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CENTRAL INTELLIGENCE AGENCY
WASHINGTON 25, D. C.

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13 JUL 1962

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : MILITARY THOUGHT (RESTRICTED): "The Question of Classifying Missile Weapons", by Colonel S. Begunov and Colonel I. Zheltikov

1. Enclosed is a verbatim translation of an article which appeared in the July 1959 issue of Military Thought, published by the Ministry of Defense, USSR. Although this monthly version of Military Thought bears no formal Soviet security classification, it is intended "Only for Generals, Admirals, and Officers of the Soviet Army and Navy".

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Richard Helms
Deputy Director (Plans)

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COUNTRY : USSR

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DATE OF INFO : July 1959

APPRAISAL OF CONTENT : Documentary

SOURCE : A reliable source (B).

Following is a verbatim translation of an article titled "The Question of Classifying Missile Weapons", by Colonel S. Begunov and Colonel I. Zheltikov. This article appeared in Issue 7 of 1959 of the Soviet journal Military Thought, which is restricted in distribution by the Soviets "Only for Generals, Admirals, and Officers of the Soviet Army and Navy".

Comment: Military Thought is published by the USSR Ministry of Defense in three versions, classified RESTRICTED, SECRET, and TOP SECRET. The RESTRICTED version is issued monthly and has existed since 1937. The SECRET version is issued irregularly. By the end of 1961, 61 issues had been published, 6 of them during 1961. The TOP SECRET version was initiated in early 1960 and is also issued irregularly.

Restricted Issue 7 of 1959 was sent to press on 2 July 1959, and it is the most recent issue of the basic version of Military Thought which is on hand. Issue 7 of 1959 is

This is the only article from the RESTRICTED version which will be published in the IRONBARK series. It is presented as an example of the articles in the RESTRICTED version, and also as an aid to the understanding of some of the missile terminology used in the two more highly classified versions of Military Thought.

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The Question of Classifying Missile Weapons

by

Colonel S. Begunov and Colonel I. Zheltikov

Missile weapons (raketnoye oruzhiye) are one of the most important and advanced types of armament for modern armies. Used for the first time on a large scale during the Second World War, missile weapons have been developed and improved rapidly during the postwar years and have become mass weapons.

Following the policy of an arms race and of preparing an aggressive war against the USSR and the People's Democratic Countries, many capitalist countries have begun to carry out extensive programs which envisage developing missile armamant for ground troops, air forces, the navy, and antiair defense. Enormous means are expended for the development of experimental work and the manufacture of these weapons. Allocations for these purposes are increasing from year to year and are taking a constantly increasing proportion of the military budgets of the imperialist countries.

According to information in the American journal Missiles and Rockets, No. 6 of 11 August 1958, budgetary allocations of the USA for missile armament during the period 1948 to 1954 amounted to 4.5 billion dollars. In 1954, 6 times more money was allocated than in 1948. In 1957, 5,107,000,000 dollars were allocated for the production and purchase of missile armament and for conducting experimental-design and scientific-research work in this field, and in the 1958-1959 fiscal year, 6,596,000,000 dollars were allocated.

The enormous scope of work for creating missile equipment (raketnaya tekhnika) can also be observed in other capitalist countries--England, France, West Germany, Sweden, Norway, Switzerland, Japan, Canada, and Italy.

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At the present time, a considerable number of models (obrazets) of missile weapons of different types have already been worked out and accepted into the armament of the armies of the USA, England, France, Sweden, and others. The armed forces of these countries are conducting combat training with wide use of missiles and are working out methods for the combat use of missile weapons, and also the forms and methods for conducting a battle and an operation with the mass use of missiles.

Taking into account the threat of a military attack by the aggressive imperialist states, the Soviet Union has been forced to give due attention to the development of missile weapons and to equipping its armed forces with them. At the extraordinary 21st Congress of the CPSU, Minister of Defense of the USSR Marshal of the Soviet Union Comrade R. Ya. Malinovskiy declared that, thanks to the daily concern of the Communist Party and its Central Committee, the Soviet Armed Forces were equipped with a whole series of combat ballistic missiles: intercontinental (mezhkontinentalnaya), long-, medium-, and short-range continental (kontinentalnaya) missiles, and a whole group of missiles of tactical designation (takticheskoye naznacheniye). Clear proof of the achievements of Soviet missile technology (tekhnika) are the successful tests in the Soviet Union of intercontinental ballistic missiles and the launching of heavy artificial earth satellites and the world's first space rocket (kosmicheskaya raketa).

The unusually rapid introduction of missile weapons, particularly guided ones (upravlyayemoye) ones, into all types of armed forces and arms of troops, which has been observed since the Second World War, is explained by the fact that these weapons have quite a number of advantages in the technical and operational-tactical sense over previous types of artillery and air weapons.

One of the most important advantages of missiles is that their movement toward the target can be guided (upravleniye).

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The conventional artillery shell, after it comes from the mouth of the gun, and the aerial bomb, after it has been dropped from the aircraft, continue to move according to the laws of ballistics, and there is no possible way to change their flight in the necessary direction, even if we have discovered that they are deviating from the target. But possible deviations (otkloneniye) of a guided missile from the necessary direction can be discovered and eliminated with the help of various automatic instruments and devices. Because of this, the sphere of use of missiles has been expanded significantly, and the effectiveness of their destructive action is being increased. In firing at great distances, and in combat against aircraft, guided missiles (upravlyayemaya raketa) are the type of weapons with the greatest future. This can be seen from the following example alone.

During the Second World War, antiaircraft artillery fired hundreds, sometimes even thousands, of shells for each enemy aircraft shot down. The misses in firing antiaircraft shells against a modern, maneuvering aircraft flying at great altitude and great speed can be quite high. Under these conditions, tube antiaircraft artillery is actually becoming ineffective. Antiaircraft guided missiles, however, destroy aircraft with a probability close to 100 percent. Consequently, in the system of antiair defense of several countries (the USA, England, France, Sweden, etc.), tube antiaircraft artillery of large caliber is being replaced by antiaircraft guided missiles.

Improvement of the weapons of antiair defense is resulting in a sharp increase in the speed and altitude of bombing. In this regard, there is a significant decrease in the accuracy of dropping bombs on small-scale targets, and many extremely important targets (vessels, bridges, river crossings, runways, etc.) are actually becoming less vulnerable to free (neupravlyayemaya) bombs and torpedoes. The reliability of destroying such targets by guided missiles dropped (launched - zapusk) from aircraft is much greater.

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In comparing the effectiveness of using guided missiles and ordinary aerial bombs, one must also take into consideration the probability of the bomber's getting through to the target. The penetration of aircraft to particularly important targets will be made more difficult by a strong antiair defense (PVO) system. Dropping (launching) guided missiles from an aircraft can be done outside the zone of antiaircraft fire of the target's antiair defense, and this will greatly increase the probability of the missiles' hitting the target and will decrease aircraft losses.

A second and no less important advantage of missile weapons is their practically unlimited capability to increase the range of fire within the limits of the earth's surface.

As is well known, the firing range of conventional modern field artillery does not exceed 25 to 30 km and for warship artillery, 30 to 40 km. Missiles, however, have a flight range counted in hundreds and thousands of kilometers and owing to this, are capable of destroying not only targets in the tactical and operational depth but also strategic objectives located in the deep rear area. "Our Armed Forces have at their disposal splendid combat rocket equipment (reaktivnaya tekhnika) capable of destroying targets both on the battlefields as well as at any point on the earth," declared Marshal of the Soviet Union Comrade R. Ya. Malinovskiy at the 21st Congress of the CPSU.

According to the latest information from the foreign press, in several capitalist countries there has been intensive development of missiles intended to destroy both operational-tactical as well as strategic targets located in the enemy's deep rear area. In the USA, for example, missiles are being developed to fire at the following distances (interval): 40 to 250 km, 250 to 800 km, 800 to 2500 km, 2500 to 5000 km, and 5000 to 8000 km. Many models of these missiles (snaryad) have already been developed and adapted as standard equipment. A large number of them are in various stages of testing, development, and design (ispitaniye, otrabotka i proyektirovaniye).

Several countries have developed and are perfecting antitank and all-purpose (universalnyy) infantry missiles with a firing range of up to 5 km. Particularly intensive work in this direction is being done in France.

Missiles make it possible to increase sharply the power of a charge by putting a larger amount of conventional explosive or special devices (spetsialnoye ustroystvo) in them. But the desire to increase the power of artillery shells could result in creating guns with such a large caliber and weight that the practical use of such guns would become extremely difficult, and in many instances, even impossible.

The simplicity of construction and the small weight of launching mounts (startovaya ustanovka) make it possible to employ missiles under the most varied conditions of a situation, and also to launch them from tanks, vehicles, aircraft, light naval vessels, and other mobile means for which the weight of the weapon plays a rather large role.

The primary advantages which have been noted for missile weapons make it possible to perform a whole series of combat tasks with their help. These tasks either could not be performed at all by other means of destruction, or would require great expenditure of forces and weapons.

The use of missiles as carriers (nositel) for nuclear charges is now acquiring exceptional significance. In the opinion of many foreign military figures, guided ballistic missiles (upravlyayemaya ballisticheskaya raketa) and cruise-missiles (samolet-snaryad) are the most effective and cheapest carriers of nuclear weapons under the conditions of waging war against a strong and well-equipped enemy because these weapons make it possible to deliver strikes against any targets, at any distance, and with the least expenditure of forces and weapons.

Thus, missile weapons are the weapons which most closely meet modern combat requirements and which make it possible

"to perform effectively the strategic, operational, and tactical tasks on the ground, in the air, and on the sea".[1]

* * *

During recent years, in connection with the rapid development of missile weapons, a large amount of scientific-technical and public popular literature has been published on the problems of their design, construction, performance, and combat use.

Many new names relating to missile equipment have appeared in the literature. In the pages of the press we often encounter such terms as "missiles" (raketa), "guided missiles and free rocket missiles" (upravlyayemyy i neupravlyayemyy reaktivnyy snaryad), "launching mounts" (startovaya ustanovka), "jet and rocket engines" (reaktivnyy i raketnyy dvigatel), "systems of direction and guidance" (sistema navedeniya i upravleniya), and many others.

A certain term expresses a definite idea, the definition of which is quite important. Precise and generally accepted names help servicemen to understand and evaluate in a more correct way the new combat weapons, and to draw the necessary conclusions about their importance in performing combat tasks under the specific conditions of a situation.

Unfortunately, one must state that so far there has not been a common, accurate terminology dealing with missile weapons, or common views on their classification,

There are three reasons to explain the absence of unanimity of views in understanding the content of the new terms. The first of these is the extraordinarily rapid development of missile equipment, with the result that in approximately ten years there have appeared hundreds of

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1. R. Ya. Malinovskiy. Speech at the 21st Congress of the CPSU. Extraordinary 21st Congress of the CPSU (Stenographic Record), Part 2, State Political Publishing House, 1959, p. 126.

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new terms concerning missile weapons. The second reason is that the names for new models and other objects relating to missile equipment have been given by separate departments, organizations, and persons. And the third reason is the absence of a military encyclopedia and reference books and dictionaries which would be the sole and common scientific guide for military-educational institutions, scientific-research and design organizations, editorial boards of printing organs, publishing houses, staffs, and all the personnel of the armed forces.

Owing to all this, a situation has been created whereby one and the same term covers a variety of meanings. The terms "missile weapon" (raketnoye oruzhiye) and "rocket weapon" (reaktivnoye oruzhiye), for example, are understood to mean different things. By the term "missile weapon" some comrades mean missiles (snaryad) with a jet engine using solid fuel (tverdoye toplivo). Others, however, consider that these are missiles (snaryad) with a jet engine using liquid fuel (zhidkoye toplivo). Some people are of the opinion that by missile weapons one should mean flying devices (letatelnyy apparat) which have a so-called self-contained "rocket" engine (avtonomnyy "raketnyy" dvigatel), i.e., an engine which ensures the flight of the missile (raketa) without using oxygen from the surrounding air, and all remaining missiles (snaryad) with engines should be regarded as rocket weapons. Finally, some people suggest that only ballistic missiles should be meant by missile weapons.

It seems to us that it is impossible to agree with these opinions. The most important technical indicators of the design of any missile are the jet engine, aerodynamic arrangement (aerodinamicheskaya komponovka), and the guidance system (sistema upravleniya). But any one of these indicators can scarcely be considered the decisive one in explaining a certain term. The indicators can be examined only in their totality.

It is well known, for example, that on many missiles (raketa) (rocket missiles) ((reaktivnyy snaryad)) one may use engines of various designs which use various fuel

components: one of them may work only in the dense layers of the atmosphere and others may work beyond them. As is well known, only rocket (self-contained) engihes are mounted on the majority of the models of free rockets and guided missiles (missiles) (neupravlyayemyy i upravlyayemyy snaryad ((raketa)). An air-breathing engine (vozdushno-reaktivnyy dvigatel) is used on some missiles (raketa) (particularly on cruise missiles) as the sustainer (main) engine (marshevyy ((osnovnoy)) dvigatel). As a rule, however, besides the sustainer engine (marshevyy dvigatel), launch boosters (startovyy uskoritel) (missile engines), the net thrust of which may exceed considerably the thrust of the sustainer engine, are mounted on them. Consequently, it is now impossible to divide the weapons which are being examined into rocket and missile according to their propulsion systems (dvigatelnaya ustanovka).

It is no less complex in dealing with the other technical parameters of missiles -- the aerodynamic arrangement and guidance systems.

The literature on missile equipment which has been published during the last two years has not brought clarity into the comprehension of the terms "missile weapon" and "rocket weapon", although both these terms are used widely by authors of books and pamphlets. As an example, we can point to the book Rocket Weapons of Capitalist Countries (Reaktivnoye oruzhiye kapitalisticheskikh stran), which was compiled by a group of authors under the leadership of D. A. Uryupin, and which was published by the Military Publishing House of the Ministry of Defense of the USSR in 1957. In the book one finds the terms "rocket weapon", "guided missiles" (upravlyayemyy snaryad), and "missiles" (raketa) referring to the very same weapons, but no explanation is given of the terms themselves.

Because there are various terms, the meaning of which is not defined, each person can understand what he wants by these terms and not always, of course, what the term should mean.

In our opinion, the terms "missile weapon" and "rocket weapon" are identical in their meaning. Both of them include the idea of missiles which have only rocket or rocket and jet engines and which are used as weapons of armed combat. In other words, each of these terms includes the whole system of free and guided rocket missiles (ballistic and winged - krylataya - missiles) i.e., all types of missiles from the smallest, which are employed in combat against tanks, up to modern intercontinental cruise and ballistic missiles with their launching mounts and guidance and control systems (sistema upravleniya i kontrolya). It seems to us that such an understanding of these terms has a more scientific basis.

At the present time there is no unanimity either on the meaning of such terms as "ballistic missiles" (ballisticheskaya raketa) "winged missiles" (krylataya raketa), and "pilotless combat weapons" (bespilotnoye sredstvo borby).

We think that one should regard as ballistic missiles those missiles whose flight trajectories after the engine has shut off is a ballistic curve (ballisticheskaya krivaya) (the trajectory of a freely thrown body). In other words, one should regard as ballistic missiles both unguided (neupravlyayemyy) as well as guided rocket missiles without lifting surfaces (nesushchaya poverkhnost) - wings. The initial supporting force of these missiles is the thrust of the missile engine. The flight range of ballistic missiles is achieved by the reserve of kinetic energy which is received while the engine is working. After engine shutdown, the ballistic missile continues its flight under the action of the force of inertia.

Depending on their designation, the designs of ballistic missiles may be one-stage or multistage (mnogostupenchataya). Their engines may work on solid or liquid fuel, usually a bipropellant (dvukhkomponentnoye) (fuel and oxidizer). Ballistic missiles are launched from ground or warship launching mounts. For multistage missiles, as a rule, the launch (start) is vertical; for one-stage missiles it is vertical

or inclined. The ballistic missile has a streamlined, cigar-like shape (sigaroobraznaya obtekayemaya forma).

The fundamental features of ballistic missiles are the great altitude of the primary part of their flight trajectory and the enormous flight speeds, owing to which they have little vulnerability to antiair defense weapons. Their warheads may be filled with conventional explosives (VV), chemical toxic substances (OV), atomic, or thermonuclear charges. In some missiles, the warhead can be separated from the body in flight, and in this way there can be achieved an improvement in its ballistic qualities, and its firing range can be increased.

The so-called "winged missiles" (krylataya raketa) comprise quite another group. In this group are all missiles with lifting surfaces (wings) and set in motion by rocket or rocket and jet engines (engine).

It is accepted practice to give the name cruise missiles (samolet-snaryad) to winged missiles with the aerodynamic shape of an aircraft. The cruise missile moves to its target by means of the force developed in the initial part of the trip by the launch boosters and later by the jet sustainer engine (marshevyy reaktivnyy dvigatel). As a rule, the sustainer engine is an air-breathing engine using liquid fuel, and the oxidizer is the oxygen in the air. The engine works until the cruise missile approaches the target area and shuts off when the missile starts its dive. For the takeoff and ascent, besides the primary engine, cruise missiles usually employ launch boosters.

Cruise missiles usually are launched from an inclined rail launching mount (naklonnaya napravlyayushchaya startovaya ustanovka) which is placed directly on the ground or can be mounted on the chassis of trucks, tanks, armored personnel carriers, or on warships of various classes, including submarines. The flight path and altitude of the cruise missiles are ensured by the guidance system. Consequently, they are all included in the guided group. Cruise missiles may be used to destroy targets on the ground or on the sea. Their

shortcomings are their comparatively low flight speed and altitude, and because of these they can be destroyed by antiair defense weapons just like conventional aircraft.

Winged missiles which are intended to destroy air targets have a somewhat different aerodynamic arrangement. They are executed according to different diagrams, have less developed wings, and, as a rule, are launched from a vertical position.

All winged missiles, just like the ballistic ones, may carry a combat charge of conventional, atomic, or thermonuclear explosive.

The meaning of the term "pilotless weapons" is also quite confused. Some comrades understand this term to mean only winged missiles; others understand it as all aircraft and missiles guided from the ground, a warship, or from the air, and including ballistic missiles; and finally, still others include in the meaning of the term "pilotless weapons" all missile weapons, both guided as well as unguided.

It seems to us that all these interpretations of the term "pilotless weapons" are not only inexact but even incorrect. The problem is that the great successes achieved during the past ten years in missile and aircraft construction are proof of the constant elimination of the differences between modern aircraft and guided ballistic missiles. The speed of aircraft has sharply increased, their aerodynamic arrangements are constantly made more streamlined, the sizes of their lifting surfaces (wings) are being decreased, and the thrust of their engines is being increased.

Recently, attempts have been made to mount a purely rocket "self-contained" engine instead of an air-breathing engine on aircraft, and this engine would work not only in the dense layers of the atmosphere but also beyond its limits, and would be capable of developing a speed of about 10,000 kph and of reaching a ceiling of hundreds of kilometers. Aircraft are being designed to take off vertically. In their technical parameters, such aircraft are approaching very close to ballistic missiles.

It is not ruled out that the development of the aerodynamic qualities of aircraft, engines,, and guidance systems will make it possible in the near future to carry out the construction of flying devices which will be ballistic during the initial and basic parts of their trajectories and later will glide by means of wings which will be released from their bodies. The latest achievements of science and technology in several countries, particularly the launching of heavy earth satellites and a space rocket in the Soviet Union, open limitless prospects for the creation of such apparatus.

In the light of the opinions which have been expressed, it seems to us that it would be more correct to understand by the term "pilotless weapons" those aircraft or missiles, which instead of a crew, are guided by automatic guidance systems. Here one cannot agree with those comrades who equate the terms "pilotless weapons" and "guided missiles" (upravlyayemyy snaryad). The term "guided missiles" is broader: it includes all ballistic and winged missiles equipped with instruments to guide their flight. Among others which are regarded as guided missiles are also antitank and airborne guided missiles (aviatsionnyy upravlyayemyy snaryad) which, according to their size, operational range, and other parameters must be regarded as pilotless weapons. They cannot accommodate a crew of even one person.

The absence of an accurate, scientifically based classification of missile weapons is greatly hampering their study, and is making it difficult to have a correct understanding of the special features of missiles and a comprehension of the problems of their combat use. At the present time, the classification of missile weapons has been reduced for the time being to a division of all missile weapons into four classes: "surface-to-surface" ("surface-to-water", "water-to-surface", and "water-to-water"), "surface-to-air" ("water-to-air"), "air-to-air", and "air-to-surface" ("air-to-water"). The place of launch of the missile and the location of the target have been chosen as the indicators for each classification. Such a classification, in which there are no data about the types of missiles, does not make it possible,

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even approximately, to imagine the characteristics of a certain model of missile weapon.

As is known, the "old" types of armament were classified primarily according to their designation. Thus, for example, artillery used to be subdivided into field, fortress, and coastal. With the appearance and development of aircraft and tanks there also appeared, and was quickly developed, artillery intended specially to combat aircraft and tanks, and it was given the name of antiaircraft and antitank artillery.

According to its technical characteristics, all artillery materiel, regardless of its designation, the tasks to be performed, to what organization it belongs, and its caliber, is regarded as a certain type of weapon: guns, howitzers, mortars, and trench mortars (minomet). The name alone of the type of gun gave a definite concept of the technical characteristics of the armament.

The division of missile weapons into the four classes named above makes it possible to judge only the location of the launch site of these weapons and the location of the target. Of course, this is far from being enough, and such a classification does not meet the level which has been achieved in the development of missile weapons. It does not even determine to which type of armed forces the missile weapons belong -- the ground troops, air forces, navy, or the antiair defense troops -- and it does not disclose the characteristics of the missiles: the methods of direction and guidance, their aerodynamic arrangement, the nature of the trajectory, the design of the propulsion system, and the possible nature of the tasks to be performed. The combat charges being carried by these missiles also remain unknown.

Thus, a situation is created whereby each class of combat missiles has many very different examples. For example, the class "surface-to-surface" includes the French antitank guided missile SS-10, the American free rockets "Little John" and "Honest John", the guided missiles "Corporal", "Matador", "Redstone", "Jupiter", "Thor", "Snark", "Atlas", "Titan",

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and others. As we see, various models of missile equipment are included in the very same class: first, by direction and guidance systems -- guided and free; second, according to their aerodynamic arrangement -- ballistic and winged; third, according to operational range -- those with extremely limited range and also intercontinental; according to their propulsion systems -- operating on solid or liquid fuel; and finally, those belonging to various types of armed forces.

The range of tasks being performed by missile weapons belonging to the "surface-to-surface" class is very large and varied -- from the destruction of individual fire points and tanks up to large objectives of strategic importance. This is the most numerous, the most varied, and the most complex class of missile weapons, according to all parameters.

In the other classes, the number of models of missile weapons is less, but the situation does not become any clearer because of this.

In classifying missile weapons we consider it advisable first of all to indicate to what type of armed forces they belong. Furthermore, in our opinion, it is already quite necessary to divide the classes of missile weapons into subclasses. As a criterion for division into subclasses, in our opinion, one should select the methods of directing missiles to their targets and guiding them in flight. Each class will have two large subclasses: free rockets and guided missiles each of which will have its own special features.

As a rule, missile weapons in the free subclass will have solid (tverdyy) fuel (dry fuel - porokhovoy) engines and a shorter firing range. These missiles are launched from inclined launching rails (naklonnaya napravlyayushchaya), and they have a larger dispersion relative to their flight range.

Missile weapons in the guided subclass are more complex in their construction and have great firing ranges (with the exception of guided antitank and some airborne

missiles). On the basis of their aerodynamic arrangement and the nature of their trajectories, the subclass of guided missiles may include missiles of one or two existing types: ballistic or winged, or those and others, while in the free subclass there should be found only ballistic missiles, because winged missiles are usually guided.

The guided subclass will have missiles with various systems. Depending on their designation and design, modern guided missiles employ self-contained (avtonomnaya) guidance systems, remote control (teleupravleniye), homing (samonavedeniye), or combined guidance systems.

The self-contained guidance system consists of guidance instruments installed on board the missile and guiding its flight according to a given trajectory without communications from the command post. It is simple in its construction and operation and is not subject to artificially created jamming (radiopomekh). Astronavigational devices (astronavigatsionnoye ustroystvo) may be used to increase accuracy in hitting targets, for missiles with a large radius of action and self-contained guidance systems.

The remote control system includes a system of equipment on board (bortovaya) the missile and equipment at the command post. The missile is guided in flight from the command post, i.e., usually with the help of the radio-transmitting and radio-receiving apparatus, it is maintained on a straight line connecting the command post with the target or on a plane passing through the command post and the target. To increase the accuracy of directing the missile to the target, one may use systems of television remote control and homing systems which are turned on as the missile nears the target. Remote control systems are subject to jamming.

Missiles with a large radius of effect usually use combined guidance systems: self-contained and remote control on the main part of the missile's flight path and homing for the final part, i.e., near the target.

The class "surface-to-surface" contains an extremely large number of various models of combat missiles, and the broad range of tasks to be performed by them necessitates their further classification. Dry-fuel missiles (porokhovaya raketa) with a firing range of up to several tens of kilometers, intended for destruction of individual targets and groups of targets on the battlefield, and their launching mounts, may be used directly in the battle formations of troops. Commanding officers of subunits armed with such missiles and launching mounts receive their task from the commanding officers of combined-arms units and large units. These missile weapons may be used immediately and do not need additional time for their preparation.

Missiles which are of large sizes and more complex in their construction, and which are capable of reaching long distances in flight and of carrying powerful combat charges, may perform the more important tasks. Such missiles need other methods of material-technical and other types of support. They need a certain amount of time for preparation to fulfil their tasks. All this creates somewhat different conditions for coordination of these missiles with the troops being supported.

It is self-evident that even more complex are the support and employment of missiles which have a flight range of thousands of kilometers, and which are capable of carrying powerful atomic or thermonuclear charges. They cannot be equated with missiles intended for the direct support of troops.

Therefore, from the viewpoint of designation, of the tasks being fulfilled, and of supporting missile units with everthing necessary, all missile weapons of the class "surface-to-surface", as has been noted in the foreign press, may be subdivided into three groups: tactical, operational, and strategic weapons.

It is advisable to regard as tactical missile weapons all missiles regardless of method of direction and guidance, propulsion system and yield of charge, with a firing range up to 100 km, i.e., missiles which can operate on the

battlefield directly with the troops and which can move in their battle formations and perform tasks for the combined-arms units and large units. Included in this group are anti-tank guided missiles and missiles which can be fired from handguns, recoilless weapons (bezotkatnoye orudiye), and launching mounts with many (light systems - legkaya sistema) or single (heavy systems - tyazhelaya sistema) launching rails (napravlyayushchaya).

Operational missile weapons are all missiles, regardless of their aerodynamic arrangement and nature of trajectory, launching equipment (startovoye oborudovaniye), guidance systems, propulsion systems, and yield of charges which have a firing range of from 100 to 1000 km, i.e., those missile weapons which by their technical characteristics can be used to the greatest extent on behalf of the large troop formations.

All remaining missiles which have a flight range of more than 1000 km, including intercontinental missiles and artificial earth satellites which are launched for military purposes, belong to the group of strategic missile weapons.

Of course, it would be incorrect to search for some kind of boundary in the tasks being performed by the various groups of missile weapons of a certain class, for example, between the tasks of the weapons of tactical and operational designation or between the tasks being performed by groups of missile weapons of operational and strategic designation. On the whole, the difference in the tasks being performed is great, but these tasks not only are contiguous but also get interwoven.

An arbitrary division of missile weapons of the "surface-to-surface" class into three groups corresponds to what these groups are intended to do and the tasks they are to perform in their general form.

Having divided missile weapons of the "surface-to-surface" class into three groups, we can now represent the whole classification of missile weapons as a table in which one can

present and evaluate this combat weapon accord..ng to its positive and negative qualities.

In our opinion, the classification of missile weapons cited in the table makes it possible to evaluate nct only the separate models but whole groups of missile weapons, particularly in the "surface-to-surface" class.

The relative magnitudes of dispersion (rasseivaniye) characterize membership in a certain subclass, and this also means the accuracy of hitting the target. The type of missiles gives an idea of their aerodynamic arrangement and trajectory and, consequently, of the possibility of combating various models of missiles with antiair defense weapons. Data on propulsion systems reveal a picture of possible methods of missile supply and support, the time needed to prepare them for launching, and the fire productivity of subunits and units. The combat charge and flight range of missiles characterize the destructive factors of this charge and the possible objectives to be destroyed.

The rapid development of missile weapons, their mass use in all types of forces and arms of troops, and the increase of their role in performing combat tasks, have logically aroused the great interest of wide circles of the military community in studying these weapons and the problems of their combat use. Under these conditions, the achievement of a common understanding of the meaning of the terms related to missile weapons and the establishment of a careful classification of these weapons are absolutely necessary. They will promote further development of scientific-research work in this sphere and the development of our military theory, and also will facilitate significantly the study and understanding of propositions in regulations and manuals.

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[redacted]

In setting forth their opinions on the terminology and classification of missile weapons, the authors make no claims for the infallibility of their proposals. Nevertheless, they hope that the proposed understanding of terminology pertaining to missile weapons and of their classification may serve as the basis for their further improvement.

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Table of Classification of Missile Weapons
(on the basis of foreign models)

Classes, groups, and names of models of missile weapons	Subclasses: Free	Subclasses: Guided (guidance systems)	Types of missiles	Propulsion system	Flight range (in kilometers)	Combat charge
			"Surface-to-surface"			
Tactical designation						
"Dart"	--	By wire	Winged (krylatyye)	PRD	1.6 to 4.8	Conventional Explosive
T66 Launching mount (24 launching rails)	Free	--	Ballistic	PRD	4.75	Conventional Explosive
"Little John"	Free	--	Ballistic	PRD	16.2	Conventional Explosive
"Honest John"	Free	--	Ballistic	PRD	27	Conventional or atomic explosive
"Corporal"	--	TU	Ballistic	ZhRD	88	Atomic
Operational designation						
"Redstone"	--	AU	Ballistic	ZhRD	320	Atomic
"Matador"	--	TU	Cruise missile (samolet-snaryad)	TRD + PRD (dry-fuel launching booster)	960	Atomic
Strategic designation						
"Jupiter"	--	TU	Ballistic	ZhRD	2400	Atomic or thermonuclear
"Snark"	--	TU + astro-navigational	Cruise Missile	TRD + PRD (dry-fuel launching booster)	6400	Atomic or thermonuclear
			"Surface-to-air"			
"Nike-Ajax"	--	TU	Winged	ZhRD	38.4 * / 23	Conventional explosive
"Nike-Hercules"	--	TU	Winged	ZhRD	60 * / 27	Atomic
			"Air-to-air"			
"Genie"	--	SN	Winged	ZhRD	88	Conventional explosive
"Falcon"	--	SN	Winged	PRD	4.8	Conventional explosive
			"Air-to-surface"			
"Rascal"	--	KU	Winged	PRD	160	Thermonuclear

KEY:
PRD - dry-fuel rocket engine (porokhovoy raketnyy dvigatel)
TU - remote control (teleupravleniye)
ZhRD - rocket engine using liquid fuel (raketnyy dvigatel na zhidkom toplive)
AU - self-contained guidance (avtonomnoye upravleniye)
TRD - turbojet engine (turboreaktivnyy dvigatel)
SN - homing (samonavedeniye)
KU - combined guidance (kombinirovannoye upravleniye)

* The denominator is the altitude ceiling.

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