployment in combat formation (the contents of the plan have been mentioned earlier).

2. The plan of action for the subunits of the regiment when moving to an alternate siting area. The plan must be worked out on the basis of intelligence data and must provide signals for leaving the positions occupied and for beginning the move to the alternate siting area; the arrangement for packing up the cable network and the ground equipment and for the quitting of their positions by the subunits; a calculation of the march and the procedure by which it is to be carried out; the deployment of the subunits in the alternate siting area and their preparation to carry out combat tasks; the organization of combat, materiel and technical and medical support on the march and at the alternate siting area.

3. The launching table (compiled during the special period (osoby period)). The table shows: the number of the targets and the total expenditure of missiles for each target, the coordinates of the aiming points, the expenditure of missiles on the aiming point, the TNT equivalent and the type of burst, the missile launching time for each launch battery.

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4. The work map of the commander (staff) of the regiment, on which the following are entered: the combat formation of the regiment in the primary and alternate siting areas; the combat formation of the PVO means covering the regiment; the routes for moving to the alternate siting area; the basic direction for the launch of missiles by the battalions; the boundaries of the area of possible destruction of targets; the unloading stations. In addition, the following are entered on the map: the forms of the tables for the control of signals and of missile launchings, the layout of the plan for the transport, preparation and issue of nose cones to subunits; the form of the plan for the issue of missiles, of materiel for building up to prescribe strength, and of fuel components. The forms of the tables and plans are filled out during the special period.

5. The plan (schedule) for the preparation of missiles for launching, which is compiled on the basis of the task and of the technological schedule for bringing the missiles to the specified degree of readiness or directly for launching. The plan (schedule) must show: the beginning and end of the work of preparing missiles for launching or for transition to a higher stage of readiness; the order for performing the basic jobs which regulate the preparation of a missile; the availability of the missiles in each missile battalion, with an indication of their degree of readiness.

6. The plan for the issue of missiles, of materiel for building up to prescribed strength and of missile fuel. The plan is compiled by the special armament service, together with the staff of the regiment, during the special period. The plan provides: the points and the time of arrival of the transport bringing missiles, materiel for building up to prescribed strength, and missile fuel components, the time of issue and the amount of materiel issued to each battalion. When the regiment is supplied with missiles for the entire operation in advance, this type of plan is not made up.

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7. The plan for transport, preparation and issue of nose cones to battalions. The plan is worked out by the staff of the regiment together with the staff of the RTB, during the special period. The contents of the plan provide: the time when the transport means of the RTB are to be sent to the unloading point; denomination and quantity of the nose cones; the time to be taken for the loading of nose cones on the means of transport; the time at which the nose cones are to arrive at the RTB and the duration of their preparation; the time for dispatching the nose cones from the RTB and the time of their arrival at the appropriate launch sites.

8. A memorandum on the provision to subunits of special armaments, missiles, nose cones and fuel components. The memorandum shows the places where materiel supplies are stored. In peacetime the memorandum is kept in a sealed package.

9. Diagrams of the radio and wire communications. The diagrams are worked out in accordance with the channels of communications which the regiment has under command and with the numbers of forces and means which are in operation. The legend for each diagram shows an estimate of the forces and means in operation and in reserve.

10. Tables of callsigns and radio data. The tables are made up in accordance with the data received and with the instructions of the staff of the large unit.

11. A prearranged message code (peregovornaya tablitsa) and a signal table. The prearranged message code of the missile regiment is confirmed by the chief of staff of the large unit and the signal table by the regimental commander. The word content of the tables must ensure control of the subordinate subunits during pre-combat preparation and during the course of combat operations.

12. Instructions for the responsible duty officer and for the duty shift of the regimental command post. The instructions are worked out by the staff of the regiment in accordance with the actual conditions and are confirmed by the regimental commander. Mentioned in them are:

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the name of the responsible duty officer; the composition of the duty shift of the command post; the duties of the personnel of the duty shift; the arrangement for the storage and use of combat documents; the procedure for action when a signal to bring the regiment to a higher degree of readiness or to prepare it for the performance of combat tasks is received.

13. A log of all orders received and issued. Commands and orders received over technical means of communication are entered and recorded in the log, as well as orders given by the commander and staff of the regiment. The log is kept personally by the chief of staff of the regiment or by a staff officer nominated by him.

14. Combat orders on the organization of direct security, on self-defense and combat with airborne forces, on antiaircraft defense, on protection against weapons of mass destruction and on camouflage. The contents of the combat orders are defined in the Staff Field Service Manual.

At the command post of the missile regiment an electrified display board (table) should be installed to show the commands of the directorate and information on the operations of subordinate subunits and of the RTB.

As the experience of exercises has shown, by the formulation and presence in the regiment of the documents enumerated, the commander and staff are assured that the necessary materiel supplies are accumulated according to plan, that the regimental subunits will move in an organized fashion and will deploy rapidly in the siting area, that they will be brought to the appropriate level of combat readiness and that missile launchings will be prepared in good time and carried out.

However, the suggested list of combat documents made up by the staff of the missile regiment may undergo significant changes with the introduction of automated and mechanized equipment into the system of troop control.

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The control of the regiment in one of the exercises was carried out from the central command post by the Commander-in-Chief of Missile Troops, by means of commands (signals) transmitted to the command post of the regiment through the communications center of the division command post. The signals were transmitted over permanent wire communications with the help of a secrecy device (ZAS) and were duplicated over high frequency communications. The control of the subunits of the regiment and RTB was carried out from the command post of the regiment, located in the primary siting area of one of the battalions. This location of the command post allowed the commander of the regiment to carry out the direction of the subunits not only by technical means of communication but also by personal contact with the commander of the missile battalion, of the transportation and fueling battalion, and with the chief of the RTB.

Ten minutes elapsed between the moment when the regiment received the signal, directing that the subsequent operations of the regiment were to be determined by documents prepared in advance, and the announcement of the alert to the batteries; of these 2 minutes were spent on the transmission of commands to the battery commanders, 8 minutes on the exchange of passwords and on study and explanation of the order. The order to go over to readiness No. 3 was sent to the battalion commander by the regimental commander by coded telegram (kodogramma) 18 minutes after the regiment received the alert signal. The explanation of their tasks to the commanders of the subunits located in the immediate proximity of the regimental command post was carried out by the regimental commander as they arrived at the command post (within 18 to 25 minutes).

The commander of a missile battalion put before the commanders of batteries orally the tasks of going over to readiness No. 3. The commanders of batteries arrived at the command post of the battalion to receive their tasks immediately after the alert had been declared. However, the summoning of subunit commanders from a combat duty position to the command post of the regiment (battalion)

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to assign or explain their tasks at the beginning of combat operations cannot be considered as a rule. Under these conditions, all tasks must be conveyed to the subunits beforehand. Thus, the combat operations of subunits must begin with the receipt of short signals (commands) transmitted by technical means of communication.

The commands for transition to readiness No. 2, and then to readiness No. 1, and for the carrying out of missile launchings were transmitted in 2 to 5 minutes to those who were to carry them out. The regimental commander transmitted the commands over the telephone (by code or in open text) to each subunit in turn, while the commander of a battalion transmitted them (in open text) in a circular manner (tsirkulyarno), spending much less time over their transmission.

From the beginning of the exercise the regimental commander, instead of transmitting signals for transition to readiness Nos. 3, 2, and 1, sent coded telegrams to the missile battalions, which took up to 3 minutes to decode. Such a method of controlling regimental subunits must be regarded as mistaken. The control of regimental subunits during the period of the preparation of missiles for launching or during their transition from one readiness to another must be exercised by means of short, instantaneously transmittable signals, whose significance must have been memorized by appropriate persons.

During the course of combat operations the commanders of the regiment and of the missile battalion controlled the subunits only from their command posts by telephone. However, it is impossible to exclude the possibility, and sometimes, the need, for personal control over the operations of the subunits by the commander of the regiment (battalion) at any stage of combat operations.

During the periods of preparation for a march and of moving the subunits to the initial line (iskhodnyy rubezh), control was exercised by telephone from the command post of the regiment and by personal contact between the regimental commander, the commander of the missile battalion and the chief of the RTB, and during the march - through

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personal contact and with the help of the traffic control service (sluzhba regulirovaniya). Wire communications in the alternate siting area were set up in advance and worked dependably and without interruption.

The experience of the exercises showed that the question of controlling regimental subunits on a march is poorly worked out. The problem consists of finding and of working out practically the most expedient methods for the control of subunits on the march. First of all it is necessary to devise a method for the control of a marching column with signals, for which it would be advisable to instal three-color signal lights on the prime movers, motor vehicles and ground carriers (using the forces and means of the units). Control signals using these signal lights must be transmitted from the driver's cab. During a march over greater distances, with the regiment and RTB at full strength, radio communications will also be organized to exercise dependable control over the column. In order to ensure secrecy, receipt and transmission of signals by the radio sets of the regimental commander and of the chiefs of the columns must be permitted. The remaining radio sets of subunits may only receive signals.

It is also necessary to bear in mind that radio will represent the basic means of communication during combat operations. Maintenance of radio equipment in constant readiness for work, a high level of training of radio operators, the improvement of their level of performance (klassnost), systematic radio training exercises, and the perfection of radio networks and of directional radio must therefore be the constant concern of the commanders and staffs of units and subunits.

The dependability and stability of control depends to a considerable degree on the level of training of personnel and on the equipment of command posts and of the working areas of commanders and staffs. In certain units the working areas of battery commanders at the launching platforms are equipped in a primitive fashion, cluttered up with telephones, loudspeaker apparatus and other equipment

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and do not provide normal conditions for work, or reliable protection for combat documents from the effects of atmospheric precipitation.

In view of the low level of training and the un-systematic conditioning of personnel, and also as a result of the lack of adaptability of the means of control to work in gas masks, the control of regimental subunits in conditions when the siting area was contaminated by radioactivity was carried out with great difficulty and was often disrupted.

In order to ensure stable control under different conditions, the attention of unit (subunit) rationalizers must be concentrated on the perfection of technical means of control, especially when personnel are operating in gas masks, the development of light, portable work areas for battery commanders, providing convenient accommodation and the interconnection (kommutatsiya) of means of communication, concealment for work with combat documents by day or night and protection from atmospheric precipitation.

The experience of exercises has shown that many questions of control are in need of further perfection with the aim of increasing its dependability and stability and of ensuring the delivery of the first nuclear/missile strikes against the enemy in the shortest possible time. For this it is first of all essential to make the maximum reductions in the time taken in the transmission and, particularly, in the encoding of commands to those who are to carry them out and of reports about progress in the fulfilment of tasks by the subunits. The signal table used in this exercise, drawn up by the staff of the regiment, turned out to be cumbersome, resembled a prearranged message code (peregovornaya tablitsa) and was inconvenient to use. As a result, the coding and especially, the decoding of even short commands and instructions took up a lot of time. Also, the time taken to issue instructions and to allocate tasks which are to be carried out by several different executants, must be reduced by means of circular transmissions over the technical means of communication which ensure the fastest transmission at a given moment. All this will allow a certain reduction in the time taken for the transmission of tasks.

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However, only broad automation of the processes for controlling missile units and subunits will provide the best degree of dependability and stability of control and will make it possible to deliver nuclear/missile strikes against the enemy in the shortest period of time.

In conclusion, it is necessary to note that the exercises which were conducted by confirming the basic principles of the instructions and directions for the employment in combat of units armed with R-12 missiles, provided valuable material for the clarification of the individual principles of existing manuals and technological schedules.

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