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CENTRAL INTELLIGENCE AGENCY
WASHINGTON, D.C. 20505

23 December 1975

MEMORANDUM FOR: The Director of Central Intelligence

SUBJECT : MILITARY THOUGHT (USSR): Three Years of Combat
Against American Aviation by the Air Defense
and Air Forces of the Democratic Republic of
Vietnam

1. The enclosed Intelligence Information Special Report is part of a series now in preparation based on the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought'. This article is a general review of the experience of North Vietnamese combat against US air forces from 1965 to late 1967, which the author relates to North Vietnamese and Soviet air defense thinking. The author examines the US aircraft, weapons and tactics involved, as well as North Vietnamese air defense capabilities, citing such problems as the organization of radar reconnaissance and warning, the negative influence of Chinese advisers on the effectiveness of surface-to-air missile activity, and shortcomings in the command and guidance of fighter aviation. The general conclusion of the article is that of the three available air defense means, antiaircraft artillery was the most effective in terms of aircraft shot down. This article appeared in Issue No. 1 (83) for 1968.

2. Because the source of this report is extremely sensitive, this document should be handled on a strict need-to-know basis within recipient agencies. For ease of reference, reports from this publication have been assigned

William E. Nelson
Deputy Director for Operations

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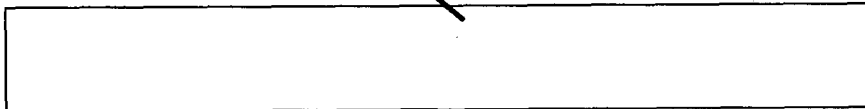
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Intelligence Information Special Report

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COUNTRY USSR



DATE OF INFO. Early 1968

DATE 23 December 1975

SUBJECT

MILITARY THOUGHT (USSR): Three Years of Combat Against American Aviation by the Air Defense and Air Forces of the Democratic Republic of Vietnam

SOURCE Documentary

Summary:

The following report is a translation from Russian of an article which appeared in Issue No. 1 (83) for 1968 of the SECRET USSR Ministry of Defense publication Collection of Articles of the Journal 'Military Thought'. The author of this article is General-Mayor of Artillery M. Naumenko. This article is a general review of the experience of North Vietnamese combat against US air forces from 1965 to late 1967, which the author relates to North Vietnamese and Soviet air defense thinking. The author examines the US aircraft, weapons and tactics involved, as well as North Vietnamese air defense capabilities, citing such problems as the organization of radar reconnaissance and warning, the negative influence of Chinese advisers on the effectiveness of surface-to-air missile activity, and shortcomings in the command and guidance of fighter aviation. The general conclusion of the article is that of the three available air defense means, antiaircraft artillery was the most effective in terms of aircraft shot down.

End of Summary

Comment:



The articles to which it refers are: "Combat Actions of Air Defense Troops and the Air Forces of the Democratic Republic of Vietnam", by Colonel A. Gryaznov and "Features of the Combat Employment of SAM Troops by the Vietnamese People's Army" by General-Leytenant of Artillery S. Vikhor The SECRET version of Military Thought was published three times annually and was distributed down to the level of division commander. It reportedly ceased publication at the end of 1970.

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Three Years of Combat Against American Aviation
by the Air Defense and Air Forces of the Democratic Republic
of Vietnam

by
General-Mayor of Artillery M. Naumenko

The third year of the barbaric air war unleashed by the US imperialists against the Democratic Republic of Vietnam (DRV) is coming to an end. During this period US aviation, having flown more than 128,000 missions over the territory of the DRV, has subjected hundreds of North Vietnamese towns and villages to air strikes, destroyed many industrial and agricultural installations, and knocked out many of the most important transportation lines and structures of a military nature. The bombings have claimed numerous victims among the peaceful inhabitants and among army and navy personnel.

But the American aggressors are encountering ever-increasing resistance on the part of the Vietnamese people. The Vietnamese People's Army, its air defense and air forces have inflicted, and continue to inflict, considerable losses on US aviation. According to official data of the Information Agency of the DRV, in the three years of the war (as of 1 December 1967), more than 2,580 American aircraft have been destroyed. During combat actions the forms and methods of organizing and conducting air defense have been improved, and the air defense forces and the air forces of the DRV have gained considerable experience in combating a powerful, technically equipped air enemy. This article will attempt to summarize the experience of combating American aviation in Vietnam, bearing in mind that a number of works on this subject already have been published in the Collection of Articles of the Journal 'Military Thought'.*

* * *

The aviation grouping formed by the Americans in Southeast Asia includes units and large units of strategic, tactical, military transport aviation and naval aviation, as well as units and subunits of army aviation from the American and South Vietnamese ground forces. The basis of this grouping is tactical and carrier aviation, which constitutes 30 to 35 percent of all aviation forces stationed here and up to 80 percent of combat aviation.

*Collection of Articles of the Journal 'Military Thought', No. 2 (81) and No. 3 (82) for 1967.

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Based in South Vietnam, Thailand, and on ships of the Seventh Fleet, the main forces of the US aviation grouping can conduct raids over the DRV from practically any direction except the north. This makes it easy for them to deliver strikes of various composition, and in a number of cases for small groups and individual aircraft to penetrate vitally important areas of the DRV with impunity. "Star" raids diffuse the efforts of the air defense forces and air forces of the DRV, exhaust the forces and means on alert, and often lead to an overexpenditure of the limited technical operating resources of radiotechnical means, surface-to-air guided missiles, and fighter aircraft materiel.

The DRV is enveloped by the deployment of the US aviation grouping, which enables the Americans to choose each time the most advantageous axes of flights based on weather conditions, time of day, nature of the terrain along the route and in the area of the targets of the strike, the availability of crews trained for the given flight and the types of aircraft, and also the means of radio navigation and air navigation available on a given axis.

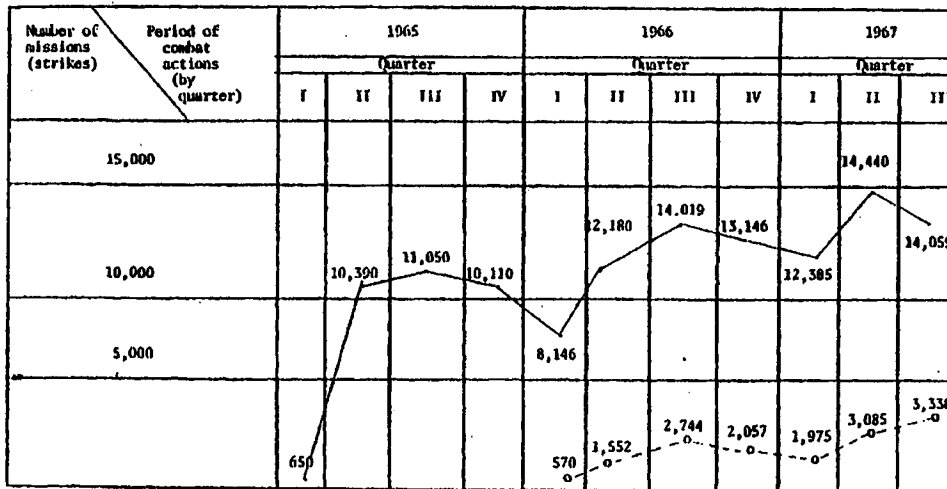
In the course of the war the scale and intensity of the actions by the aviation of the interventionists, as is clear from the graph, rose consistently.

Thus, with the beginning of the air war (February 1965) the task of undermining the military and economic potential, as well as of demoralizing the Vietnamese army and people, was accomplished by air strikes against areas located mainly to the south of the 20th parallel. Beginning in the fall of 1965 the Americans began to operate almost without restriction over the entire territory of the DRV. An exception were small areas adjoining the capital of the DRV -- Hanoi, and the most important port of the country -- Haiphong. But at the end of 1966 these areas, too, were subjected to massed air strikes, as a result of which the entire territory of the DRV became the target of US aggression.

A similar picture prevailed in regard to the fulfilment of tasks of disrupting and interdicting shipments. Until the spring of 1966 US aviation delivered strikes against troop columns and bridges and crossings on paved roads and railways located in a zone 75 to 100 kilometers north of the 17th parallel and along the borders with the Chinese People's Republic and Laos. After the spring of 1966 the scope of US aviation actions expanded sharply: targets now included almost all major bridges, ferry and bridge crossings, railroad stations, depots, columns of vehicles and troops, and trains on track sidings along most of the country's railroads.

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Key
● Number of missions flown in a quarter
○ Number of bombing strikes against DRV installations in a quarter
Intensity of combat actions of US aviation against the Democratic Republic of Vietnam



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The relative proportion of flights by American aircraft and unmanned means for conducting air reconnaissance has risen steadily. In the first half of 1965 it came to about 12 percent of the total number of missions, in the second half of 1965 -- about 18 percent, and in 1966-67 -- over 28 percent. In the opinion of the Americans this is as it should be since in this theater air reconnaissance serves as the main means of obtaining information about the enemy, his disposition and movements, structures erected, results of air strikes, etc.

In combat actions against the DRV the American command has employed practically every type of aircraft, unmanned means, and means of destruction known to us -- some of which have been in service with US aviation for a long time, and some that have been put in service in recent years.

The principal aircraft employed by the US to deliver strikes against troops, transportation lines, and installations in the DRV are the F-105D and F-4C tactical fighters and the A-4D and A-6A carrier-based ground-attack aircraft. Operating at low and medium altitudes and mainly at subsonic speeds, they have shown themselves to be no worse, and in some cases even better, than medium and heavy bombers. Good maneuverability, the ability to carry a large number of bombs, free rockets and guided missiles, and the modern equipment on board enable them to deliver fairly powerful strikes not only against large area targets, but also against point targets. Worthy of note are their considerable tactical radiuses of operation (for tactical fighters -- 800 to 1,000 kilometers, and for carrier-based ground-attack aircraft -- 600 to 700 kilometers without midair refueling, which is widely used by them both en route to the target and when returning to base).

Of the new means of destruction, the effectiveness of strikes against small-size and point targets, is, in the opinion of the Americans, heightened by Bullpup guided missiles and Snake Eye aerial bombs with opening brake fins.

The Shrike guided missile using electronic countermeasures deserves careful study. Although it is still premature to draw final conclusions regarding the combat specifications and capabilities of this missile, in the future the Shrike guided missile may represent a serious danger to the guidance radars for surface-to-air guided missiles and other air defense radiotechnical means, especially in the event the Americans succeed in equipping it with a special memory device.

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The tactics of the actions of American aviation in Vietnam are marked by great diversity. But the majority of the tactical procedures employed by the Americans until the middle of 1966 were not unexpected. Variable-profile flights in air defense zones, actions against ground targets by small groups of aircraft flying at low altitudes and hedge-hopping, the employment of conventional antimissile maneuvering and evasive action, and the noise jamming of radar on various frequency bands were well known to us before.

Heavy losses to American aviation from surface-to-air guided missiles and antiaircraft artillery fire, as well as increasing opposition from the fighter aviation of the DRV air defense, forced the commands of the US Air Force and Navy in 1966 to develop a number of new methods for negotiating air defense. These methods have been covered in sufficient detail in the aforementioned Collections of Articles of the Journal "Military Thought".

After the middle of 1967 combat actions by US strike aviation during raids against targets with strong air defense cover again began to be conducted at altitudes of 3,000 to 5,000 meters. This apparently was a normal attempt to increase the effectiveness of the bombing, reduce losses from small-caliber antiaircraft artillery fire, and also to create more favorable conditions for antimissile maneuvering. To prevent an increase in losses from the fire of surface-to-air missile troops, the Americans greatly intensified the jamming of missile guidance radars and radar means of detection. In addition, the US aviation command recently has sharply increased the number of strikes against ground air defense means, and has specially trained individual crews and entire aviation subunits to perform this task.

Groups for neutralizing ground air defense means usually consist of eight to 12 aircraft forming two subgroups: diversionary and strike. Their tactics are as follows: the diversionary subgroup, upon entering an area in which fire positions are presumed to be located, draws fire while maneuvering in altitude, course, and speed; the strike group, having precisely determined the location of the fire positions, delivers a strike against them from altitudes of 300 to 1,200 meters, usually with free rockets and bombs and, as a rule, from one, or less frequently two, passes.

The tactics of the actions of large US aviation groups when delivering strikes against targets with strong air defense cover have recently become fairly clear.

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Their combat formations are, as a rule, of mixed nature and include:

- a group for laying down passive jamming -- four to six naval aircraft;
- a diversionary echelon consisting of four to eight aircraft; sometimes it includes F-105D and F-4C aircraft to create the appearance of a strike group with cover;
- an advance echelon consisting of eight to 12 F-8 or F-4C aircraft to provide cover against strikes by fighters of the Vietnamese People's Army. (These aircraft also have the tasks of blockading airfields and engaging air defense fighters in battle in the area of the targets of strikes.);
- an echelon consisting of four to eight aircraft to neutralize surface-to-air missile troops and antiaircraft artillery of the Vietnamese People's Army in the area of the strike targets; since July 1967 it has been noted that any group of US aircraft, upon detecting surface-to-air missile troops or antiaircraft artillery, immediately delivers a strike against the positions with all available means;
- a strike echelon of eight to 32 aircraft; each flight (or pair of flights) usually is assigned a separate target;
- a last echelon in the formation to provide cover against the fighter aviation of the Vietnamese People's Army (up to four aircraft).

Raids on the DRV, as before, are covered by special EB-66 aircraft for active jamming, which patrol the Vietnam-Laos border and the Tonkin Gulf. In addition a considerable number of support and strike aircraft are equipped with generators for jamming the frequency bands of air defense radar means.

To improve control of their aviation in the air and to guide it to the targets of a strike, the Americans additionally have deployed in Thailand and South Vietnam a number of posts of the TACAN system, and also have used special airborne command posts set up in radar patrol aircraft.

It probably is to be expected that the Americans, in continuing to study the specifications and combat capabilities of individual models of armament, and the entire DRV air defense system as a whole, will continue to seek even more effective methods of operation for their aviation which would ensure fulfilment of its combat tasks with the least possible losses in aircraft inventory, flight personnel, and armament.

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US aggression in Vietnam has forced the Party Central Committee and the government of the DRV to develop a number of very important measures designed to bolster the defensive capability of the country. Special attention has been devoted to organizing air defense and equipping it with modern combat equipment and armament, since the country, in the first months of the air war, was in effect defenseless against strikes by US aviation.

The Soviet Union and the other socialist countries have responded to the needs of the fraternal Vietnamese people. While furnishing combat equipment and armament, we have at the same time also begun to solve the extremely acute problem of training Vietnamese personnel to use modern weapons competently.

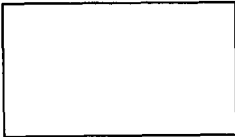
The first and most important step in increasing the effectiveness of the DRV air defense was the establishment of a radar field at high, medium, and semi-low altitudes in the main part of the country, with centralized warning on the air situation for all air defense units and subunits belonging to the main grouping of forces and means.

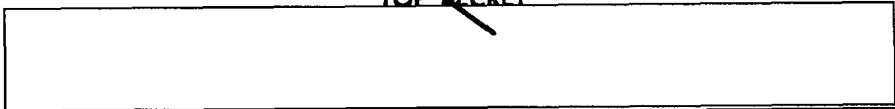
The establishment of a radar field was facilitated to a considerable extent by large deliveries of radiotechnical means, radios, and other means of control from the socialist countries to the DRV, as well as by the transfer by the DRV government of certain very important wire communications links, formerly under the jurisdiction of civilian organizations and departments, to the air defense command.

At the same time the structure of radiotechnical troops and antiaircraft artillery was partially revised, mainly along the lines of reorganizing them into larger elements. Out of small isolated subunits armed with radars and medium- and small-caliber antiaircraft guns, radiotechnical and antiaircraft artillery regiments were formed with means of control and communications.

The system of battle formations for radiotechnical and antiaircraft artillery units became more orderly and more in accord with the situation. The first, though extremely timid, attempts were planned to mass air defense forces and means to cover the principal vitally important installations in the country.

But on the whole the DRV air defense system by the end of 1965 still remained inadequately organized, which reduced its effectiveness in combating American aviation. The major cause of this were primarily the





opinions that had developed in the leadership of the Vietnamese People's Army about the role and tasks of the country's air defense forces.

According to views existing at that time, the air defense of the DRV had to be built on the principle of "the weak against the strong", and based not on a reliable defense of the most important installations and areas of the country, but rather on the destruction of enemy aircraft in places where they did not expect it (similar to the way detachments operate in a guerrilla war). In connection with this there was a tendency to distribute the limited amount of air defense forces and means uniformly throughout the entire territory of the country, and to frequently shift them around in order to set up fire ambushes on the most probable axes and flight paths of American aviation.

A large number of anti-aircraft guns, anti-aircraft machineguns, and hand-held firearms were left in service with various semi-guerrilla detachments and even the civilian population. As a result, the coefficient of the combat use of air defense means without effective control of them was extremely small. A considerable portion of the active air defense means operated in isolation and did not coordinate their fire; this enabled American aviation, holding the initiative and having air supremacy, to negotiate the air defense system with relative ease and fulfill its tasks with minimum losses.

In examining the first period of the formation and combat actions of the air defense forces of the DRV (up to the beginning of 1966), it should be borne in mind that our Vietnamese comrades at that time had no experience whatever in the organization and conduct of combat against an air enemy equipped with the latest aviation equipment. Nor had they developed in advance any methods for the operational and combat use of modern air defense means. They solved all these problems in an extraordinarily complex situation, in the face of raids by American aviation on North and South Vietnam that were continually increasing in scale.

We must also take into account the difficulties in organizing the air defense of the DRV occasioned by the particular features of the area of combat actions. The small depth of the country's territory, especially of its southern part, makes it easy for enemy aviation to achieve surprise in its strikes from land and sea even against installations in the center of the country, and requires constant readiness on the part of air defense forces and a large daily expenditure of the forces and means on alert. The mountainous-wooded terrain covering more than half of the country greatly





complicates the detection and tracking of air targets by radiotechnical means, especially at low altitudes, and makes it more difficult to discover the intention of enemy actions, the structure of the combat formations of his aviation, the composition of his groups, etc. And lastly, the unfavorable weather conditions (high temperatures and humidity, low clouds, fog, etc.) adversely affect the efficiency of troop personnel and the readiness of combat equipment.

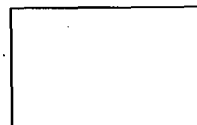
All this had its effect upon air defense measures, for which decisions frequently changed and were not always successful; this hindered the improvement of the combat training and combat readiness of the air defense forces of the DRV.

A new stage in the development of the air defense of the DRV began with the introduction of surface-to-air missile systems and the newest fighter-interceptors. As a result, the capabilities for destroying high-speed, high-altitude targets increased sharply; conditions were created for the transition from defending individual installations to providing area cover for the most important areas of the country. It was now possible for air defense forces to destroy an air enemy by day or by night under adverse weather conditions on the distant approaches to targets, and thus prevent unimpeded reconnaissance and training flights by the interventionists near the coastline and the national borders of the DRV.

In the meantime the methods of control and cooperation employed by the air defense forces and air forces of the DRV lagged noticeably behind the pace at which they were equipped with modern means for combating an air enemy. Therefore, the capabilities of surface-to-air missile troops, fighter aviation, and partly of rapid-fire antiaircraft artillery, were not fully utilized in 1966.

Despite the great amount of work done, the weakest point of the air defense system of the DRV continued to be the organization of radar reconnaissance and warning of the troops. The inventory of radars was not always used efficiently: some of the most powerful radars supported the flights of aviation and actually took no part in reconnaissance of the enemy; a certain number of radars operated exclusively in support of coastal defense and the navy.

For the purpose of camouflaging the radars and conserving their technical resources, the detection and tracking of an air enemy was performed, as a rule, only by those means on alert; therefore, the



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capabilities of the entire grouping of radiotechnical troops were not actually used. This severely limited the performance of the radar field in detecting and tracking air targets, especially low-altitude ones, and affected its overall resistance to jamming.

There also were failings in the warning of troops. Most of the active air defense means immediately subordinate to the air defense and air forces command were warned only through a centralized point: the information was transmitted with a time lag of up to three to ten minutes and often with major mistakes and distortions, especially when tracking low-altitude targets. As a result fighter aviation was often late in taking off on an intercept mission and surface-to-air missile troops and antiaircraft artillery opened fire on withdrawing air targets. The method of decentralized warning, which has proven itself in our own air defense forces, has thus far not had broad application in the Vietnamese People's Army.

Control of the air defense forces of the DRV at the tactical level on the whole is in accordance with modern views. As for the operational level, the various air defense branch arms are controlled individually by the respective commanders and their staffs, without close coordination of their actions. The commander of the air defense and the air forces of the DRV exercises centralized control only over those forces and means that constitute the main grouping of air defense forces deployed to cover the principal industrial-administrative region of the country. Also removed from the sphere of control are a large number of air defense forces and means under the jurisdiction of the commanders of military zones (districts), in the navy and in the various provincial military committees.

Recommendations for the formation of combined-arms large units of air defense, which have fully justified themselves in our own field experience, were never fully put into practice. A factor here was the influence of Chinese advisers who had no experience in controlling large groupings of air defense troops and were not interested in the effective use of combat equipment supplied by the Soviet Union.

Overall data on the results of combat actions by the air defense forces of the DRV are shown in the following table.

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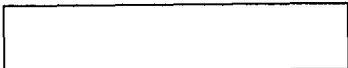
Results of Combat Actions

Period	Surface-to-air missile troops		Antiaircraft artillery		Fighter aviation		Total number of aircraft shot down
	Number of aircraft shot down	Percentage of total number of aircraft shot down	Number of aircraft shot down	Percentage of total number of aircraft shot down	Number of aircraft shot down	Percentage of total number of aircraft shot down	
1965	93	10.9	739	87.0	18	2.0	850
1966	203	26.9	497	65.7	56	7.4	756
1967 (through 1 December)	354	36.3	504	51.7	117	12.0	975
Total	650	25.2	1,740	67.4	191	7.4	2,581

Note. The total number of aircraft shot down and the results of combat actions by fighter aviation and antiaircraft artillery are taken from official data of the Information Agency of the DRV and the command of the air defense and air forces of the Vietnamese People's Army.

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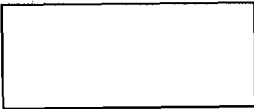
The special features of the grouping and operational use of the air defense forces and means of the DRV have had their effect on the principles for the combat employment of the branch arms (antiaircraft artillery, surface-to-air missile troops, and fighter aviation).

According to prevailing views in the Vietnamese People's Army, the main branch arm of air defense is antiaircraft artillery because of its great proportion relative to the other branch arms, its ability to combat American aviation at low, medium, and high altitudes, the considerable combat experience maintained by antiaircraft gunners since the days of the struggle against the French colonialists, and the possibility of employing antiaircraft guns not only in combat against an air enemy, but also against various land and sea targets.

The massing and wide-scale maneuvering of antiaircraft artillery are considered to be the basic principles for its combat use. But massing on the main axes of operation of American aviation was not, as a rule, carried out in battles. Nor was the principle of massing antiaircraft artillery to cover important installations observed in all cases.

The largest part of the antiaircraft artillery of the Vietnamese People's Army -- small-caliber antiaircraft artillery -- was used both independently and also in combination with medium-caliber antiaircraft artillery and surface-to-air missile troops. Small-caliber antiaircraft artillery independently provided cover for small installations against which American aviation could operate only from low altitudes and by dive bombing. When operating in combination with medium-caliber antiaircraft artillery and surface-to-air missile troops, small-caliber antiaircraft artillery, besides fulfilling its primary task, provided cover for the battle formations of cooperating air defense means against air strikes from low and maximally low altitudes.

Among small-caliber antiaircraft artillery, in the estimation of our Vietnamese comrades, the 37mm automatic guns and the 14.5mm dual-mounted antiaircraft machineguns proved especially effective and were reported to have shot down most of the American aircraft operating at low altitudes. As for the 57mm antiaircraft guns, estimates as to their effectiveness vary. We may assume that the lack of timely warning and accurate target indication, the low level of teamwork in many batteries, and the inadequate preparation of materiel (especially of fire control radars, fire control directors, and range finders) had a considerable effect on the results of the firing. It is, therefore, probably premature for the time being to draw final conclusions as to the effectiveness of this system.





Medium-caliber antiaircraft artillery was used to provide cover for especially important installations, and in antilanding defense for firing at sea and land targets. It is felt that medium-caliber antiaircraft artillery systems are insufficiently mobile, have a slow rate of fire, are complex in design, and require an extremely large number of highly skilled personnel to service them. The principle employed by fire control directors for solving a prediction problem reportedly is of no help whatever when firing at aircraft taking evasive action.

In our view, the reasons for the unsuccessful use of medium-caliber antiaircraft artillery in Vietnam in no way could be traced to low tactical-technical specifications of the systems, but rather were due to the poor preparation of technical equipment and the inadequate training of crews. It was not by accident that most medium-caliber antiaircraft artillery fire was not aimed, but consisted of barrage fire because of malfunctions of fire control radars, fire control directors, and automatic mechanisms of the guns. Data exist showing that 100mm antiaircraft artillery in 1965-66 carried out more than 700 battery firings and shot down only 18 aircraft, expending as many as 2,000 shells for one downed aircraft.

The advisers to the Vietnamese antiaircraft gunners are Chinese, who have little knowledge of medium-caliber antiaircraft artillery systems and who do not know how to operate, repair or adjust them properly. As a result, they are unable to properly train their Vietnamese comrades to skilfully handle the materiel of medium-caliber antiaircraft artillery and to carry out effective aimed fire.

The command of the Vietnamese People's Army has made extensive use of antiaircraft artillery of all calibers for roving actions and for firing from ambushes to destroy individual aircraft and small groups of American aviation on probable and established flight paths. Most often the ambushes have been staged near typical visual reference points and at launch sites abandoned by surface-to-air missile subunits after firing. For ambushes, various amounts of antiaircraft artillery were assigned: from one or two batteries to two or three battalions or more. The battle formation was designed to overlap the entire width of a possible aviation flight path. If because of the terrain it was impossible to set up the required battle formation (a ravine, narrow depression, marshy area, rice paddy, jungle, etc.), antiaircraft batteries were deployed in a line, wedge, or echelon. The distance between batteries usually was not more than one to 1.5 kilometers for medium caliber and 0.3 to 0.5 kilometers for small caliber, so that it would be possible to concentrate the fire of an entire "ambush"





grouping on a single aircraft.

Fire positions of batteries located in ambushes were carefully camouflaged from ground and air observation. Before the battle the use of any radiotechnical means was expressly prohibited. After firing the batteries immediately packed up and moved to alternate fire positions or to another area to set up new ambushes.

Surface-air missile troops occupy an important place in the air defense system of the DRV and are considered one of the most effective branch arms. They are assigned the task of providing cover for the largest installations in the country and for the most important lines of transportation, and of destroying in the process the greatest possible number of enemy aircraft and unmanned reconnaissance means.

At first, as has already been noted in a number of articles, methods for the combat use of surface-to-air missile troops were strongly influenced by the tactics of the antiaircraft artillery of the Vietnamese People's Army. They were employed for the most part by battalion, without any intercommunication or fire cooperation with each other in setting up fire from ambushes on the probable flight axes of American aviation. These tactics, considering the limited amount of surface-to-air missile means available in the DRV in 1965, to a certain extent proved their worth, since they misled the American command about the strength of the surface-to-air missile troops of the Vietnamese People's Army, concealed their grouping, and helped reduce losses to personnel and equipment. However, the absence of continuous surface-to-air missile zones on the approaches to the main installations in the DRV meant that reliable cover could not be provided for them, and as a result American aviation often got through to these installations through gaps between the fire zones of the battalions.

With the increase in the number of surface-to-air missile troops and the accumulation of experience in combating American aviation, methods for the combat use of surface-to-air missile troops gradually changed. They began to be grouped around the main administrative-political and industrial centers of the country, and to be set up in comparatively deep battle dispositions so that the kill zones of the surface-to-air missile battalions overlapped.

More favorable opportunities developed for organizing uninterrupted control of units and subunits, belonging to a grouping of surface-to-air missile troops, at individual installations. Of especially great significance was the establishment of an autonomous radar field for



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surface-to-air missile troops using the reconnaissance and target indication radars available in the units.

The tactic of extensive maneuvering by surface-to-air missile battalions is still in use, but now these battalions have begun to maneuver only within their established grouping, as a rule without loss of fire coordination with adjacent subunits.

The extent to which surface-to-air missile troops are employed for firing from ambushes has decreased somewhat, because the Americans have begun to conduct much more extensive reconnaissance of the launch sites and have almost stopped their repeated use of the same flight paths to the targets of a strike. For example, in January 1967 eight missile battalions lay continuously in ambush, periodically changing their fire positions. But their assigned goal was not achieved because each time the enemy changed the direction, time, and altitude of his flights.

The effectiveness of the actions of surface-to-air missile troops shows a tendency toward a gradual decline. The main reason for this is the employment by American aviation of increasingly effective methods for negotiating the air defense system of the DRV and the use of new technical means of combat. Another factor has been the reduction in the number of flights by American aircraft in zones of surface-to-air missile fire: in May and June 1966, for example, out of 2,600 groups of aircraft that conducted flights in the airspace of the DRV, only 38 groups entered the zones of surface-to-air missile troops; in June 1967 these figures were 2,713 and 280, respectively.

The effectiveness of surface-to-air missile troops was adversely affected by the decision of the Vietnamese command not to launch missiles against targets flying at altitudes of less than 1,000 meters (supposedly because of the danger of missile bursts striking people and buildings), as well as by the prohibition against firing more than one missile at low-altitude maneuvering targets. Many missiles were expended for nothing to accomplish the so-called "tactical task" of frightening away with surface-to-air missile fire groups of American aircraft flying under cover of jamming. These misguided actions were the result, on the one hand, of the desire of the Chinese advisers within the command of the air defense and air forces of the Vietnamese People's Army to discredit our missile technology, and on the other hand, of the fact that the command of the Vietnamese People's Army in 1965-66 was still experiencing its "period of growth" and the Vietnamese missile launcher crew members at the time had not sufficiently mastered the complicated surface-to-air missile systems

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and had not learned how to make full use of the great fire capabilities they contained.

The drop in the effectiveness of surface-to-air missile troops, however, had no substantial effect on the overall increase in American aviation losses in Vietnam. The powerful effective fire of the surface-to-air missile systems forced US aviation to shift to actions primarily at low altitudes and maximally low altitudes. As a result, the number of targets flying through zones of small-caliber antiaircraft artillery and antiaircraft machineguns increased many times. The combat activity of antiaircraft artillery and antiaircraft machineguns was greatly intensified, and the number of aircraft they shot down increased sharply.

At low altitudes and especially at maximally low altitudes the Americans began to fly, as a rule, at subsonic speeds and only in the daytime in good weather conditions. As a result, a large amount of antiaircraft means without radar systems or with devices that were out of order, were put into effective combat against low-flying targets. Previously these means were employed only for the conduct of barrage fire.

Thus, the successful employment of surface-to-air missile troops at high and medium altitudes led to an increase in the role of antiaircraft artillery and machineguns and forced American aviation to seek new methods for negotiating the air defense of the DRV.

At the present time surface-to-air missile troops in close cooperation with antiaircraft artillery means are significantly limiting the area of activity of American aviation by not permitting unimpeded raids on vitally important areas and installations. Combat crews of surface-to-air missile subunits are continually raising their level of training in firing at maneuvering targets (especially at the lower limit of the kill zones of the systems), are more strictly observing the rules of firing and the norms for expenditure of missiles to reliably destroy targets, and are improving the tactics for their actions based on the new conditions of the situation and the new means of enemy air attack.

Fighter aviation is still small and has not as yet assumed a firm place in the air defense system of the country. Vietnamese fighters in 1965-66 usually operated in a limited area, near the airfields where they were based, and did not make use of all available opportunities for intercepting and destroying enemy aircraft on the distant approaches to the installations being covered. Most flights were conducted in the daytime, more often in good weather conditions than in bad. Interceptions and air

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battles, as a rule, were conducted visually above the clouds and under their lower edge. Interceptions in the clouds using radar sights were employed to a limited extent.

Conventional front aviation fighters operated in groups of four to six aircraft and more; interceptors operated singly or in pairs. Vietnamese fighter pilots are displaying great selflessness and continual readiness to wage combat against the superior forces of the air enemy.

The MIG-17 fighters of the Vietnamese People's Army began to be used in the spring of 1965. The very first air battles showed that these subsonic aircraft were capable of operating successfully against the supersonic tactical aviation of the enemy. It developed that two weak points of the F-105D tactical fighter were its great sluggishness and insufficient maneuverability. Its advantage in speed over the MIG-17 fighters was lost in air battles at low altitudes. In addition, during a battle the American pilots adhered to defensive tactics and tried to disengage from the battle as quickly as possible. The success of Vietnamese fighters may also be explained by the suddenness of their attacks and by the fear of American pilots to engage in aggressive air battles.

In the spring of 1966 MIG-21's first began to be employed to repulse raids by American aircraft. They first took to the air to destroy unmanned reconnaissance aircraft, and later began to wage air battles against manned means. Despite individual failures involving mainly poor warning and guidance, the fighters displayed high combat qualities. In the opinion of captured American pilots, these fighters not only are the equal of US tactical fighters, including the latest modifications (the F-4C Phantom), but in certain respects, especially maneuverability, they are superior.

The extent of the employment of modern MIG-21 fighter-interceptors is thus far not great, because of the inadequate training of flight personnel for combat actions in adverse weather conditions, at night, and at low altitudes, especially at the lower operating limit of the onboard radars.

A significant factor in the effectiveness of the actions of fighter aviation are shortcomings in the work of command posts and guidance posts (the manual method of guidance, the ill-timed take-off of fighters, their placement in a disadvantageous position relative to enemy aircraft, etc.), as well as low-quality group formation flying by the fighters and poor cooperation among the crews of MIG-17 and MIG-21 fighters.

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The experience of the combat actions of the air defense and air forces of the Democratic Republic of Vietnam appears to have two aspects. The first pertains directly to our own air defense. It confirms the validity of the extensive and complex work we are doing to improve the technical equipping of air defense, its organizational structure, control system, and the combat training of troops. On the basis of a thorough evaluation of the experience gained in combat actions in Vietnam, we are able to form a more complete picture of the possible ways that American aviation might be used in wars on a larger scale, and to work out in advance appropriate measures for counteraction.

The second aspect is the significance of the experience gained in combat actions of the air defense and air forces of the DRV to the theory and practice of modern local wars in a remote and inadequately prepared theater of military operations. Analyzing it from this point of view, it appears possible to make the following conclusions.

In the first place, the air defense forces of the country, deployed in a remote theater of military operations and subjected to aggression by a developed capitalist state, will as a rule have to operate under extremely unfavorable conditions when the attacking side enjoys considerable superiority and even supremacy in the air.

As a result, the operational use of air defense forces and the tactics for their actions must be extremely flexible and diverse, and provide for the extensive maneuvering of forces and means for the purpose of quickly transferring efforts to axes and installations where the main forces of the air enemy are operating. Not only fighter aviation must be ready for wide-scale maneuver, but also the other branch arms, including radiotechnical troops. In a number of cases owing to the poorly developed system of airfields, as occurs in many peripheral areas, maneuver by ground air defense means will play the main role.

In the second place, air defense in a local war must be multi-faceted, that is it must have at its disposal various types of armament. As a rule, attempts to accomplish tasks with any single, albeit even a fairly powerful, weapon (for example, surface-to-air missiles), cannot succeed, since the air enemy, holding the initiative, is capable of continually changing his tactics and using more effective methods of counteraction. Under certain conditions antiaircraft artillery will play an important role in air defense. The DRV has a sufficient number of small though extremely

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important installations, which antiaircraft artillery successfully covers against strikes by single aircraft and small groups of American aviation operating at low and maximally low altitudes.

In the third place, the form and methods of controlling air defense troops in a local war can be extremely diverse depending on the availability of forces and means, their grouping, the nature of the actions of the air enemy, etc. Experience shows that control of individual area groupings deployed to cover the most important installations in the country must be centralized. When the necessary means of communications and control are available, it is also highly advantageous to centralize control over several groupings deployed over an extensive area. At the same time attempts to centralize control of individual units and subunits covering separate, especially small, installations usually limit the initiative of the respective commanders and often result in the combat task not being fulfilled. When observing the point principle of cover, it is advantageous to base control of air defense forces and means on a combination of centralized and decentralized control, especially when the enemy is based a short distance away and can conduct raids from different directions.

In the fourth place, air defense forces, in addition to fulfilling their basic tasks, must be ready to repulse enemy strikes from sea and from land. A grouping of air defense forces and means should be formed with these additional tasks in mind; and when organizing cooperation with the navy and ground forces, provision should be made for the integrated use of fighter aviation, surface-to-air missile troops, and antiaircraft artillery to deliver strikes against sea targets, infantry, tanks and fire means.

