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CENTRAL INTELLIGENCE AGENCY
WASHINGTON 25, D. C.

28 MAR 1962

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : STRATEGIC MISSILE BULLETIN: "Questions of the Advance Preparation of Initial Data for the Launching of Missiles of Strategic Designation"

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 (Informatsionyy 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.

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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

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12 March 1962

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COUNTRY : USSR

SUBJECT : STRATEGIC MISSILE BULLETIN: "Questions of the Advance Preparation of Initial Data for the Launching of Missiles of Strategic Designation"

DATE OF INFO: July 1961

APPRAISAL OF CONTENT : Documentary

SOURCE : Reliable source (B).

Following is a verbatim translation of an article titled "Questions of the Advance Preparation of Initial Data for the Launching of Missiles of Strategic Designation", which appeared in the 1961 First Issue of a TOP SECRET Soviet publication titled Information Bulletin of the Missile Troops (Informatsionnyy Byulleten Raketnykh Voysk). The 1961 First Issue was sent to press on 16 July 1961.

## Questions of the Advance Preparation of Initial Data for the Launching of Missiles of Strategic Designation

In a modern war in which nuclear/missile weapons are used, speed of reaction to changes in the situation, the correct selection of the most important objectives for destruction in the first nuclear/missile strike, and the accuracy of preparation of this strike, can be decisive factors for success.

The preparation of initial data for the launching of strategic missiles is one of the most important and labor-consuming problems in the preparation of a nuclear strike. The task of preparing data for the launch of a missile consists of determining the time-setting of the accelerometer (integrator) for engine shutdown (vyklyucheniye dvigatelya), the calculated angle of direction of the launch, and the quantities (doza zapravok) of fuel components necessary for the missile to achieve its allotted range. For this, it is necessary to calculate the range of the target, the spherical azimuth of direction of the target and corrections which take into account the specific geophysical, ballistic and meteorological conditions of the launch.

At the present time, the preparation of initial data for a launch can be carried out either by the method of numerical integration of the equations (uravneniye) of movement of the missile or with launch tables (tablitsa puskov) compiled for the particular missile.

In principle, the numerical integration method is most accurate. However, this method is highly complex and labor-consuming, and as a result, it can be employed in practice only when electronic computing machines are available.

The use of electronic computing machines for the calculation of initial data will guarantee:

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-speed in the preparation of initial data (no more than 1 to 2 minutes are required to carry out calculations of the initial data for a single target);

-the documentation of the results obtained and of the data used as the basis of the calculations;

-the observance of the practice of secrecy in making calculations;

-the reliability of the results obtained.

The development of specialized electronic computing machines of small dimensions, and their issue to troop units, have great significance in raising the combat readiness of missile troops.

The preparation of initial data with the help of launch tables is relatively simple and does not require a knowledge of higher mathematics on the part of those using the data. But, even then, the calculation of initial data is a highly labor-consuming process, demanding constant and intense attention from those who use them. Thus, not less than 1 to 1½ hours are required to prepare the initial data for a single launch. In addition, calculations of initial data from launch tables, even those made by adequately trained data-personnel (vychislitel) cannot be guaranteed against chance errors. Such errors are especially possible in the second stage of the preparation of initial data when launching from readiness No. 1, when an extremely limited time will be allotted for the making of final calculations.

If we take into account that each missile battalion will be required to carry out a large number of launchings, the necessity for the advance calculation of initial data for launchings against all objectives scheduled for destruction will become quite clear.

The possibility of carrying out such calculations follows from the conditions under which the combat use of strategic missiles is planned from primary or field-type siting areas which are prepared beforehand. The objectives to be destroyed, against which the use of strategic missiles is planned beforehand, are stationary.

If one has the data for the geodetic tying-in (privyazka) of the launching points (start) and of the other elements of the combat formation and the coordinates of the objectives for destruction, one can calculate in advance the initial data for launching a missile from each launching point against the objectives planned for destruction by a given launching point. Corrections which take into account the specific conditions of a launch should be calculated and implemented immediately before the launch. However, if the advance calculation of first phase initial data is carried out for each launching point against all possible objectives for destruction, much time will be needed, and the document containing the results of the calculation will be cumbersome and therefore most inconvenient for practical use.

In order to reduce the number of calculations and to produce a compact document with the initial data on all objectives for destruction (against which the launching of missiles is possible from a given siting area), it is advisable to have, for each battalion, a catalogue (katalog) of initial data which have been calculated for the coordinates of a mean point in the battalion's siting area.

Launching mounts are dispersed at an insignificant distance from one another in the siting area. As a rule, this distance does not exceed 150 to 200 meters. The launching points may be deployed in a line or in a checkerboard pattern. The distance of the launching points from the central point will equal

$$\delta = \sqrt{\delta X^2 + \delta Y^2},$$

where $$\delta X = X_{SR} - X_i, \quad \delta Y = Y_{SR} - Y_i;$$

$$X_{SR} = \frac{\sum_1^4 X_i}{4}, \quad Y_{SR} = \frac{\sum_1^4 Y_i}{4}$$

The deviation (otkloneniye) of the impact point of a missile from the target, resulting from the fact that the initial data are prepared for a mean point, will in no case exceed the distance between the launching point and the mean point. Computations show that in practice this deviation does not reduce the effectiveness of nuclear/missile strikes.

The calculation of initial data for a mean point in a battalion's siting area, instead of analogous calculations for each launching point, allows a four-fold reduction in the number of calculations and in the volume of the catalogue of initial data for missile launchings and also simplifies the use of the catalogues and the reallocation of objectives for destruction among the launching points of a battalion to a significant degree.

It is advisable to compile catalogues of initial data directly from the strips of paper tape on which the numerical results of the calculations made by the electronic computing machine are printed.

For each objective for destruction, the catalogue should contain approximately the following data:

-the number of the objective for destruction and the number of the aiming point;

-the geodetic coordinates of the objective for destruction (latitude, longitude, height above sea level);

-the spherical range;

-the spherical azimuth;

-the calculated azimuth and the calculated directional angle of the launch;

-the calculated time for the preliminary and main commands for engine shutdown for the setting of the accelerometer;

-the corrected range and other data necessary for making calculations for the second phase, immediately before the launching of the missile.

In addition, the catalogue must contain brief instructions on its use and indications as to the complex for which it was compiled.

The use of a catalogue of the structure indicated reduces the time for the preparation of initial data for the first phase from between 1 and 1½ hours to several minutes. In fact, when the catalogue is available, no calculations for the preparation of initial data for the first phase need be carried out. The entire process of preparing initial data is then reduced to the location in the catalogue of the objective which it is necessary to destroy and to copying the data required on an orientation card, a launch card and on No. 2 data-preparation forms to make calculations for the second phase.

It is certainly probable that during combat operations the need will arise for the destruction of objectives on which data have not been prepared in advance. In these cases, initial data will have to be prepared in their entirety immediately before the launching of the missiles. In order to perform such a task, the personnel of the data-preparation sections (otdeleniye podgotovki dannykh) must be constantly instructed in the preparation of initial data and trained in the acquisition of practical skills.

A special place in the process of preparing initial data for launching is occupied by the second phase calculations, as a result of which the amounts of fuel components and corrections which take into account the specific conditions of the launch are determined. Second phase calculations must be carried out immediately before the launch. The volume of these calculations and the time required to carry them out is considerably less than the volume of calculations and the time needed for the first phase.

However, when launching missiles from readiness No. 1, when an extremely limited time is allowed for the preparation of the missiles for launching, the preparation of initial data for the second phase will be difficult and may delay the timely launching of the missile.

Until troop units are equipped with electronic computing machines, in order to shorten the time needed for the preparation of initial data for the second phase, means for small-scale mechanization (the simplest electrical calculating devices, calculations made with auxiliary tables, nomograms, etc.) must be introduced in every possible way.

In order to determine the amounts of fuel components for topping off (dozapravka) of missiles which it is proposed to launch from readiness No. 1, it is necessary to calculate in advance the relationship between the volume of the fuel components and the readings on the gauges of the level-regulation signal system (sistema signalizatsii kontrolya urovney).

The essence of such a calculation is as follows. Tables showing the relationship between the volume of the fuel components and the readings on the gauges of the level-regulation signal system for all possible calculated temperatures of the components during launching are compiled beforehand, in accordance with calibrated graphs showing the relationship between the fuelling capacity (obyem zapolneniya) of the tanks and readings on the gauges of the level-regulation signal system, which are appended in the form of data formulated for the missile. With the tables mentioned above, on receipt of the command to launch the missile, the temperature of the fuel components, the quantities of the components which it is necessary to add or to jettison, and correction of the time-setting of the accelerometer, calculated during the first phase of data-preparation, can be determined with the minimum expenditure of time, in accordance with the readings on the gauges of the level-regulation signal system. As the

experience of exercises in troop units shows, the availability of such advance calculations is an essential condition for the timely launching of missiles from readiness No. 1.

An incomplete list of the measures which must be accomplished in order to perfect the means and methods of preparing initial data for the launching of missiles of strategic designation is given in this article. At the same time, the implementation of these proposals will undoubtedly contribute to an increase in the combat readiness of missile troops.

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MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT: Preliminary Comments on [redacted]

1. There is no reason to doubt that this is an authentic Soviet document. The article is from the Information Bulletin of the Missile Troops, journal for the dissemination of official doctrine to officers of the strategic missile forces, controlled by Marshal Biryuzov.

2. This article discusses methods for calculating the basic data needed for launching long-range ballistic missiles, such as angle of fire, settings for controls, and loading of propellants. From the discussion it appears that in mid-1961, few if any operational units had their own electronic computers on site, although the author recognizes that such computers would greatly reduce the time necessary for producing such data and would improve their accuracy. In the absence of computers on site, he recommends that certain rudimentary short-cuts and methods of approximation be used, even though this might introduce an error as large as 700 feet at impact. He also indicates that targets of opportunity may be assigned to missile units during combat, and that as much as 24 hours would be needed to prepare the necessary data by hand.

3. By US standards, the Soviet procedures for preparing necessary firing data appear extremely unsophisticated, and this is one of several Soviet documents which reveal that the Soviets themselves are dissatisfied with these procedures. Apparently, a need for rapid reaction times and machine calculation of target data, which have been critical elements in the development of U.S. systems from the beginning, is only belatedly being recognized in Soviet planning for the employment of strategic missile systems.

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[redacted], Jr.
Deputy Director (Intelligence)

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