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The Development of Soviet Air Defense Doctrine and Practice

70 Development of Soviet Air Defense
Doctrine and Practice

Historical Evaluation and Research Organization



Sandia National Laboratories

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THE DEVELOPMENT
OF SOVIET AIR DEFENSE
DOCTRINE AND PRACTICE

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ABSTRACT

This report describes the evolution of Soviet air defenses from 1918 through World War II, the war in Vietnam, and the Arab-Israeli wars. It also discusses present-day Soviet air defenses and possible Soviet motivations in structuring such formidable defenses. Chapters IV and V (Secret), bound separately, cover the "Cold War Era" and the Vietnam experience.

THE DEVELOPMENT OF SOVIET AIR DEFENSE
DOCTRINE AND PRACTICE

EXECUTIVE SUMMARY

This study is a follow-on to a study prepared for Sandia Laboratories in July 1978, titled Availability of Historical Data Concerning Soviet Air Defense Experience. The objective was to research and analyze data discovered in the course of the earlier effort on the organization and performance of Soviet air defense in World War II and the subsequent development of Soviet doctrine, forces, and materiel in the postwar period.

The study generally lent itself to a chronological breakdown that included the origins of Soviet air defense, Soviet experience in World War II and the immediate postwar period, and the present situation. Because the Soviets were the chief suppliers of air defense materiel to the North Koreans, North Vietnamese, and Arab bloc nations, special emphasis was placed on gaining the available data from these areas, as well as directly on the USSR itself.

A great deal of data has been amassed that tends to indicate that in the past the Soviet Union has devoted, and is presently devoting a large share of its resources toward maintaining a viable air defense system that encompasses not only the protection of the homeland, but also Soviet troop formations. All indications are that the USSR intends to maintain its present level of effort into the foreseeable future, responding to real or perceived threats from the West by employment of the latest technologies available. One reflection of this is the fact that while the West has allowed its air defenses to become obsolescent at best in some areas, the Soviets have continued to upgrade their systems with the obvious aim of ensuring maximum survivability of their means of existence. To this extent, the type and mix of air defense systems currently found in type Soviet military formations can only reaffirm that these formations are offensive in configuration and nature.

While the study is as complete as time would permit, a great deal more needs to be done by way of analysis to determine exactly what effect this present Soviet air defense system would have when applied to certain critical scenarios and what are its vulnerabilities.

THE DEVELOPMENT OF SOVIET AIR DEFENSE DOCTRINE AND PRACTICE

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AA	Antiaircraft
AAA	Antiaircraft Artillery
AAMG	Antiaircraft Machine Gun
AD	Air Defense
ADD	Russian Acronym for Strategic Aviation
CAS	Close Air Support
C & C	Command and Control
CinC	Commander in Chief
Comp	Composite
ECM	Electronic Countermeasures
Front	Soviet term for Army Group
ICBM	Intercontinental Ballistic Missile
Ind	Independent
IOC	In Operational Configuration
MZA	Soviet abbreviation for light antiaircraft artillery
NEADC	National Egyptian Air Defense Command
Point	Soviet designation for an air defense area generally surrounding an important industrial or politico-economic complex.
PKO	Soviet abbreviation for Aerospace Defense
PRO	Soviet abbreviation for Anti-Ballistic Missile Defense
PUAZO	A type of Soviet antiaircraft associated fire direction equipment
PVOIA	Air Defense Fighter Interceptor Aviation Units
PVO Strany	National Air Defense of the Homeland Forces
PVO-SV	New Soviet acronym for Air Defense Forces of the Ground Troops
PVORTV	Air Defense Radio Technical Troops

PVO-Voisk Old Soviet acronym for Air Defense Forces of the Ground Troops
PVOZA Air Defense Artillery Units
PVOZRV Air Defense Antiaircraft Missile Forces

SA/AW Small Arms/Automatic Weapons
SAM Surface to Air Missile
SZA Soviet abbreviation for medium antiaircraft artillery

TVD Soviet acronym for Theater of Military Operations

VNOS Soviet abbreviation for Air Defense Air Warning Service

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Introduction

This is a follow-on to a report prepared for Sandia Laboratories in July 1978, entitled Availability of Historical Data Concerning Soviet Air Defense Experience. The objective was to research and analyze data discovered in the course of the earlier effort on the organization and performance of Soviet air defense in World War II and the subsequent development of Soviet air defense doctrine, forces, and materiel. The resultant data was then to be compiled into a comprehensive summary of the findings.

In accomplishing this task a considerable amount of additional data was uncovered that tends to indicate (A) the wealth of source material on the subject and (B) the level of emphasis placed on air defense by the Soviet Union. The data selected for inclusion in this report best illustrates these points and covers material produced in the Soviet Union and supporting documentation collected in this country and abroad.

Data in Soviet sources often is redundant in form and style, and data in US and foreign sources other than Soviet tends to conflict in detail and in interpretation. Whenever possible a fresh analysis of the basic data was performed.

As is the case in all studies of the Soviet Union, this project suffered from lack of data from that source. Such information as actual ammunition expenditures in World War II and parametric data on weapons, which are usually available for the United States and other nations, simply are not made public by the Soviet Union. In some instances it has been necessary to fill gaps in available data by interpolation or extrapolation, based on judgment of individuals at HERO with long experience in analysis of Soviet military matters, or reliable secondary sources.

Although the Soviet Union has not participated overtly in a major war since World War II, its air defense equipment was used by participants in Korea, Vietnam, and the Middle East. Considerable information about equipment and doctrine has been gleaned from experience in those conflicts. Much of the data concerning the Middle East experience has been collected by HERO for other projects.

Sources for charts, maps, and illustrations are identified where appropriate. Most of the statistical charts have been prepared by HERO for this report.

The Chief author of this report was John E. Jessup. Also participating were Trevor N. Dupuy and Grace P. Hayes.

THE DEVELOPMENT OF SOVIET AIR DEFENSE DOCTRINE AND PRACTICE

CHAPTER I

BACKGROUND

To understand the present air defense (AD) system of the Soviet Union better, a study of its evolution is necessary. This does not imply any great innovation on the part of the Soviets but, rather, the problem of application of fundamentals which make Soviet air defense unique. Typically, research into Soviet air defense is beset by the problem of lack of access to basic documentation with the concomitant lack of faith in the data that has been made available or that is found in secondary Soviet sources. In recent years the Soviets have spoken rather candidly about some of the problems encountered in air defense, especially during World War II, and have discussed some of the means used to overcome these problems. Still, the more basic issues, such as the intermediate level decision-making processes and resource allocations, are either totally ignored or are glossed over. Similarly, the statistical data presented in secondary sources is suspiciously the same in form and language and is most often cited without referral to basic documentation. Soviet literature fails, therefore, to present a balanced, credible statistically accurate account of the role of air defense in the war.

A second complication involves the fact that most of the official German Luftwaffe records of the Eastern Front were destroyed near the end of the war. What data does exist, or can be compiled, is sketchy and uneven. Only the memoirs of a number of senior German officers offer any valuable material, and these, of course, must also be taken at face value.

In sum, then, what statistics do exist lack substantial detail and are most often low when dealing with friendly failure and high when dealing with success. The data that does exist, however, illuminates a number of significant areas from which certain inferences may be made and from which certain conclusions may be drawn.

It may be postulated that the Soviets' air defense of today is to a large extent the result of their experience in World War II, where some of the processes of advancement and development were begun. It must also be remembered that, while the fundamentals of air defense have remained basically unchanged over the years, the sophistication of both attacker and defender systems has been modified dramatically, primarily because of technological advancement. Since World War II was the last direct combat experience for the Soviets, there are some important lessons to be learned from that period that will apply to the present. That the Soviets themselves appreciate this may be demonstrated in two ways: their lack of hesitation to reorganize their air defense as they gained experience during the war and their postwar improvements in weaponry, organization and doctrine based on lessons learned, improved technology, and their perception of probable enemy capabilities.

The Prewar Period

Soviet air defense had its beginning in the Civil War period (1918-1920). The general method of air defense at that time combined a system of "spotter" posts (air warning stations) located along the lines of probable attack. These posts were located as far as 100-200 kms. out from the point, usually a city, to be protected. Inside this air warning line the various target attack means were located. Fighter-interceptor aircraft, for instance, assigned to the responsible air defense commander, were usually based just outside the point and were usually maintained on ground alert. These aircraft had the mission of intercepting the intruder in an area between the air warning line and the outer perimeter of the defensive envelop created by the positioning of the assigned antiaircraft artillery (AAA) batteries. Whether the interceptors would pursue into the AAA zone is not clearly stated. Low flying intruders were engaged by small caliber antiaircraft guns and by antiaircraft machine guns (AAMG) located on rooftops in and around the point. Because of a chronic lack of proper communications, which extended into the World War II period, the responsible air defense commander was almost always in the position of having to relinquish control to subordinate commanders, who undertook engagement on an independent, uncoordinated basis. Antiaircraft batteries were positioned,

where feasible, with overlapping fires, but, again, a lack of ability to coordinate the handoff of targets existed because of the lack of adequate communications means.

The two decades preceding the outbreak of World War II did see numerous changes in the Soviet air defense system in all areas - organization, tactics, and equipment. In the main these changes were brought about by the spectacular improvements seen in the airplane itself. As speeds, altitude limits, range, and endurance of aircraft improved as much as 300% in all areas, so did the imperative to improve defenses against them. This requirement was further increased by the knowledge that the newer aircraft being developed by those nations that constituted a threat to the USSR had greater ordnance-carrying capabilities and therefore created an ever-growing menace.

To offset these threats the Soviets set about improving their PVO (Protivovozdushnoi Oborony) or air defense. By the end of the 1920s, the first fundamental study of the subject had been completed in Soviet Russia.¹ In this study, L.N. Borodachev conceived of Air Defense as having three elements - active, passive, and auxiliary - designed to interact in combating the activities of an enemy's air force. This breakdown was not a unique approach for the USSR, nor did the Soviets' assignment of fighter-interceptors and AAA to active, balloons and camouflage to passive, and searchlights, sound detectors, and air warning to auxiliary means constitute any real innovation. Those differences that may have constituted a specific Soviet approach may be found in their appreciation of the size of their country and the fact that most lucrative targets lay close to their western borders, inside the accepted attack ranges of the aircraft of their most likely European adversaries.

This knowledge, coupled with the omnipresent problem of available resources during this critical period in the development of the Soviet state led to the establishment of an air defense program that was characterized by:

- the division of the threatened belt in the western Soviet Union into a number of regions wherein the assigned PVO units would be concentrated around priority areas and,
- the division of these regions into groups of "points" called sectors and,

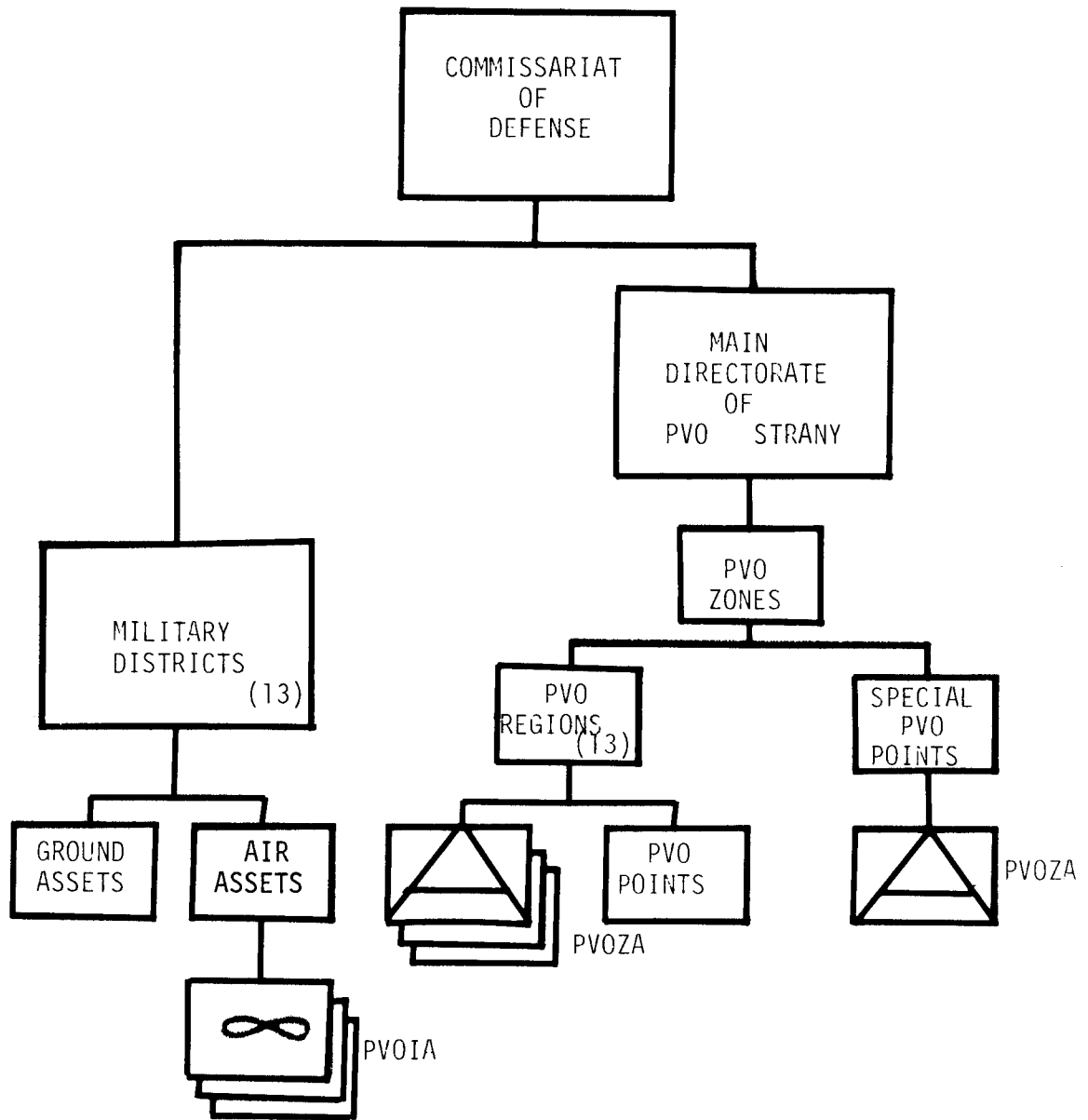
- the selection of the more important "points" as separate areas responding directly to the regional air defense commander.

In this last instance, particularly, the air defense would consist of both air and ground active means. In regions of lesser importance only ground active means would be employed. The regional air defense commander was still responsible, however, for the maintenance of a mobile reserve to be employed on a priority need basis over points not normally covered by air active means. He was also responsible for the assignments of targets to the air and ground active means at his disposal. In essence, this meant he would assign the types of targets to be engaged by each means and the rules of engagement to be followed.

By 1930, some codification of these hitherto rather theoretical points can be seen in the establishment of a Main PVO Directorate within the Headquarters of the Workers and Peasants Red Army. This new directorate added the dimension of national planning to air defense. Even so, a debate of sorts developed between those who saw the necessity for zonal defense systems and those who espoused the Borodachev theory of air defense of points. Others, of course, saw the melding of the two systems as the solution. In this view, the idea of organizing air defense so as to cover the more important politico-economic centers within a particular operational zone was stressed, with aircraft and AAA positioned so as to allow for mutually supporting radii throughout the zone. Thus, in this organization, the intruder was to be engaged early on his entry into the zone and would meet increasingly heavier concentration of air defense means as he approached the more sensitive and important politico-economic centers. This system was eventually selected for employment, and this type of "circular air defense" remained in operation into the war period. Within this system three major politico-economic centers were designated as separate air defense areas: Moscow, Leningrad, and Baku. Approximately 42.5% of all available medium caliber AAA and a high percentage of the available fighter-interceptors were assigned to these three special areas.

From the organizational point of view, these air defense zones formed a belt 500-800 kms. in depth along the western borders and 250-500 kms. deep along the Transcaucasian border. (Moscow was actually outside the western belt, as it lay approximately 1,200 kms. inland.) In 1939, this organization was improved by assigning all AAA units to corps, division,

and brigade formations (PVOZA). Aviation assets of the Air Defenses' Intercept Squadrons (PVOIA) were similarly organized, but, even though the airplane was considered a more efficient anti-aircraft weapon, command was retained by the aviation commander of the associated military district. The air defense zones were further divided into air defense regions in which points, including key rail junctions, were designated. These air defense regions generally coincided with the boundaries of the appropriate military district. Almost all the air defense assets of PVO were located within the structure when the war began. The other areas of the Soviet Union, except in the far east, were virtually without air defense protection, but they were also not attacked in the initial period of the war. At best the PVO structure presented an extremely cumbersome organization, which only further diminished its capability. Thirteen such zones existed at the end of June 1941. Figure 1-1 shows the Soviet air defense organization of this period.



SOVIET AIR DEFENSE ORGANIZATION - June 1941

Figure 1-1

CHAPTER I

Notes

- ¹ N. Borodachev, Taktika Vozdushnoi Oborony (Moscow: 1928). "The Tactics of Air Defense."

CHAPTER II
THE WORLD WAR II PERIOD

Organization

The surprise German attack on the Soviet Union found the air defense system less than adequately prepared to carry out its mission. How much of this was caused by Stalin's total refusal to accept hard intelligence that the attack was coming, and, hence, his virtual stand down orders to all echelons of the armed services, and how much was caused by the numerous deficiencies in the air defense system itself is hard to determine. While Stalin's reaction obviously played a significant role, it constitutes a non-definable element. What can be defined, however, is the Soviet admission that approximately 90% of all of the fighter-interceptors assigned air defense missions were obsolete and that approximately 66% of all medium caliber AAA was due for replacement when the war started. Target acquisition was still limited primarily to visual observation, although a small number of primitive radars (34) were available to PVO. Of this number, only six were capable of doing anything other than identifying the entry of an intruder into their ranging sweep. Still, even if a target could be accurately identified as to numbers, types, direction, altitude, etc. by the extant air warning system, only about 25% of the air warning stations (VNOS) had proper communications to enable rapid alerting of the point or zonal direction center. Thus, the progress from target acquisition to target engagement was in the vast majority of cases hampered by inadequate communications. While some communications means, such as landline telephone, probably were available, they too seem to have failed to perform as required. The obsolete or inadequate equipment, plus the apparent lack of initial alert status at the outbreak, because of Stalin's reluctance to face the realities of the moment, weighed heavily in the initial successes of German airpower over the Russian front.

At the moment of the opening of the Russian campaign, at 0300 hours on 22 June 1941, the German force consisted of 145 divisions of ground troops, along with about 2,000 combat aircraft.¹ The initial successes scored by the Germans in all areas were indeed impressive. Within the first 48 hours the Luftwaffe "had swept nearly all of the Soviet combat aircraft from the skies. By 28 June the High Command of the Luftwaffe announced that 4,000 Russian planes had been destroyed."²

While the Soviets acknowledge severe losses they have published no confirmation of these cited German figures. Suffice it to say that, regardless of the exact numbers, Soviet air defense was inadequate to ineffective in its overall performance.

The new equipment authorized after the 1939 reorganization was only just beginning to enter the inventory when the war began. What there was of it had also come too late to change the initial outcome. The numbers were too small, and insufficient time was available for essential training of the user personnel and units. Some of the new equipment did see service on 22 June. Some new fighter-interceptors (Yak-1, MiG-3 and LaGG-3) did get airborne, and new AAA weapons, such as 37mm and 85mm guns, were on hand but not in sufficient numbers to affect the outcome. An additional problem was severe personnel shortages. At the beginning of hostilities all units of the PVO were below strength:

<u>Unit Type</u>	<u>% of Troops Available</u>
Aviation Units (PVOIA)	60%
AAA Units (PVOZA)	70-85%
AAMG Units	70%
Searchlight & Balloon Units	50%

One manifestation of the low level of effectiveness that contributed directly to the heavy losses suffered in the initial hours of the German attack is the Soviet statement that the air warning service (VNOS) in the Western Special Military District was "poorly organized," and this was the cause for the losses in tactical aircraft that were caught on the ground at well identified airfields close to the frontier.³ No more than anyone else the Soviet air defense organization was caught by surprise by the German attack.⁴ That the surprise was not universal may be assumed by the

fact that at least some commanders, ignoring the deadly wrath of Stalin, had violated their orders and had gone to advanced readiness conditions. This factor, plus the human phenomenon of untested individuals rising to the occasion, is probably responsible for the disparate levels of effectiveness found among all units of the Red Army.

By August 1941, less than 60 days into the war, the first reorganization of Soviet air defense took place as a part of the overall realignment of the Red Army. Fronts (Army Groups) were established that incorporated all combat, combat support, and combat service support (Rear Services) elements in a particular linear area facing the enemy. The Air Defense Zones, as such, were disbanded. Some AAA assets were assigned directly to the fronts, where they served in the dual capacity of air defense and as direct-fire reinforcement of other antitank units. These AAA units were employed in an antitank role because of the extremely serious situation that existed at that time. German forces had enveloped large numbers of Soviet units around Minsk in the center sector, while at least 15 Soviet divisions had literally disappeared under the German thrust to the northeast across the Dvina River. Salvation rather than textbook utilization must have been the operative factor during these critical days.

The remainder of the air defense assets of the PVO were organized to defend the areas behind the fronts' rear boundaries and, in some cases, certain politico-economic points within the fronts' areas of responsibility. Although these elements were also prepared for antitank missions their principal responsibility rested in their air defense role.

This August 1941 reorganization marked the beginning of the true separation of the PVO into two components-- the PVO Strany, or Air Defense of the Territory of the Country, and the PVO Voisk, or Air Defense of the Troops. The PVO Strany in reality had two missions: air defense of the theater rear and air defense of the zone of interior. The bulk of the total air defense assets apparently went to the PVO Strany.

The PVO Strany during the War Years

The organization of the PVO Strany following the August 1941 reorganization is not clearly delineated, but it is assumed to have remained