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CENTRAL INTELLIGENCE AGENCY
WASHINGTON 25, D. C.

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23 JAN 1963

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : MILITARY THOUGHT (SECRET): "Some Problems of Improving Wheeled Combat Vehicles for the Ground Forces", by Major-General of Engineer-Technical Service G. Zimelev, Engineer-Colonel A. Frumkin, and Engineer-Colonel V. Medvedkov

1. Enclosed is a verbatim translation of an article from the SECRET Collection of Articles of the Journal "Military Thought" published by the Ministry of Defense, USSR, and distributed down to the level of division commander.
2. For convenience of reference by USIB agencies, the codeword IRONBARK has been assigned to this series of CSDB reports containing documentary Soviet material. The word IRONBARK is classified CONFIDENTIAL and is to be used only among persons authorized to read and handle this material.
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Richard Helms

Richard Helms
Deputy Director (Plans)

APPROVED FOR RELEASE
DATE: Dec 2004

Enclosure



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Original: The Director of Central Intelligence

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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
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COUNTRY : USSR

SUBJECT : MILITARY THOUGHT (SECRET): "Some Problems of Improving Wheeled Combat Vehicles for the Ground Forces", by Major-General of Engineer-Technical Service G. Zimelev, Engineer-Colonel A. Frumkin, and Engineer-Colonel V. Medvedkov.

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Following is a verbatim translation of an article entitled "Some Problems of Improving Wheeled Combat Vehicles for the Ground Forces", by Major-General of Engineer-Technical Service G. Zimelev, Engineer Colonel A. Frumkin, Engineer Colonel V. Medvedkov. It appeared in Issue 3 (64) of 1962 of a special version of the Soviet journal Military Thought which is classified SECRET by the Soviets and is published irregularly. Issue 3 (64) of 1962 was probably sent to press in May or June of 1962.

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

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'Some Problems of Improving Wheeled Combat

Vehicles for the Ground Forces

by

Major-General of Engineer-Technical Service G. Zimelev,

Engineer Colonel A. Frumkin,

Engineer Colonel V. Medvedkov

As is known, the destructive factors of nuclear weapons are considerably greater than those of all known weapons of destruction used during the Second World War. By its nature, this circumstance has put special demands on all types of combat equipment used by the ground forces in order to ensure that they can carry on combat operations without interruption.

At present, the most stable and mobile vehicles are armored tracked vehicles of the tank type. However, full use of their striking power depends to a considerable extent on the combat and technical qualities of the wheeled vehicles of the ground forces.

Lately, in the press and at scientific conferences, methods of further development of wheeled combat equipment, and especially problems of creating an infantry combat vehicle have been widely discussed.

It is generally agreed that the combat vehicle must ensure that infantry can fight in coordination with tanks without having to dismount. As regards the design of such a vehicle, however, various opinions are expressed.

In this article we put forward our viewpoint regarding the prospects of creating wheeled combat vehicles for the ground forces.

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What requirements must wheeled combat vehicles really meet? Because they operate in troop battle formations under the very same conditions as tanks, their mobility (cross-country ability is included in the meaning here) should be as good as that of tanks. Moreover, wheeled combat vehicles must provide protection for personnel to a definite extent against firearms and the destructive factors of nuclear weapons.

Armored cars, i.e., armored wheeled vehicles, equipped with guns or machine guns, made their appearance in the armies of various countries at the beginning of the present century. The rudimentary design of armored cars in general during that period could not ensure that they had the necessary tactical-technical features, especially the ability to cross roadless terrain. In the following years, the technical and, consequently, the tactical qualities of armored cars improved. However, the rapid development of tanks, which combine great striking power with high cross-country ability, diverted attention for a long time from the development of wheeled combat vehicles. It was only during the Second World War, after the appearance of reliable cars with increased cross-country ability, that several countries again started to construct armored cars, but only for the limited purpose of tactical employment.

In our army it was wrongly considered for a comparatively long time that it was possible to create wheeled combat equipment by fitting ordinary cars with armor. This completely, and for a long time, undermined the idea of using wheeled combat vehicles. A glaring example of this approach is the BA-20 armored car, created by fitting an armored body to the chassis of the M-1 automobile, and which earned such an unfortunate reputation in the army at the beginning of the war.

The extensive development of mechanized troops and the need to move them rapidly from place to place for operational and tactical purposes caused the appearance of military combat vehicles of a new type -- armored personnel carriers, which

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have come into very extensive use in all the leading countries of the world since the Second World War. At the present time, considerable attention is being paid in several countries to working out new layouts and designs for armored personnel carriers.

In the USA, a number of wheeled armored personnel carriers are in the process of being developed and tested, including a heavy armored personnel carrier constructed in accordance with the so-called "Gor idea." This idea is based on the use of vehicles consisting of a one-axle prime mover and a one-axle trailer with driving wheels. The large size of the wheels ensures that these vehicles have a high cross-country ability, while the hinged coupling between the forward and rear parts enables them to turn in a small space.

The British Army is equipped with the "Humber" two-axle armored personnel carrier and the three-axled "Saracen." On the three-axle chassis of the "Saracen" armored personnel carrier several modified vehicles have been produced, including the "Saladin" armored car and the auxiliary vehicles "Salamander" and "Stalwart."

The French Army is equipped with wheeled and tracked armored personnel carriers. Of the wheeled type, the one of most interest is the four-axle "Panar" armored personnel carrier with a combat weight of 13.5 tons, which has fairly strong armor and is intended for transporting 15 persons. The layout of the armored carrier is an original one: the air-cooled engine of 200 hp is in the middle of the vehicle and the transmission has side distribution of power (bortovaya razdacha moshchnosti). The wheels of the second and third axles with prominent metal spuds (razvityy metallicheskiy gruntozatsep) are lowered to the ground when the vehicle has to move over difficult terrain. The "Panar EBR-75" armored car, equipped with guns and machine guns, produced on the same chassis.

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The West German Army is being equipped with a light two-axle wheeled "Unimog" armored personnel carrier with a combat weight of 7 tons, which has bulletproof armor plating and is intended to carry 4 or 5 persons. According to the requirements laid down by the West German Ministry of Defense, there are to be two types of armored personnel carriers in service: light - with a combat weight of 10 tons and carrying capacity for 5 persons, and heavy - with a combat weight of 15 tons and carrying capacity for 10 persons; the armor must provide frontal protection against bullets and shells up to 20 mm in caliber.

The direction which development of armored personnel carriers is taking abroad points to a trend to have them not only for the purpose of transporting infantry, but also in the role of combat vehicles on the battlefield.

From this viewpoint, the choice of the most efficient types of wheeled and tracked vehicles for combat use under various conditions now becomes a fairly acute problem. Until quite recently the opinion was held that for direct coordination with tanks, it was supposedly best to use tracked armored personnel carriers. But in doing so, as is known, two main difficulties arise. Firstly, a modern army requires tens of thousands of combat vehicles, and the provision of such expensive equipment is a heavy burden on the country's economy. Secondly, the reliability and durability of tracked vehicles, especially of their running gear, are still far from adequate.

For these reasons, greater attention is now being paid to introducing wheeled combat vehicles into the army. This is facilitated by the considerable improvement in their tactical-technical qualities, which has been achieved as a result of extensive tests. The latest wheeled combat vehicles have, in practice, just as good a cross-country ability as tanks, and at the same time have a number of advantages over tracked vehicles. These advantages are:

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— they can be turned out by the automobile industry, and this ensures the possibility of mass production, and at a comparatively small cost per vehicle;

— the increased reliability and durability of wheeled vehicles as compared with tracked ones, particularly their engine and transmission, which are 3 to 5 times more reliable and durable, and their running gear — 15 to 20 times;

— their greater (by 50 to 60 percent) speed and greater range;

— when their carrying capacity is the same, wheeled combat vehicles use 40 to 50 percent less fuel for carrying one soldier than tracked ones;

— the metal content of wheeled combat vehicles is 30 to 40 percent less;

— they make comparatively little noise when moving;

— they do less damage to roads.

Until recently, one of the most vulnerable parts of wheeled armored personnel carriers was their pneumatic tires, damage to which put the vehicle out of action. Now, however, the tubeless tire system (sistema tsentralnogo regulirovaniya vozdukha v shinakh) has increased the life of the vehicle on the battlefield to a considerable extent. Numerous tests have shown that thanks to this system tires are not put out of action even when hit by many bullets and the wheeled combat vehicle can continue to carry out its task. But this is, of course, not the only resolution to the problem of increasing tire life.

It is necessary to add that the armored personnel carriers developed in the postwar period and now in service do not meet modern battle conditions. They are only capable of "transporting" infantry because the infantry cannot fight from them without dismounting.

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The highly mobile operations of the present day, especially on ground contaminated by radioactive substances, make it necessary to develop a vehicle that can be used for waging combat together with attacking tanks.

On the basis of tactical, technical, and economic considerations let us analyze the basic requirements that a modern wheeled combat vehicle for ground forces must meet.

Protective characteristics and combat weight. The relationship between the protective characteristics of tanks and wheeled combat vehicles must be determined, firstly, by the nature of their tactical and operational employment, and, secondly, by considerations of technical expediency. It is essential to find a solution which would provide for the necessary degree of protection and ensure that the vehicle is highly mobile. The protective characteristics of a wheeled vehicle, determined by the thickness of the armor, are inferior to those of tanks; consequently, the reliability of wheeled combat vehicles must be increased not only by improving the armor protection, but also by making the vehicle more mobile.

The wheeled armored personnel carriers in service in the Soviet Army have only bulletproof armor 10 to 13 mm thick in the case of the hull front plates (lobovoy list) and 6 to 10 mm thick in the case of the hull side plates (bortovoy list). Such armor gives frontal protection for the vehicle against armor-piercing bullets of 7.62, 12.7, and 15 mm caliber at ranges of over 400 m. The side plates give protection against bullets of the above-mentioned calibers at ranges of 400 m when the angles of impact are 22 to 45°. Furthermore, it should be added that the majority of armored personnel carriers in service have bodies of the open type, made without taking into account the destructive effects of nuclear bursts.

In our opinion, the way in which wheeled combat vehicles are to be employed calls for strengthening the armor to afford protection against armor-piercing bullets from large-caliber machine-guns at all ranges when the angle of impact is $\pm 45^\circ$. Abroad there are wheeled combat vehicles which have frontal armor 40 mm thick, and side armor 16 mm thick, and this fully meets these requirements.

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An analysis of the weight data of a great number of the available wheeled combat vehicles shows that the distribution of weight is characterized by the following average indices. The armored body accounts for 20 to 30 percent of the total combat weight. The crew and personnel carried (desant) account for 15 to 20 percent, the engine mount 5 to 10 percent, the transmission 12 to 15 percent, the running gear 12 to 15 percent, and the armament and additional equipment 10 to 20 percent.

When bodies of an efficient kind are used, an increase in the thickness of the hull front plates to 30 to 40 mm and of the hull side plates to 12 to 15 mm will result in an increase of the proportion of the body weight of up to 40 to 50 percent, if the possibility of using armor made of the latest materials is not taken into consideration.

On an average, an increase in the thickness of armor protection by 1 mm leads to an increase in weight of 200 to 250 kg for vehicles weighing 5 to 7 tons and of 350 to 400 kg for vehicles weighing 10 to 12 tons. Consequently, an increase in the thickness of the armor by 1 mm raises the total weight of a wheeled combat vehicle by 3 to 3.5 percent. Bringing the thickness of armor plate up to dimensions affording protection against armor-piercing bullets of large-caliber machineguns at all ranges leads to an increase in the weight of light combat vehicles by 800 to 1,000 kg, and of medium ones by 1,200 to 1,600 kg., and this calls for a corresponding increase in the engine's power in order to retain the essential traction capability.

An increase in the thickness of the armor plates of the body improves at the same time its ability to resist the destruction effects of a nuclear burst.

The wheeled armored personnel carriers now in service suffer medium damage when they are at a distance of 1,000 m from ground zero of the burst of a warhead with a TNT equivalent of 30,000 tons. When such damage is done, the armored personnel carriers cannot continue to fulfil their allotted tasks. If the combat effectiveness of a wheeled combat vehicle capable of remaining in action at a distance of 1,000 m from ground zero of a burst is to be achieved, then the thickness of the armor and the toughness of a body of closed type must be such as to withstand the pressure of a shock wave equal to 0.8 kg/cm^2 . This

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means that the vehicle's body must have armor plates 25 to 35 mm thick.

In existing armored personnel carriers, the personnel carried and the crew will get the maximum permissible dose of radiation with the burst of a nuclear warhead with a yield of 30,000 tons when they are at a distance of 1,500 m from the ground zero of the burst. Any significant reduction of the safe distance involves a sharp increase in the thickness of the plates of the armored body. It is also possible to make use of special "lining" (podboy) for facing the inside of the body; this, however, leads to a considerable increase in weight and, furthermore, reduces the inside capacity of the body.

Under modern conditions, it is of special importance that wheeled vehicles should be able to move over contaminated terrain. Ground forces may encounter extensive zones of unbroken radioactive contamination. The level of radiation in them will reach 100 to 200 r/hour. The armored personnel carriers, which we have at our disposal, including those with closed-type bodies, are badly adapted for crossing such zones of contamination. It is impossible to achieve a sharp reduction in the radiation dose which the personnel carried and crew get, by increasing the speed with which wheeled combat vehicles move through contaminated zones. Reliable protection for the crew and the personnel carried can only be provided by a closed, hermetically sealed body, fitted with filtering and ventilating equipment and means for detecting radioactive elements and toxic substances. At the same time, one must have air conditioning (mikroklimaticheskoye usloviye) inside the vehicle's body so that human beings can remain there for a long time.

Everything connected with the improvement of the protective characteristics of a wheeled combat vehicle is limited by weight parameters. Up to the present time, there is no clear understanding of what the maximum weight of a wheeled combat vehicle can be. Many arguments are going on as to whether it is really possible to make a wheeled vehicle with armor protection which is not inferior to that of tanks.

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Basically, the weight of a wheeled combat vehicle is limited by the maximum load on each wheel; when the size of the wheel is satisfactory, the load must ensure a specific pressure at the point of contact between the wheel and the ground which is not greater than that of tanks. If we take the permissible diameter of a wheel as 1.5 m and the specific pressure as not more than 0.7 to 0.8 kg/cm², it can be calculated on the basis of experimental data that for the existing makes of tires the permissible load on them must not exceed 3,000 kg. Because a wheeled combat vehicle must be highly mobile, be of an acceptable size, and have not more than four axles, its maximum weight can be about 24 tons. The average thickness of the armor of a wheeled combat vehicle of such a weight, intended for 20 persons, can be up to 40 mm, and when intended for 10 persons - 70 mm. When armor of varying thicknesses is used, however, the thickness of the hull front plates can go up to 90 to 130 mm.

Carrying capacity and specific indices. A wheeled combat vehicle's efficient carrying capacity is determined jointly by tactical, technical, and economic factors.

In the first place, one must take into consideration the way in which wheeled combat vehicles are to be used in tank and motorized rifle units. It is obvious that the number of wheeled combat vehicles in tank units must be such as to ensure that all the motorized infantry can go into the attack at the same time as the tanks. Moreover, one must be guided by the consideration that for convenience of control in battle, there should only be a single subunit (for instance, a squad ((otdeleniye))) inside the vehicle. Evidently, the most advisable type for tank units, taking into account the establishment strength of motorized infantry in them, is the combat vehicle intended for carrying one squad of motorized infantry. Such an infantry combat vehicle can be employed successfully for carrying out combat tasks in combined attacks with tanks, for conducting reconnaissance, for protection duties, for transporting communications officers into combat, and for other forms of combat activity. As for the construction of the running gear, such a vehicle can also be of the wheeled-tracked type, where the engine for the tracked gear is an auxiliary one and is switched on only when broken ground has to be crossed.

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For various military purposes, it is desirable to have a combat vehicle of large carrying capacity, for example, for two squads. This would allow one to reduce the length of columns on the move and would simultaneously create the necessary conditions for dispersal. A vehicle of such a type could be used successfully as a control vehicle in large units and formations, and also as an ambulance.

From the technical viewpoint, too, it is advisable to increase the carrying capacity of wheeled vehicles to certain limits, because an increase in the capacity has a favorable effect on a whole number of technical-economical indices. For instance, there is a decrease in the specific metal content, i.e., the relation of the actual weight of the vehicle to the crew and personnel strength carried. When the capacity is 5 to 7 persons, the expenditure of metal per soldier amounts to 1,000 to 1,200 kg, whereas for 16 to 22 persons it decreases to 350 to 500 kg. This ratio can vary depending on the armor, the armament system, etc. For instance, the high specific weight of the French "Panar" armored personnel carrier (800 kg per man) is due to its comparatively strong armor.

An analysis of the weight parameters of existing armored personnel carriers shows that the actual weight of the vehicle does not increase in direct proportion to an increase in carrying capacity. On an average, it can be reckoned that when the capacity is increased three times, then the weight will increase about twice.

An increase in carrying capacity also has a favorable effect on such indices as the specific length and the specific over-all bulk. In combat vehicles for 3 to 5 persons, the specific length is equal to 1 to 1.1 m/person, whereas when the capacity is 20 to 22 persons, this figure falls to 0.3 to 0.35 m/person. In an efficiently designed wheeled combat vehicle, it can be reckoned that when the attacking force (desant) is carried in two rows, the specific length approaches half the width of the seating area.

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When the vehicle's carrying capacity is increased, its over-all length also increases, and this leads to a deterioration of the parameters characterizing the vehicle's mobility. Consequently, from the technical standpoint there are limitations on the efficient carrying capacity, which is determined by the permissible over-all length dimensions of the vehicle. Designing experience shows that the maximum over-all length of a vehicle falls within 7 to 7.5 m and its maximum capacity is 20 to 25 persons.

In determining the most efficient carrying capacity from the economic standpoint, it must be borne in mind that when the capacity is increased, the specific cost per soldier decreases. If a comparison is drawn as an example between the cost of two combat vehicles for 10 persons, each weighing 5 tons, and one vehicle which can carry 20 persons, then the cost of the latter will be less, because there will be fewer engines and other basic parts. Furthermore, the weight of one wheeled combat vehicle of large carrying capacity will be 20 to 30 percent less than the total weight of two military vehicles with the same capacity. This makes the difference in the economic indices even greater.

Armament. Until recently the armored personnel carriers in the Soviet Army either had no organic armament (BRDM) or were armed with 7.62 mm machineguns. Such a state of affairs does not meet modern requirements. If one looks upon the wheeled vehicle as a fighting one, capable of engaging enemy personnel and of delivering strikes against enemy objectives of armored equipment, it is essential to strengthen its armament. To fulfil the allotted tasks, in our view wheeled combat vehicles must have as their main organic armament guided antitank missiles to combat enemy tanks, as well as large-caliber machineguns or small-caliber automatic guns. However, in order to mount armament of this kind, the over-all height of the vehicle would have to be considerably increased for the installation of a turret, in which the armament is mounted and the gunner is located. Therefore, the most efficient solution should be considered that of using a revolving turret of small over-all dimensions simply for holding the armament and the appropriate sighting apparatus, while control of the armament and conducting of fire must be by remote control.

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Another solution can be that of installing a special turret of the usual size, but which could be lowered when it is necessary to reduce the over-all height of the vehicle..

Engine and dynamic qualities (dinamicheskoye kachestvo).
The engine determines the dynamic qualities of the wheeled combat vehicle, and the position of the engine - its layout. Up to the present, in our armored personnel carriers use is being made of truck engines of somewhat increased power. Their specific power is 12 to 18 hp/t, the second figure applying to the latest vehicles. The amount of specific power determines the vehicle's maximum speed and, consequently, influences the vehicle's average speeds and acceleration. If we assume that modern wheeled combat vehicles should have a maximum speed of 100 kph, then the specific power must fall within the range of from 18 hp/t for heavy vehicles (combat weight 20 tons) up to 27 hp/t for light vehicles (combat weight 5 tons). Such power fully ensures good acceleration and average speeds of 50 kph.

In view of the lack of automobile engines of high power, two engines of medium power are sometimes installed in order to improve the vehicle's dynamic qualities. This is a solution born of necessity. It is not an efficient one either from the economic standpoint or that of the layout. In this case steering becomes more complicated, and the amount of technical servicing that has to be done increases. The only advantage of such a solution lies in some increase in the vehicle's life, because in case one of the engines is damaged or falls into disrepair, the vehicle can continue to move.

To create a combat vehicle with the optimum dynamic and design qualities, it is necessary to develop special engines.

The fact that engines need different kinds of fuel presents a serious problem. The resolution of this problem would make it possible when necessary to use a single kind of fuel for wheeled combat vehicles and tanks and would simplify problems of supply and the refuelling of vehicles operating in the depth of the enemy's defense.

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It must be added that in foreign armies multifuel engines are in practical use. For instance, all West German military vehicles which have a tonnage of 5 tons and more are equipped with multifuel engines. For vehicles of lesser tonnage, such engines are in the process of being developed. In the USA the firm "Continental" has built a multifuel engine of 140 to 180 hp which is intended for installation in wheeled vehicles. In France, a series of multifuel engines in power ranges from 60 to 700 hp has been developed.

In view of the modern demand that wheeled combat vehicles should be amphibious, one must reckon that in the future the engine must be located at the rear, while the driving compartment and the compartment for the attacking force must be in the central part of the vehicle's body. Such a layout ensures a stable stern-heaviness (stabilnyy different na kormu) because a varying load (the attacking force) in this case does not change the position of the center of gravity along the vehicle's length to any great extent. When the engine is at the rear, if necessary the attacking force can leave the vehicle safely over the side through open protective hatches on the armored roof.

Mobility and cross-country ability. As has already been mentioned, the mobility and cross-country ability of wheeled combat vehicles must not be inferior to that of the tanks with which they cooperate. This means that the vehicle must move with confidence over soft ground and broken country and, like tanks, must be able to overcome various obstacles.

Can such requirements be met in the light of the modern development of wheeled vehicles? At the present time world industry is solving this problem in two ways. Firstly, it is being done by bringing the traditional designs of wheeled, mainly four-axle, vehicles to a high state of perfection, and secondly, by working out designs involving basically new layouts, which ensure high qualitative indices, as for instance "Hower," "Metrak," and others. From the standpoint of mobility and cross-country ability, some models of wheeled equipment now not only come up to but surpass the indices of tracked vehicles.

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A modern four-axle vehicle can ensure a specific pressure at the point of contact between the wheel and the ground of 0.7 to 0.8 kg/cm² and even less, and this enables the vehicle to move reliably behind tanks over soft ground, especially if the track of the wheeled vehicle corresponds to that of the tank.

A wheeled four-axle vehicle can cross pits and trenches on the battlefield up to 2.5 m in width. The upward and downward slopes that it can cope with are the same as those surmountable by tanks. The ratio of weight to bulk in wheeled combat vehicles makes their conversion to amphibious vehicles a comparatively simple matter.

The only way in which wheeled vehicles have proved inferior until now to tracked ones is in their turning ability. A wheeled vehicle requires a considerable space in which to turn, and, in order to eliminate this shortcoming, use has been made of a large number of wheels which can be steered or of two steering positions, and sometimes a combination of the two. Such a solution has complicated the design, and it still has not done away altogether with the difference in turning ability between wheeled and tracked vehicles. At the present time, various methods of turning wheeled vehicles are being used: either like those in tanks ("Metrak," "Terrapin") or in accordance with the principle used in "Goer" vehicles.

In conclusion, it can be stated that in order to ensure successful operations by ground forces in highly mobile operations of short duration, it is essential to have new wheeled combat equipment which should be developed mainly on the lines given by us above. The present level of industrial production in the Soviet Union, and in particular of the automobile and tractor industry, allows a start to be made now to create special wheeled combat vehicles for the ground forces.

It is necessary to bear in mind the possibility of developing in the future combat vehicles of other designs, for instance air-cushion vehicles. The problems connected with their development merit separate examination.

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COUNTRY USSR

SUBJECT MILITARY THOUGHT (SECRET). "New
Developments in the Combat Use
of the Air Forces of a Theater
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Initial Period of a War"
by Colonel A. Konstantinov

DATE OF INFO August 1961

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Following is a verbatim translation of an article entitled "New Developments in the Combat Use of the Air Forces of a Theater of Military Operations in the Initial Period of a War" which was written by Colonel A. Konstantinov.

This article appeared in Issue 5 (60) of 1961 of a special version of the Soviet journal Military Thought which is classified SECRET by the Soviets and is published irregularly. Issue 5 (60) was sent to press on 25 August 1961. [Redacted] contained the Table of Contents for this issue.

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are assumed to
use nuclear weapons!

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In Foreign Armies

New Developments in the Combat Use of
the Air Forces of a Theater of Military Operations

In the Initial Period of a War

(According to American Views)

by

Colonel A. Konstantinov

For a long time after the end of the Second World War the American command looked upon the use of air forces in a theater of operations and the strikes of strategic aviation against objectives in the deep rear as operations aimed at performing three basic tasks: winning superiority in the air, isolating the region of combat operations, and providing direct air support.

At the same time the American command held that successful combat use of aircraft and ground troops in a theater of military operations depends primarily on the outcome of the battle for air superiority. This viewpoint was also corroborated after the Korean War.

Although US Air Force manuals allow the proper sequence and distribution of forces for the performance of these tasks to be determined by the combat situation, nevertheless, experience gained from exercises and maneuvers indicates that the main consideration should be given to gaining air superiority. The largest number of aircraft resources was usually allotted for the performance of this very task. Concentration of any Air Force effort to perform any other tasks was permitted only after air superiority was attained. The entire combat training experience of the American Air Force up to 1957 indisputably corroborates this conclusion.

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The air forces of the theaters of military operations were organized in accordance with such views. They included one or several tactical air commands and an air defense command.

The tactical aviation command composed of two or more tactical air armies, bomber air army, reconnaissance units and units of materiel and technical support, was designated for carrying out joint operations with a group of armies and independent air operations. To a considerable degree, the complement of an air force of a theater of military operations depended on the way in which aviation would be used in combat. Formerly the basic use of an air force in a theater was to deliver massed strikes by large groups of light bombers under heavy cover of fighter planes. In this the percentage of aircraft delivering nuclear weapons was not large. They were concealed by the overall formation and proceeded to target in the unified combat formation of the bomber groups. Breaking through the enemy's anti-air defense, the basic weapon of which was fighters, was accomplished at intermediate and high altitudes, along one or several axes while taking certain measures to set up active and passive jamming of the enemy's radiotechnical means. However, these measures could not insure safe breakthrough of the PVO for the bomber groups. Therefore, side by side with special combat operations to neutralize the PVO means, provision was made for a "breakthrough by force": this necessitated a heavy cover of fighter planes for the groups of light bombers.

Target bombing was carried out primarily from horizontal flight, and if nuclear warheads were used, then it was only from horizontal and high-altitude flights.

Mixed groups of fighters and light bombers were unwieldy and difficult combat formations to control, and their use depended a great deal on meteorological conditions.

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The presence of a large number of light bombers within the complement of the air force of a theater of military operations made it necessary to expend a considerable amount of fighter aviation in support of the bomber operations and as a whole this lowered the combat capabilities of the air force of a theater.

An analysis of combat training of recent years and a comparison between the methods of using tactical aviation in the years 1958 to 1960 and the methods used in the middle 50's indicate that important changes have occurred in this field. The main cause for this is the desire to find such methods for combat use of the new weapons of armed conflict which would best coincide with the aggressive schemes of the American imperialists and which would resolve the outcome of the war in the shortest possible time.

Under modern conditions in the opinion of the American command, only gaining air superiority is not sufficient to support the operations of the armed forces of a theater of military operations; moreover, it does not insure nuclear superiority over the enemy or his defeat. Therefore beginning in 1958 all exercises and maneuvers began to put the main emphasis not on gaining air superiority, but on gaining nuclear supremacy in the theaters of military operations. Tactical aviation, as a part of the air force, also participates in the effort to accomplish this task.

This new task also includes winning air superiority something which is still considered the basic task of the air forces. "The importance of this (gaining air superiority--A.K.) has grown and will continue to grow in proportion to the progress in the field of nuclear physics and aerospace (vozdušno-kosmicheskoye prostranstvo) science."¹

1. The US Air Force Basic Doctrine (Aerospace doctrine) Manual of the US Air Force AFM 1-2, published by the GRU, General Staff, 1960, page 17 page 10 in original 7.

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Thus, although the earlier military doctrine of the USA considered that victory in a war depended on winning air superiority, now it is felt that victory in war is unattainable without first winning supremacy in the aerospace.

In theaters of military operations aerospace superiority is attained by concentrating the main efforts on the destruction of piloted and pilotless means of delivering nuclear weapons and destruction of nuclear weapon supplies, missile bases, and airfields.

The new views of USA and NATO commands regarding the conduct of air operations in military theaters were particularly evident in the large-scale air maneuvers "Full Play" (1958), the 1959 spring maneuvers, and the 1960 fall exercises.

As far as aircraft are concerned, the main substance of these exercises were air operations of tactical aviation to win nuclear supremacy in order to seize the strategic initiative, disrupt industry, neutralize the nuclear potential of the enemy in the theater of military operations, lower his offensive capabilities and disorganize military control, all of which, in the opinion of the American command, should create favorable conditions for operations by the ground troops.

In contrast to preceding exercises, the 1958 to 1960 maneuvers were carried out simultaneously in all European theaters of military operations and apparently were organized along a single plan, which provided for operations by strategic weapons of attack. Operations by tactical aviation of a military theater were carried out in support of the ground troops and were very closely coordinated with operations by naval aviation as to time and objectives. For example, in one of the exercises in 1959 conducted in the

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South European Theater of Military Operations, the participants of a nuclear "counterblow" were three squadrons of tactical fighters and subunits of US Naval aviation from an aviation strike large unit of the 6th Fleet. During one day this aviation grouping, composed of 150 aircraft, delivered more than 110 nuclear strikes against the enemy objectives and troops in the operational depth and coastal areas. In this, the stationary objectives designated for destruction by nuclear weapons, and the time for delivering strikes against them, were distributed in advance between the tactical and the carrier-based aviation. Such mobile objectives as troop groupings and concentrations of combat materiel were distributed among tactical and carrier-based aviation during combat operations, as a coordination of efforts. Thus, coordination between tactical and carrier-based aviation was constantly effected in the period of preparation as well as during combat operations.

Considerable importance was also attached to coordinating the operations of tactical and carrier-based aviation with operations of units of strategic aviation; in the overall war plan these operations are considered to be interdependent.

Air operations, conducted against the background of the initial period of a war, were characterized by the maximum possible effort of tactical aviation, high speeds in nuclear strike delivery, broad scope, great depth, and comparatively short duration. Thus, the depth of air operations by tactical aviation at the 1958 maneuvers reached 500 to 600 km, and at the 1959 to 1960 maneuvers--900 to 1000 km, i.e., they were conducted to the entire depth of the theaters of military operations.

The duration of the operations was from three to ten days, nuclear strikes were delivered at

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high speed, and aircraft sorties took place at the rate of three during the first 24-hour period and one and a half during the second and third 24-hour periods.

In operations to win nuclear supremacy and air superiority in the theaters of military operations, and at the 1959 to 1960 exercises, the greatest number of nuclear strikes were delivered during the first 72 hours.

Tactical aviation was assigned the following tasks: ---winning nuclear supremacy and air superiority in a theater of military operations by delivering massed strikes by nuclear and conventional weapons against the enemy's nuclear missile weapons; ---neutralizing the enemy's radiotechnical means, which would have insured his control of aviation, missiles, and ground troops; ---destroying large enemy groupings of troops and materiel in places of concentration and on the march; ---preventing the movement of reserves and materiel-technical means by destroying important railroad centers, road junctions, and bridges and also creating nuclear barriers along the main operational axes; ---seeking and working out the most effective methods of breaking through the enemy's antiair defense and delivering strikes by nuclear and conventional weapons of destruction; ---conducting uninterrupted aerial reconnaissance in order to expose primarily the enemy's nuclear/missile weapons; herein, the tasks in reconnaissance of these weapons were assigned not only to the organic reconnaissance aircraft, but to all the crews participating in combat operations.

Used for the fulfilment of the task to win nuclear supremacy and air superiority in a theater of military operations were the largest number of aircraft sorties and the larger portion (from 50 to 85 percent) of nuclear warheads. During the

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1959 maneuvers in the European Theater of war, 700 nuclear strikes were delivered 610 of which were delivered by tactical and carrier-based aviation, while at the 1960 maneuvers the number of nuclear strikes went up to approximately 1000

Tactical aviation was delivering strikes by nuclear and conventional weapons against airfields, missile launch sites, communications centers, anti-air defense objectives, and troops and equipment in the operational rear area. Objectives at a depth up to 100 km were neutralized by the combined efforts of nuclear missile weapons of the ground troops and tactical aviation.

Large amounts of nuclear warheads were used also to destroy airfields and neutralize nuclear missile weapons. Although during the "Carte Blanche" maneuvers in 1955 approximately 45 percent of nuclear bombs were used to destroy airfields, mainly by strategic aviation, in the 1958 "Iron Play" maneuver for the same purpose not less than 70 percent of nuclear charges were used by the tactical aviation of one formation alone.

Thus, a constant increase in the amount of nuclear warheads assigned by the U.S. command to achieve the goals of the initial operations in a theater of military operations appears to be the typical tendency of combat employment of tactical aviation during the initial period of a war. Nuclear weapons, which all tactical fighter-bombers constituting the main strength of the aviation of a theater of war are now capable of employing, have become the basis of the combat power of tactical aviation. To achieve a more complete utilization of tactical aviation's combat power in air-nuclear operations, the US Air Force Command has altered the methods of its combat employment in a

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theater of military operations. In contrast to the middle-50's, the main emphasis in combat training now is placed on the employment of small groups of individual tactical fighters from maximum altitudes as well as minimum (250 to 350 m) altitudes within the entire radius of operation.

Operations at low altitudes were first introduced in 1957 and quickly found broad acceptance. In the "Full Play" maneuvers, operating at low altitudes were as many as 25 percent and in the 19.9 maneuvers - 40 percent of the air crews of the air force formations in the Central European Theater of Military Operations

A breakthrough of the anti-air defense can now be accomplished on a broad front at any altitude and from different directions by small groups and individual aircraft with a certain neutralization of the radiotechnical means of the PVO. In the opinion of the American command, to a large degree this reduces the capability for a countermeasure by the missile and tube weapons of the PVO, and approaching targets at low altitudes almost entirely excludes the interception of attacking aircraft by fighters.

The concentrated nature of aviation strikes not only is preserved, but it may even be increased with operations by small groups and individual aircraft by way of careful planning and simultaneous operations against a large number of objectives situated on a broad front and at considerable depth.

Mastery of bombing from low altitudes (toss-bombing, vertical climb bombing, and "over-the-shoulder" bombing) has increased accuracy, reduced expenditure of bombs, increased the element of tactical surprise, and reduced the dependence of tactical fighters upon meteorological conditions.

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At the present time, all tactical fighters are equipped with radiotechnical systems for bombing from low altitudes.

In contrast to the middle 50's, the organization of coordination in tactical aviation has been simplified, and the need to assign special fighter aviation units to cover tactical fighters and to organize coordination between them has been eliminated. The task of organizing cover for delivery aircraft is now accomplished within a tactical fighter air wing. The American command is striving to achieve maximum similarity between the operational tactics of delivery aircraft using conventional weapons of destruction and those of combat support aircraft.

Together with the search for and improvement of methods for their combat use, a constant search is conducted for the most advisable organizational forms for the air forces in a theater of military operations.

At the present time, the air forces of a theater of military operations is considered a tactical aviation formation intended to conduct independent air operations and joint actions with ground troops. They are regarded by the US and NATO command as the main striking force of a theater's armed forces and a force capable of defending in coordination with other weapons the troops and objectives in a theater of military operations from enemy air strikes.

A certain reduction in the combat composition of the air force in a theater of military operations as a result of the elimination of air bombardment armies, as well as the fact that part of the tasks for direct aircraft support and isolation of an area of military operations, previously carried out only by aircraft, has been transferred

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Still in existence at the present time in the European theaters of military operations are unified tactical aviation commands of NATO, which, by their composition, mission, and organization are quite similar to a US tactical air army*

According to American views, the tactical air army, designated for conducting offensive operations in coordination with one army group may have in its composition, depending on the significance of the theater of military operations, 8 to 12 air wings (32 to 48 air squadrons) of tactical fighter aircraft, i.e., 512 to 768 planes; 3 to 4 air wings (12 to 16 air squadrons) of air defense fighters, i.e., 225 to 300 planes; 3 to 4 air wings (12 to 16 air squadrons) of reconnaissance planes, i.e., 216 to 288 planes; and one wing of cruise missiles.

In other words, the composition of one tactical air army may include 14 to 20 air wings (53 to 76 air squadrons) with a total number of 953 to 1356 combat line (raschetnyy) aircraft of various designations, not taking into account reserve aircraft, and one wing of cruise missiles (18 to 36 launch pads).

When comparing the composition of a tactical air army with the actually existing combat composition of the unified tactical aviation commands of NATO in Europe, one cannot help but notice that their compositions are approximately the same. In the Central European Theater of Military Operations, the 4th Unified Tactical Aviation Command (OTAK) consists of 65 air squadrons with a total of over 1200 aircraft of various types, including approximately 750 light

*In some American works dealing with US and NATO air forces, the unified tactical commands are called tactical air aviation armies.

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to the nuclear/missile weapons of the ground troops but the combat power of tactical aviation has not been reduced. On the contrary, equipping tactical aviation with more modern multipurpose tactical fighters with powerful weapons, the best tactical-technical features, and capable of carrying nuclear weapons has increased its combat capabilities, simplified the organization of combat operations, and raised its combat readiness.

Organizationally, the air force of a theater of military operations may consist of one or several tactical air armies, air defense formations, airborne landing and air transport means, and organs of materiel-technical support

According to American views, the grouping of the air force in a theater of military operations, and the number and composition of tactical air armies, depend on the significance of the theater in the overall war plan, the availability of formations of ground troops, the composition of forces, the expected enemy countermeasure, and the conditions concerning their bases.

Taking all this into account, American manuals recommend that in organizing combat operations the ratio used should be "one tactical air army for one army group"*; this army is responsible for an area of 480 km along the front, 800 km in the depth of disposition of its own troops, and within the entire operational radius of aircraft, as well as within the full range of tactical cruise missiles over enemy territory.

*Joint Combat Operations of the Army and the Air Force, published by the Chief Intelligence Directorate (GRU) of the General Staff in 1958, and Manual of the U.S. 17th Air Force, 1960

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bombers and tactical fighters, over 350 air defense fighters, and over 100 reconnaissance planes. Another unified tactical aviation command in the same theater of military operations has only approximately 1000 aircraft.

Thus, it may be considered that in regard to its combat and numerical strength a US tactical air army is equivalent to a NATO unified tactical aviation command. This similarity is even greater because the armament is almost the same and also because during combat training the tasks of a tactical air army and of a unified tactical aviation command are determined by American plans and regulations which are completely shared by the NATO command.

Let us examine briefly the capabilities of one tactical air army of the aforementioned composition (14 to 20 air wings, i.e., 953 to 1356 planes) to deliver nuclear strikes.

Tactical fighters alone possess the technical capabilities of carrying nuclear weapons. Consequently between 8 and 12 air wings with a total of 512 to 768 planes may be assigned within a tactical air army to deliver strikes by nuclear weapons.

However, exercises that have been conducted prove that it is not possible to have the entire composition of a tactical air army in a condition of flight readiness because of a shortage of personnel and unserviceability of materiel. By analogy with strategic aviation and judging by the number of tactical aviation planes used for the initial strike in exercises in a theater of military operations, it may be said with confidence that not more than 70 percent of authorized combat strength (not counting reserve aircraft) will be in a condition of readiness to

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conduct the opening operations of the initial period of a war.

In other words, one tactical air army, with the availability of an adequate number of nuclear weapons, will possess potential capabilities to deliver 360 to 540 strikes.

To conduct the opening operations to gain nuclear supremacy during the initial period of a war, a tactical air army in the main theater of military operations may be reinforced by two or three wings from the reserve of the air force commander in Europe and by transferring to Europe some operational strike large units of tactical aviation from the continental US.

In this connection it must be said that the air force commander in Europe has at his disposal at all times a considerable reserve of tactical aviation. This is the 3rd Air Army consisting of five air wings based in Great Britain, and air squadrons of tactical aviation, based temporarily in Europe as part of the program of familiarization with the theater. The number of squadrons simultaneously familiarizing themselves with the European Theater is constantly growing. For example, engaged in familiarization with the theater were two squadrons in 1957, four in 1958, and twelve in 1959. Units of the 3rd Air Army and the squadrons engaged in the familiarization program are kept in a state of high combat readiness, and without doubt will participate in the opening air operations in the theater of military operations.

Reinforcement of a tactical air army by two or three air wings of tactical fighters would augment its combat composition by 128 to 192 planes and bring its strength up to 640 to 960 tactical fighters. Taking into consideration that the

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average rate of readiness for materiel and personnel is 70 percent, one tactical air army with the reinforcement means will have from 450 to 670 plane-carriers of nuclear weapons, and one wing of tactical cruise missiles.

However, of this number even with an adequate supply of nuclear weapons not all of these planes will be used but only as many as there are well-trained crews, which, according to British information, constitute one third of the flight personnel.*

Thus, a tactical air army of the above-mentioned composition may deliver 120 to 225 nuclear strikes simultaneously or within a short period of time (during one sortie).

At the same time, it should be taken into account that in order to deliver a maximum possible number of nuclear strikes in the opening operations of the initial period of a war, the well-trained crews representing the other one third of the personnel may also be used. In this case, the capabilities of a tactical air army would increase and make the number of nuclear strikes delivered during one sortie - 300 to 450. This number of nuclear strikes may be increased by adding one wing of tactical cruise missiles, which is capable of carrying out 35 launchings of "Matador" missiles and of over 100 "Mace" missiles.

When comparing the actually existing groupings of tactical aviation in the European Theater of War with the amount of tactical aviation considered necessary by the American command to conduct the early operations of the initial period of a war in a theater of military operations, one cannot help but notice that in the main Central

*"Flight," April 8, 1960.

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European Theater of Military Operations this amount will also be almost the same.

The most important fact is that there is no substantial difference between the number of actually existing aircraft with potential capabilities of nuclear weapon carriers and the number of aircraft required, according to American views, to conduct the early air-nuclear operations. In the opinion of the Americans, the air force of a theater of military operations which is designated for the conduct of offensive operations in coordination with two army groups existing at the present time in the Central European Theater of Military Operations, may have two tactical air armies included in its composition.

Depending on the situation, its striking nucleus may consist of 18 to 21 air wings of tactical fighters and one or two wings of tactical cruise missiles. Besides this, the air force of a theater of military operations may be reinforced by 1 to 3 wings of tactical fighters. Thus, the total strength of the air force of a theater of military operations, including reinforcements, may consist of 19 to 24 air wings of tactical fighters or 1,216 to 1,536 delivery aircraft. If one calculates that 70 percent will be combat ready, then the number of delivery planes will be 850 to 1075 aircraft. Apparently 30 to 35 percent of this complement will be prepared to use nuclear weapons, and this will comprise 290 to 360 crews.

As is known, the air force of the Central European Theater of Military Operations is composed of two unified tactical air commands (2nd and 4th Unified Tactical Air Commands - OTAK), the striking nucleus of which is composed of 1,100 light bombers and tactical fighters, possessing the technical capabilities of delivery aircraft, and one wing of tactical cruise missiles

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If one calculates that 70 percent will be combat ready, then the number of aircraft technically capable of carrying nuclear weapons is about 770; 30 to 35 percent of the crews or 230 to 270 aircraft will use nuclear weapons.

Consequently, the air forces grouping now actually in existence in the Central European Theater of Military Operations possesses without further reinforcement almost the strength which, according to the views of the US command, should be used for the air nuclear operations in the theater.

This is confirmed by the experience of the 1959 large spring maneuvers in the European Theater of War, where the opening air force operations in the theaters of military operations began without any substantial regrouping of aircraft, while in the Central European Theater of Military Operations, no regrouping of aircraft was conducted at all before the beginning of combat operations.

At the same time, the US and NATO command, placing great hopes on the opening air-nuclear operations of the initial period of a war in general and on the operation of tactical aviation in particular, does not exclude an augmentation in the strength of an aircraft grouping by means of a covert maneuver. For example, the prearranged combat complement for conducting the opening operations during the initial period of a war in the European theaters for the "Full Play" air maneuvers was set at 4,000 aircraft. To augment the force of the strikes, this complement was provisionally reinforced by 900 aircraft from British units based in Great Britain, Cyprus and Malta and carrier-based aircraft from the US 6th Fleet.

Therefore, in assessing an air grouping and its capabilities to deliver nuclear strikes with aircraft in the Central European Theater of Military

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Operations, one should also keep in mind the capabilities of the US 6th Fleet's air strike large unit, units of the 3rd Air Army based in Great Britain, which, in the majority of exercises, cooperate with the air forces of the Central European Theater of Military Operations, as well as British tactical aviation from Cyprus and Malta.

Based on an analysis of the exercises which were held, it can be assumed that the number of aircraft possessing potential capabilities to deliver nuclear strikes in the Central European Theater of Military Operations can be increased by 200 to 250 aircraft from units of the US Navy's carrier-based aviation and the 3rd Air Army and will comprise about 1300 to 1350 aircraft.

Considerably smaller air groupings than in the Central European Theater of Military Operations have been created in the remaining European theaters of military operations in accordance with the role assigned to this theater in the overall war plan. In the South European Theater of Military Operations two unified tactical air commands (the 5th and 6th Unified Tactical Air Commands) with a total strength of about 1,000 aircraft of various designations have been deployed. In the North European Theater of Military Operation the air grouping is composed of two Norwegian and one Danish tactical air command with a total of about 400 various aircraft.

In all, the combined NATO air forces in the European Theater of War have more than 3,600 aircraft of various designations and more than 30 mounts to launch cruise missiles.

Thus, viewing the Central European Theater of Military Operations as the main theater, the US and NATO command is striving to create there an air force grouping which will correspond to the greatest extent possible to their views on the initial

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period of a war because it is considered that there will be no time to deploy an air force under modern conditions and that they will have to wage war with the forces and means already deployed in peacetime.

The principal shortcoming in using tactical aviation in a theater of military operations which shows to a significant degree the unsoundness of US military plans, lies in the dependence of the theater's air forces on permanent airfields, which are well-known and easily destroyed targets. Therefore, the imperialists have no real capabilities to achieve success in a war against a strong enemy equipped with nuclear/missile weapons and modern aircraft.

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