Tactical Integrated Air Defense System

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The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

TACTICAL INTEGRATED AIR DEFENSE SYSTEM, by Major Michael C. Press, USAF,

Several significant events of the past decade have demonstrated the importance of tactical integrated air defense. These events include the air war over North Vietnam, the 1973 Middle East War, and the changes in Soviet offensive tactical air doctrine and capability. These three major events are examined and form the basis for a comprehensive assessment of the present United States tactical integrated air defense system (IADS).

The IADS assessment includes a study of IADS doctrine, organization, methods of control and integration, command and control equipment, weapons, and current joint training. The study concludes that the United States is inadequately prepared to conduct a tactical integrated air defense battle. Major deficiencies in all areas of the integration process are discussed.

Based on the foreseen importance of tactical integrated air defense in future wars and on the deficiencies in the present United States IADS, numerous recommendations are offered for improving IADS capabilities. The recommendations stress the need for increased Air Force/Army emphasis on tactical integrated air defense development in doctrine, equipment, weapons, tactics, and training.

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CHAPTER I

INTRODUCTION

> . . . Both air force and air defense force [Egyptian] commanders confirmed that, while it was an operational goal to use the MiG-21 as the first force to engage enemy aircraft at maximum range, it also was tactical doctrine for the interceptors to fight within the missile belt and continue harrying attacking forces all the way to their targets. They agreed that losses from friendly missiles were so relatively small that the tactics of using both interceptors and missiles in the same airspace was operationally sound and militarily effective against the offensive formations.[1]

The preceding account of Egyptian air defense operations over the Suez Canal missile belt in the 1973 Yom Kippur War raises significant questions about the United States air defense system. Do the Air Force and the Army have the capability to operate F-15s and I-Hawks in the same airspace? What is the United States air defense doctrine vis-à-vis interceptor and friendly missile integration? Given the United States air defense capabilities, are tactics that use both interceptors and missiles in the same airspace operationally sound and would they be effective against the threat? What are the command and control requirements necessary to operate in a totally integrated environment? These questions and others are answered in this study.

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[1] Robert Hotz, "Offense, Defense Tested in 1973 War," in Both Sides of the Suez: Airpower in the Mideast, ed. Editors of Aviation Week & Space Technology [New York: McGraw-Hill, 1975], p. 40.

Objectives of the Study

The purpose of this study is to investigate the present United States integrated air defense (IAD) doctrine, tactics, and training. Integrated air defense is defined as the combined efforts of the Air Force defensive counterair resources with the support of Army air defense artillery. The principal objective is to focus on the defensive counterair battle and to analyze the integration of interceptor and ground defense systems. Given the capabilities of the present air defense system, a determination is made on the viability of integrating air defense resources. Finally, changes to IAD doctrine, tactics, and training are recommended on the basis of the conclusions regarding requirements, capabilities, and viability of integration.

Limitations

The Air Force counterair role ranges from active offensive missions against enemy airfields to passive defensive measures such as reinforced hangars. This study is limited to the active defensive counterair mission in an area of operations. Although specific operational areas are not addressed, overseas land tactical operations are the principal concern as opposed to strategic air defense in the Continental United States.

To further limit the scope of this thesis, analysis of the Army's contribution to air defense was narrowed to the integration problem. Army air defense doctrine lists four basic weapons employment

principles: mass, mix, mobility, and integration. The integration employment principle is twofold: first, integration of air defense resources into the ground commander's battle plan and, second, integration of the resources into the battle for air superiority. This study focuses on the second integration employment principle to determine how the Army perceives the concept of integrating air/land defensive resources in a major conflict.

Methodology

United States air defense forces have not been seriously challenged since World War II. Air superiority over United States ground forces was uncontested in Korea and Vietnam. For this reason, United States IAD doctrine, capabilities, and training have not received the scrutiny of extensive investigation and examination. Combined Air Force/Army training exercises continually stress offensive counterair, interdiction, and close air support missions. Because of this reduced historical and operational first-hand experience in IAD, United States military decisionmakers must depend on the IAD experiences of other countries.

In recent wars, North Vietnam, Egypt, and Syria proved to be experts in modern air defense employment. Because of the massive air threats they faced, their air defense systems were highly sophisticated and integrated. The discussion in Chapter II summarizes the effectiveness of their integration experiences.

Any evaluation of current air defense requirements must consider the threat against which it might be employed. Simply determining an enemy's air order of battle does not satisfy this requirement. Other factors such as the enemy's aircraft capabilities, doctrine, tactics, and training must be analyzed to determine joint Air Force/Army requirements. Therefore, to serve as a baseline for evaluating the present IAD capabilities of the United States, Chapter III contains an analysis of the present Soviet tactical air threat.

Given the historical background and operational requirements for IAD, an evaluation of the present United States integrated air defense system (IADS) is presented in Chapters IV and V. In Chapter IV, the evaluation includes Air Force/Army IADS doctrine, organization, and methods of control and integration. Chapter V contains a review of IADS weapons and recent IADS training in combined Air Force/Army exercises. This review illustrates the lack of practical understanding of the air defense integration problem.

The summary, conclusions, and recommendations are presented in Chapter VI. This thesis should provide decisionmakers with additional insight into the air defense integration problem.

CHAPTER II

IADS IN COMBAT

> . . . The American pilots have made a fool of our air force right from the beginning. They think we have only a few outdated jets and dare not intercept them head on. If we do, they will let us have it. So we pretend to intercept, let them pursue us, and lead them into a trap. They have been trapped many a time, because we arrange with the missile troops and Mig-21 units to give them the work.
>
> North Vietnamese MIG-17 Pilot[1]

Introduction

In the past 14 years there have been two major conflicts in the world where modern air defenses played a significant role. In the first conflict, the North Vietnamese, starting from very humble beginnings, built an integrated air defense system (IADS) that battled United States airstrikes off and on for more than eight years. The second major conflict was the 1973 Yom Kippur War. Arab Forces, after being so soundly defeated in 1967, surprised the Israeli Air Force with their air defense effectiveness.

These two conflicts provide the historical base for examining

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[1]Teramoto Keiji, "The Air Combats I Witnessed in North Vietnam" (pp. 10-11, 44-45, & 93-95 in the magazine Koku Fan, Vol. 20, No. 1, 1971, which the Air Force Foreign Technology Division translated, edited, and repaginated as pp. 1-16, 3 October 1972), p. 7. (DDC Doc. AD 904872L.)

modern air defense integration doctrine in actual combat. The North Vietnamese, Egyptians, and Syrians are the only three countries that have employed missiles and interceptors together in actual prolonged combat conditions. It can be argued that Israeli air defenses also engaged targets in the 1973 war, but these proved to be isolated incidents and the Israeli air defenses remained relatively unchallenged throughout the war. The first three countries, however, defended against sustained offensive air attacks throughout the conflicts in which they were involved. Also, their air defenses were challenged by what were possibly the two best offensive air forces in the world.

The North Vietnamese and Arab air defense experiences during their respective conflicts are examined for the purpose of understanding how these countries integrated their missile and antiaircraft artillery (AAA) with their interceptor forces. Their integrated air defense strategy and doctrine are investigated. Specific integration tactics between the interceptors and ground systems are also reviewed. Finally, an evaluation is made on the effectiveness of their integrated air defense systems. These two conflicts are discussed separately and are followed by a comprehensive conclusion.

North Vietnam Air War

The first air war in which the surface to air missile (SAM) was employed in combat was the air war over North Vietnam. Before studying the North Vietnamese IADS, it is necessary to describe briefly the long air war and the North Vietnamese defensive strategy.

Three major United States air campaigns called Rolling Thunder, Linebacker I, and Linebacker II comprised the air war in North Vietnam. Rolling Thunder officially lasted three years, from 2 March 1965 to 31 March 1968, although the first airstrikes in North Vietnam actually occurred on 5 August 1964 in retaliation for the Gulf of Tonkin incident.[2] Rolling Thunder ended when President Lyndon Johnson declared a bombing halt above the 20th parallel in an attempt to get Hanoi to the peace table. In the 3 years of bombing during Rolling Thunder, more than 350,000 sorties were flown over the North and 915 fixed-wing planes were lost to the North Vietnamese air defenses. The North Vietnamese claim they downed more than 3,000 planes in this operation; however, their claim includes aircraft losses from all causes, plus pilotless drones. In fact, more than 1,200 aircraft were lost to "non-hostile" actions throughout Vietnam during these 3 years.[3]

From 1968 to mid-1972, bombing operations in the North were limited to sporadic retaliatory attacks on missile and gun sites. Then, on 8 May 1972, President Nixon began Operation Linebacker I, which lasted until 23 October 1972. Although the targets in Linebacker I were similar to those in Rolling Thunder, the development and use of the "smart" bomb and advanced weapon systems dropped the daily sortie rate

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[2]U. S. G. Sharp and W. C. Westmoreland, Report on the War in Vietnam (Washington: Government Printing Office, 1969), pp. 12-16.

[3]Jon M. Van Dyke, North Vietnam's Strategy for Survival (Palo Alto, Calif.: Pacific Books, 1972), pp. 240-41 & 248.

by approximately one-third that of Rolling Thunder. The air-to-air war in Linebacker I, however, was larger than in Rolling Thunder. MIG losses totaled 69 (59 in the air and 10 on the ground) during the 6-month operation, compared to 112 MIG kills in the 3 years of Rolling Thunder.[4]

The bombing halt of 23 October 1972 lasted less than two months. From 18 to 29 December 1972, Linebacker II, the most intense bombing campaign of the entire war, was conducted. It was an all-out air offensive designed to break the war-making capability of the North Vietnamese.[5] During those 12 days, more than 4,000 sorties were flown over North Vietnam and at times more than 200 aircraft crowded the skies above Hanoi. Attacks took place around the clock, with B-52s and F-111s flying night-time raids.[6] Enemy air-to-air attacks were minimal because of poor weather, night-time raids, and F-111 attacks on MIG airfields. Only 32 MIGs were launched during Linebacker II, and 8 of them were shot down.[7] United States losses during Linebacker II totaled 26 aircraft:

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[4]"Airpower Provides Viet Leverage," Aviation Week & Space Technology, 30 October 1972, p. 12; and Van Dyke, pp. 243-44.

[5]U.S., Congress, House, Committee on Appropriations, Subcommittee on Department of Defense, Briefings on Bombings of North Vietnam, Hearings, Committee Print, 93d Cong., 1st sess., March 1973, pp. 4 & 14-15. (Congressional Information Service, Microfiche H181-1.)

[6]Frank Giusti, "Linebackers of the Sky," in Guide for Air Power Case Study: Linebacker I and II, Area III, Course 1975-76, Instruction Period 3107, ed. William B. Hill (Air War College, Department of Military Strategy, n.d.), pp. 86-89.

[7]U.S., Congress, pp. 4, 11, & 38.

15 B-52s, 5 Air Force fighters (including 2 F-111s), and 6 Navy planes.[8]

When Linebacker II ended, the United States began its final disengagement from Vietnam. The air war in North Vietnam was over. The unclassified number of sorties flown in the eight years over the North Vietnamese defenses is difficult to find, as is the exact toll of aircraft losses. Unofficial sources indicate that the total number of aircraft shot down over the North was about 1,700.[9] Regardless of figures, the North Vietnamese obviously became extremely experienced at air defense.

Air Defenses

The North Vietnamese air defense system that challenged the American bombing became recognized as one of the greatest air defense systems of modern warfare. As Major General George B. Simler stated, "The air defense system in North Vietnam is the most formidable and sophisticated our aircrews have yet encountered in any conflict."[10] General John P. McConnell, former Air Force Chief of Staff, referred to the North Vietnamese defenses as "the greatest concentration of antiaircraft weapons that has ever been known in the history of defense of any

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[8]U.S., Congress, p. 5.

[9]"Antiaircraft Defense in North Vietnam" (pp. 55-71 in the magazine Norsk Artilleri-Tidsskrift, No. 3, 1974, which was translated and repaginated as pp. 1-18 by Leo Kanner Associates, Redwood City, Calif., 30 September 1975), p. 16. (DDC Doc. AD B009853L.)

[10]George B. Simler, "North Vietnam's Air Defense System," Air Force/Space Digest, May 1967, p. 81.

town or any area in the world."[11]

This powerful North Vietnamese air defense system grew from very humble beginnings. In late 1964 the North Vietnamese had only 84 aircraft (30 trainers, 50 transports, and 4 helicopters), 700 conventional antiaircraft guns, and 20 early warning radars of limited capability. They had no SAMs. Defenses were limited to population centers and military installations and were restricted to altitudes below 20,000 feet.[12] The warning system during the early days of the war was primitive. One eyewitness observed: ". . . When a plane was spotted, word was spread either by radios and telephones or by less sophisticated methods, such as whistles, gongs, triangles, and drums. . . ."[13]

From this austere beginning, the North Vietnamese defenses grew into an awesome force. By the end of Rolling Thunder, March 1968, there were more than 8,000 AAA weapons. Among them were 37mm, 57mm, and 100mm radar guided cannons that were capable of attacking aircraft up to 40,000 feet altitude.[14] The Soviet-built SA-2 SAM system was introduced in April 1965. The first successful SAM firing on 24 July 1965 downed an F-4C aircraft. During Rolling Thunder, more than 300 SAM sites were identified and more than 5,500 SAMs were launched.[15] MIG-17s, MIG-19s,

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[11]Simler, p. 82.

[12]Sharp and Westmoreland, p. 13.

[13]Van Dyke, p. 65.

[14]Sharp and Westmoreland, p. 48; and Van Dyke, p. 64.

[15]Sharp and Westmoreland, pp. 18 & 48; and Van Dyke, p. 60.

and MIG-21s were integrated into the defenses, and by late 1968 more than 150 MIGs were operating from bases such as Peitum Yunnani in Southwest China and Phuc Yen and Gia Lam in North Vietnam.[16] Their warning system was modernized and expanded to provide extensive overlapping coverage from the Gulf of Tonkin to Laos. It included altitude discrimination with height finders, and more than 350 radars were operating in North Vietnam. Admiral U. S. G. Sharp, the wartime commander in the Pacific, said in reference to the North Vietnamese defenses:

> . . . The radar net was evaluated as having the capability to detect and track aircraft above 1,500 to 2,000 feet and the net was also probably sufficiently sophisticated to maintain continuity of tracking and coordinate air defense even under pressure of multiple penetrations. GCI [ground-controlled intercept] radars provided control for jet operations in the Haiphong-Hanoi-Thai Nguyen areas, and, for a time, in the southern Panhandle in early 1968.[17]

During the four-year bombing halt between Rolling Thunder and Linebacker I (1968-1972), the North Vietnamese increased their capability even further. A total of 2,500 SAMs were fired in Linebacker I, and more than 1,000 were fired in the 12 days of Linebacker II. MIGs increased in number to a total of 250.[18] One of the most significant developments of this period was the integration of the North Vietnamese radar system, as explained in the excerpt that follows.

> Late in 1971, North Vietnam worked out and executed the integration of all of its radar systems. . . .

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[16] Van Dyke, p. 62.

[17] Sharp and Westmoreland, p. 48.

[18] "Antiaircraft Defense in North Vietnam," pp. 8 & 12; and U.S., Congress, p. 30.

> The essential link in the system was the interaction between the sector radar stations and the local missile batteries' target tracking radars. . . .
>
> By coupling these systems together, the missile batteries were warned earlier than they had been previously, so that the missiles were ready to be fired before the attacking planes had arrived. Eventually all of North Vietnam was covered by a cohesive radar network.[19]

Integration Tactics

As evidenced by the record, the North Vietnamese had ample time to develop and refine their air defense strategy. Although they relied primarily on the antiaircraft gun, integration of their small fleet of MIGs into the overall defense system became quite ingenious. The MIG tactics changed throughout the war, but basically the North Vietnamese strategy was to employ the MIG to complement the other weapons in an integrated air defense.

General William W. Momyer, wartime commander of the 7th Air Force and Tactical Air Command, reflecting on how the MIG tactics varied during the war and how they affected American tactics, wrote:

> . . . During the early part of the war, F-4s carried bombs and were assigned targets in the same general area as the F-105s. . . . In addition, the MiG threat was very low so there was no need to sacrifice the bombing potential of the F-4. As the MiG threat increased and as the enemy radar system improved, it became necessary to take the F-4s out of the strike role and use them exclusively for air-to-air combat. . . .
>
> . . . The enemy realized that the bombing attacks were doing the real damage . . . . In order to stop these attacks, the enemy positioned the MiG-17s, which had good maneuverability, along the

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[19] "Antiaircraft Defense in North Vietnam," p. 15.

> ingress routes of the F-105s. These MiG-17s would be held at specific points at a very low altitude.
>
> As the F-105s would start to boost their speed up for the final leg into the target and just prior to the heavily defended SAM ring, the MiG-17s would pop up and try to force the F-105s to jettison their bombs. . . .[20]

The tactics described in the preceding passage demonstrate the coordination that must have taken place in the air defense network. Another recounting by an F-105 pilot of Operation Rolling Thunder further emphasizes this point.

> Generally, however, you could see steady improvement in their defense coordination and as you moved down the Ridge you would go through a definite Mig area where the Sams, although they might be actively operating their radar, would not be firing. Once you broke through that quadrant, the Sams would start filling the air. The ground fire was always present during this phase and in the area of the target itself. As soon as you came back up off the target, you would usually find the Migs shunted in against you, and you would have to fight your way back out. . . .[21]

Although specific integration tactics are difficult to find, research indicates that the North Vietnamese relied basically on a geographical and time separation between their MIGs and SAMs. A highly centralized command and control network directed the integrated tactics.[22] By the middle of Rolling Thunder, Admiral Sharp was concerned about the integrated tactics effectiveness. He said:

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[20]William W. Momyer, "Momyer Cites Viet's Tactical Lessons--2," Aviation Week & Space Technology, 4 June 1973, p. 59.

[21]Jack Broughton, Thud Ridge (Philadelphia: J. B. Lippincott Company, 1969), p. 106.

[22]Cecil Brownlow, "North Viets Intensify Combat Capabilities," Aviation Week & Space Technology, 8 July 1968, p. 14.

> During 1966 MIG aggressiveness against our strike forces increased from an average of only one engagement per month in the first half of the year to an average of about 12 per month during the last half. Interference by MIG's on numerous occasions served to force strike aircraft to jettison their ordnance in order to engage the attacking MIG's, or to evacuate the area. An increasingly effective air defense effort was evident as coordination between fighters, SAM's, antiaircraft artillery, and radar elements improved. . . .[23]

Late in the Rolling Thunder campaign the MIG-21 began appearing more frequently. It engaged the Americans with a new tactic of close control intercepts with hit-and-run attacks. As General Momyer related:

> . . . The increased deployment of SAMs, greater concentration of AAA, better integration of radars and an increased number of MiG-21s made these new tactics feasible. With a small fighter force, it was necessary that it be under very close control and that it be committed to battle only when the situation was most favorable. . . .[24]

The extremely coordinated air defense network plus the MIG tactics proved successful, for no MIGs were reported lost to friendly defenses. In the unclassified literature examined, the only mention of possible interference appeared in the two extracts below.

> . . . [Migs] could hose a missile at you, but if you keep [kept] thundering, they couldn't quite get the edge they wanted. It must have been frustrating to them, and I had one Mig-21 who got so wrapped up in trying to shoot me down that he made us a flight of five and even stuck in there as I pulled up and rolled in on the bomb run. It was not until the massive ground fire from his compatriots engulfed us that he realized he was in sort of a stupid spot and got out. . . .
>
> . . . . . .
>
> . . . [W]ith the Migs, Sams and guns well coordinated, the defense was probably as intense as the Northern forces could muster and the Migs were particularly active. They would orbit in a

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[23] Sharp and Westmoreland, p. 27.

[24] Momyer, p. 59.

> specific area and you would have to fight first through them and then through the Sams. The Migs would stay pretty well dispersed so as not to soak up the Sams, but there have been occasions when the Migs have not done their homework too well and have wound up right in the middle of their own ground fire.[25]

Yom Kippur Air War

In the 1973 Middle East War, the Arabs did not overlook the lessons of Vietnam. The humiliating defeat the Arabs suffered in 1967 and the long War of Attrition from 1967 to 1970 convinced them that a strong air defense system was a prerequisite for victory. By the summer of 1973, only six months after Linebacker II ended, the Arabs had developed their version of an integrated air defense system.

Before examining the Arab system and integration procedures, recapping chronologically the events that occurred prior to and during the 1973 air war is also important. The roots of the October 1973 air war strategy go back to the debacle the Arabs suffered in the 1967 war. The Israeli Air Force (IAF) won that war almost by default, because the IAF's surprise preemptive air strikes defeated the Arab air forces and defense forces in the first few hours of the war. The War of Attrition, which culminated in deep Israeli air strikes in 1970, convinced the Egyptians that a stronger and more effective air defense was required.

Air Defenses

The Soviets were asked to help stop the Israeli bombings and build a strong defense. In February 1970, the Soviets sent the first

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[25]Broughton, pp. 72 & 106.

SA-3 SAMs to Egypt, and by July 1970 more than 10,000 Soviet air defense advisors were in the country. Included in this force were MIG-21Js that were flown by Soviet pilots.[26] The success of the Soviet buildup began to pay off and IAF losses began to mount. In the six weeks before the August 1970 War of Attrition cease fire, IAF losses equaled those of Egyptians at six apiece. Prior to this and since June 1967, the Egyptian loss had been 110 aircraft to 16 for the Israelis. The War of Attrition cease fire came before the Israelis could realize the effects of a modern air defense system.[27]

Egyptian generals have called the War of Attrition a valuable training exercise. One of them said:

> We did not start to prepare our forces from scratch. We knew the enemy whom we were charged to confront; we had greatly benefited from actual contact with him during the War of Attrition from 1967 to 1970. We carefully analyzed the combat actions during this period. We were able to acquire a complete knowledge of the enemy's methods and tactics. We unceasingly watched and followed up all the new developments in Israel's Air Forces until our enemy became an open book before us. . . .[28]

Another said:

> The War of Attrition was in fact a practical experience for our Air Forces which restored to us our self-confidence. One of the

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[26] Insight Team of the London Sunday Times, The Yom Kippur War (Garden City, N. Y.: Doubleday & Company, Inc., 1974), pp. 35-36.

[27] Ibid., pp. 42-43.

[28] Mohamad Aly Fahmy, "The Role of Egyptian Air Defence in the October/73 War," in Military Sector, Vol. I of The Book of the International Symposium on the 1973 October War: Cairo, 27-31 October 1975 Proceedings [ed. Ahmed Ali M. Amer] (Cairo: Ministry of War, 1976), p. 86.

> lessons from which we gained experience was that our pilots discovered the Israeli air combat methods and their ways of infiltrating through the gaps of our air defence.[29]

The period between 1970 and 1973 was a time for regrouping and further rebuilding. Prior to July 1972, when Egyptian President Sadat expelled the Russians from Egypt, there were more than 15,000 Soviet missile technicians in the country. Also, there were 50 SA-2 and SA-3 sites and between 100 and 200 MIG-21J and SU-11 pilots in Egypt.[30] On 3 May 1973 Syrian President Hafez Asad made a 24-hour visit to Moscow and returned with Soviet Air Force Commander Marshal Kotakhov and a promise to complete the Syrian air defense system with SA-6s and an additional 40 MIG-21s.[31]

At the start of the 1973 war, the completed Arab air defense network was impressive. The initial order of battle prior to hostilities showed the IAF outnumbered almost two to one (see Table 1).[32] The

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[29]Mahmoud Shaker Abdel Moniem, "The Role of the Air Force in the Operations of October 1973," in Military Sector, Vol. I of The Book of the International Symposium on the 1973 October War: Cairo, 27-31 October 1975 Proceedings [ed. Ahmed Ali M. Amer] (Cairo: Ministry of War, 1976), pp. 130-31.

[30]Insight Team of London Sunday Times, p. 56; and D. K. Palit, Return to Sinai: The Arab Offensive, October 1973 (Dehra Dun, New Delhi: Palit & Palit, 1974), p. 26.

[31]Insight Team of London Sunday Times, p. 72.

[32]Stig Lofgren, "Missiles Against Tanks and Aircraft," in Military Sector, Vol. I of The Book of the International Symposium on the 1973 October War: Cairo, 27-31 October 1975 Proceedings [ed. Ahmed Ali M. Amer] (Cairo: Ministry of War, 1976), p. 103; Palit, pp. 54, 69, & 91; and Strategic Survey, 1974 (London: International Institute for Strategic Studies, 1975), p. 15.

TABLE 1.--Pre-1973 Hostilities Air Order of Battle

Aircraft	Egypt	Syria	Aircraft	Israel
MIG-21	210	200	Mirage	35
MIG-17	105*	80	F-4	100
SU-7	80	30	A-4	160
TU-16	25	0		
Total	420	310	Total	295

*Approximate figure; 6 to 7 squadrons.

SOURCES: Stig Lofgren, "Missiles Against Tanks and Aircraft," in Military Sector, Vol. I of The Book of the International Symposium on the 1973 October War: Cairo, 27-31 October 1975 Proceedings [ed. Ahmed Ali M. Amer] (Cairo: Ministry of War, 1976), p. 103; D. K. Palit, Return to Sinai: The Arab Offensive, October 1973 (Dehra Dun, New Delhi: Palit & Palit, 1974), pp. 54, 69, & 91; and Strategic Survey, 1974 (London: International Institute for Strategic Studies, 1975), p. 15.

ground defenses were even more impressive. Egyptian air defense forces, under the command of Major General Mohamad Aly Fahmy, had completed an interlocking system of missile batteries. This system represented a triangular shaped defensive pocket with its apex at Cairo and its base stretching from Port Said to the city of Suez (see Fig. 1).[33] In this triangle were some 158 batteries of SA-2s, SA-3s, and SA-6s complemented by SA-7 and ZSU-23 units. Along the Suez Canal alone there were 62 missile batteries that included 46 SA-6 batteries.[34]

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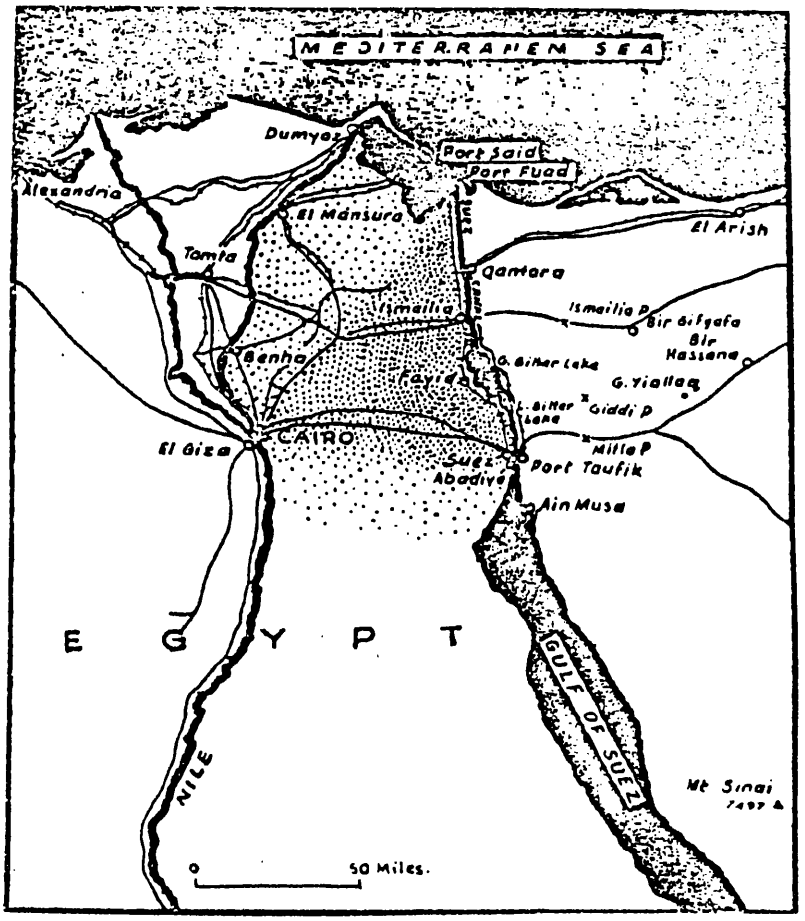
[33]Palit, p. 27.

[34]Chaim Herzog, The War of Atonement, October 1973 (Boston: Little, Brown and Company, 1975), p. 256; Insight Team of London Sunday Times, p. 189; and Palit, pp. 69-70.



SOURCE: D. K. Palit, Return to Sinai: The Arab Offensive, October 1973 (Dehra Dun, New Delhi: Palit & Palit, 1974), p. 27.

Fig. 1. Density of SAM Cover Over Egyptian Territory

In Syria the missile defense was not as dense, but it was just as deadly. Prior to the war, the Syrians were deployed along the front line with 32 SA-6 batteries and approximately 22 SA-2 and SA-3 batteries. They also possessed the SA-7 and ZSU-23 guns.[35]

The air defense forces described above replaced North Vietnam's air defense system as the world's most dense employment of antiaircraft equipment. As Israel's Moshe Dayan stated:

> . . . I doubt whether there is another place in the entire world that is protected by such a dense array of modern missiles. I doubt whether there is a place in Russia or Vietnam that is equipped like the Arab front--and, chiefly, the Egyptian front at the canal.[36]

The Yom Kippur War lasted only from 6 to 22 October 1973. It began at 1358 hours on Saturday with a massive Arab air attack on Israeli positions. The Egyptian strike consisted of 220 aircraft attacking interdiction targets in the Sinai. The commander of the Egyptian Air Force, Air Lieutenant General Mahmoud Shaker Abdel Moniem, provided the following list of targets that were damaged in this strike:[37]

3 primary runways	2 major command centers
3 secondary runways	1 telecommunications center
12 Hawk sites	2 radar stations
2 field artillery positions	

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[35]Herzog, p. 254; and Insight Team of London Sunday Times, p. 189.

[36]Insight Team of London Sunday Times, p. 189.

[37]Robert Hotz, "Offense, Defense Tested in 1973 War," in Both Sides of the Suez: Airpower in the Mideast, ed. Editors of Aviation Week & Space Technology [New York: McGraw-Hill, 1975], p. 38; and Moniem, p. 133.

The initial Syrian attack consisted of 100 aircraft which concentrated on low level strafing and rocket attacks on front line Israeli troops, as opposed to deep interdiction targets.[38]

Following the initial offensive air attacks, the Arab air forces were employed primarily on the defense throughout the remainder of the war. Major General Binyamin Peled, the wartime IAF commander, estimated that 80% to 90% of the Arab fighter force was allocated to the air defense role during the war.[39]

On 6 October 1973 the IAF struck hard at the bridges across the canal and also at the Syrian first echelons that were breaking through on the Golan southern flank. The Israelis, however, were surprised at the extremely stiff and effective air defense resistance. The employment of the SA-6 and ZSU-23 especially concerned the Israelis. In the first afternoon alone, the IAF lost 30 A-4s and 10 F-4s to SA-6 and ZSU-23 defenses on the Golan Heights.[40]

On 7 October the IAF mounted a major air attack on Egyptian air bases and SAM sites in the Nile Delta. The Egyptian air defenses were ready. Sixty MIG-21s were launched to meet the attack, and a massive

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[38]Herzog, p. 257; and Insight Team of London Sunday Times, p. 133.

[39]Binyamin Peled, "The Air Force in the Yom Kippur War: Main Moves and Lessons," in Military Aspects of the Israeli-Arab Conflict, ed. Louis Williams (Tel Aviv: University Publishing Projects, 1975), p. 242.

[40]Insight Team of London Sunday Times, p. 161.

air battle ensued. ". . . The MIG-21 formations attacked the Phantoms first to get them to jettison their bombs. The Israelis made a determined penetration, and the air battle swirled through the air defense force missile belt to the airfield target areas."[41] The Egyptians later claimed that not one aircraft on the ground was destroyed and that the air bases were repaired quickly. Smaller IAF attacks occurred on 8 and 9 October 1973, but after 9 October they were stopped completely due to poor results and higher priorities elsewhere.[42]

By 8 October the Israelis had already diverted most of their air strikes to the Golan Front in an attempt to blunt the Syrian offensive. Even though the IAF losses were tremendous (about 1 A-4 shot down in every 12 sorties), the IAF was credited with saving the Golan Front.[43] The IAF losses during the first 3 days were put at 50 to 80 aircraft, more than one-third of its forces.[44]

On 9 October, in retaliation for Frog attacks, the IAF began air strikes against strategic targets in Damascus. This was also an IAF attempt to tie up Syrian air defense forces in Damascus and prevent the Syrians from resupplying SA-6s to their depleted missile batteries on the Golan Front. After 9 October, the air war in the north stabilized with IAF air superiority over the Golan and IAF sporadic interdiction

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[41]Hotz, p. 39. [42]Hotz, p. 40.

[43]Insight Team of London Sunday Times, pp. 182-83.

[44]Palit, p. 157.

missions deep into the heart of Syria.[45]

From 9 through 13 October 1973, the IAF fought an intense air battle over Port Said. Experts are still unsure of why the IAF conducted such a major effort at knocking out the missile batteries at Port Said, because no major ground battles were fought there once the IAF was successful. The Egyptians claimed the IAF lost 28 aircraft to interceptors, missiles, and guns in this battle.[46]

By 15 October, Israeli General Ariel Sharon began the final battle of the war when he crossed the Suez Canal and began attacking Egyptian SAM sites on the ground in the vicinity of Seversoir. Due to this threat, on 18 October the Egyptians released their air force for full-scale defensive operations. For the first time since the air battle on 9 October, Egyptian interceptors began fighting inside the missile belt. In the following four days the Egyptian Air Force fought 18 major air battles with air-to-air engagements that ranged up to 50 aircraft and lasted more than 40 to 50 minutes. The Egyptians launched more than 2,500 sorties in one week. Israel claims that during this battle, 200 Egyptian aircraft were lost versus 3 for the IAF.[47]

The war ended on 22 October. As usual the losses on both sides were contested, but the following aircraft losses are close to those

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[45] Insight Team of London Sunday Times, p. 204.

[46] Hotz, pp. 40-42.

[47] Insight Team of London Sunday Times, p. 376; and Moniem, p. 136.

mentioned in most sources: Egypt, 182; Syria, 165; and Israel, 120.[48] Contradictions also exist regarding the most effective weapon in shooting down Israeli aircraft. The different claims are shown in Table 2.

TABLE 2.--Percentage of Israeli Aircraft Versus Type of Defensive Weapon

IAF Losses Due To:	Arab Claim	Israeli Claim
Air-to-air combat	30%	15%
Missiles	60%	30%
Antiaircraft artillery	10%	30%
Unknown	. .	25%

SOURCE: Stig Lofgren, "Missiles Against Tanks and Aircraft," in Military Sector, Vol. I of The Book of the International Symposium on the 1973 October War: Cairo, 27-31 October 1975 Proceedings [ed. Ahmed Ali M. Amer] (Cairo: Ministry of War, 1976), p. 104.

The Israelis claim that Arab interceptors shot down only 5 of their aircraft and that they made 334 kills themselves.[49] The Egyptian pilots, on the other hand, say they shot down many Israeli aircraft. Perhaps the discrepancy lies in the pride of the Israeli pilots. An Egyptian MIG-21 regiment commander, who said his squadrons accounted for a total number of 22 Israeli kills, remarked that he believed ". . . many Israeli pilots who punched out of their stricken planes reported they had been hit by a SAM rather than shot down by a MiG to salve their

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[48] Strategic Survey, 1973 (London: International Institute for Strategic Studies, 1974), p. 26.

[49] Herzog, p. 259.

pride."[50] Regardless of the actual figures, the Egyptians at least feel that they regained their self-respect in the battle for air superiority. As General Fahmy explained:

> . . . Despite these great Israeli losses, we believe that the greatest loss it has sustained from the Egyptian Air Defence Forces is the psychological shock to its Air Force High Command and its pilots and the fact that their self-confidence has been shaken. The enemy, two years after the October War, is still doubtful and perplexed about the reasons of his losses in planes. This alone is something for our Air Defence Forces to be proud of. . . .[51]

Integration Tactics

After examining the war, it is evident that the Arab defensive strategy was to rely on the missile belts as their primary defensive weapon. The air forces were given the task of protecting the flanks and providing limited ground support with MIG-17s and SU-7s. This was especially true with the Egyptian Air Force, for it was held in reserve following the initial air strikes and was not fully used until the air battles over the Suez began on 8 October 1973.[52]

Although not as much information is written on Syria's defensive strategy, its air force was aggressive on the Syrian front during the war. For example:

> . . . Syrian (and later Iraqi) MIGs were thrown into the fray with what seemed reckless abandon, but they provided a considerable degree of close support to the ground forces attacking on the Golan

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[50]Robert Hotz, "Egypt Plans Modernized Air Arm," in Both Sides of the Suez: Airpower in the Mideast, ed. Editors of Aviation Week & Space Technology [New York: McGraw-Hill, 1975], p. 36.

[51]Fahmy, p. 94.

[52]Palit, p. 154.

> Heights. Furthermore, probably because of a lesser degree of SAM cover than in the Canal Zone, Syrian based fighters remained in the air more often.[53]

Both Egypt and Syria had problems integrating their air forces and their air defense forces. In 1969 Egypt formed a separate Air Defence Force that was similar to the Soviet Union's PVO Strany.[54] Syria, on the other hand, maintained its air defense forces under the Syrian Air Force, which "perhaps resulted in a close though less sophisticated coordination of missile defences and fighter aircraft."[55] The Egyptian air defense system was highly centralized and similar to the network in North Vietnam. A report by Aviation Week editor Robert Hotz after the war demonstrated this centralization. He wrote:

> The heart of the air defense system is the joint command post at brigade level where an air force colonel and the air defense brigade commander sit side by side with the combat situation display and remoted radarscopes. . . .
>
> . . . . . .
>
> Based on the information it gets from its radar troops and forward visual observation posts, the joint command post directs the air battle in the sector covered by its missile battalions and interceptor aircraft.[56]

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[53] Palit, p. 156.

[54] Robert Hotz, "Battlefield Equation Changes Seen," in Both Sides of the Suez: Airpower in the Mideast, ed. Editors of Aviation Week & Space Technology [New York: McGraw-Hill, 1975], p. 24.

[55] Palit, p. 157.

[56] "Command Strives To Improve Capabilities," in Both Sides of the Suez: Airpower in the Mideast, ed. Editors of Aviation Week & Space Technology [New York: McGraw-Hill, 1975], pp. 20-21.

The Egyptians, as can be determined through bits and pieces of information, relied basically on corridors for integration of offensive operations and geographical separation for integration of defensive operations. During the major offensive interdiction mission the Egyptian Air Force flew against targets in the Sinai on 6 October 1973, corridors or "passways" were made through the missile belt for the bombers. As General Moniem explained:

> The air formations participating in the strike flew at very low altitudes, nearly touching the sand barriers on both sides of the Canal. Fighter bombers and medium bombers guarded by fighters were used in this raid.
>
> The artillery fire preparations started five minutes after the beginning of the air strike. Therefore, the back trip of the planes after bombarding their targets was a difficult operation that was well-coordinated with the command of the Air Defence forces since the time between the passage of each plane and the other through definite passways for the return trip did not exceed a few seconds.[57]

For aircraft returning from close air support missions, the procedure was to circumvent the missile belts. As explained in the account that follows, this procedure was not always successful.

> The inter-locking missile belt on the West bank posed a problem for Egypt's own aircraft too, because it is almost impossible to rely on I.F.F. [identification, friend or foe (radar)] equipment when aircraft come in flying low and at speeds of Mach I and above. The missile radar is not given sufficient reaction time for its "recognition" procedure, hence there is always a danger of aircraft being hit by their own missiles. Rather than lay down a system of "silent" lanes--which the Israeli air force would soon have discovered--it was decided that Egyptian fighters on their way to or back from their missions over Sinai would have to circumnavigate the missile belt. If they strayed into it there were risks of being hit

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[57] Moniem, p. 133.

by their own missiles. Some aircraft are reported to have been lost on this account.[58]

On the defense, the Egyptian plan was not to employ MIGs inside the missile belt. They would be operated on the flanks or forward or in the rear. This, of course, worked during the early days of the war, but by 18 October 1973 the Egyptians were forced to abandon this strategy. One source used the words below to recount the dilemma the Egyptians faced.

> . . . The only method of ensuring safety for one's own aircraft is to arrange "clear fire" zones through the area--that is, air corridors in which the missile sites have been closed down for certain mutually agreed periods. The danger in this, of course, is that enemy radar surveillance would at once recognise the existence of such corridors and the enemy air force would use them for their own anti-missile offensive. The Egyptians, so dependent on their missile cover, decided that clear-fire zones could not be permitted --a decision which prevented the Egyptian air force from operations over the area except in emergency; and, if used then, they would simply have to accept the risk of being hit by their own missiles.[59]

Of course emergencies did exist whereby the Egyptian High Command was forced to employ MIGs in the missile belt. The results were predictable, but evidently the Egyptians were prepared for them and even admitted shooting down friendly aircraft over the Suez Canal missile belt.[60] There are claims that a total of 58 Arab aircraft were shot down by their own forces.[61]

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[58]Palit, pp. 154-55. [59]Palit, p. 70.

[60]Hotz, "Offense, Defense Tested in 1973 War," p. 39; and Palit, p. 155.

[61]Herzog, p. 260.

> . . . The whole blame for such losses should not, however, be borne by the Air Defence System alone. It is reported that because of the linear defensive deployment of SAM sites, the disengagement procedures of Egyptian aircraft were at times faulty. Furthermore, in the forward positions on the East bank bridgeheads, ground forces were operating the shoulder-controlled SAM-7s (Strela) missiles: twin-barrelled antiaircraft guns mounted on trucks are also known to have been deployed in the forward areas and manually operated. Since these weapons depend upon identification by the human eye, mistakes during the heat of battle are known to have caused casualties. It is not quite clear how the Russians, who presumably have a higher density of missiles in their air defence system and a greater number of interceptors, have solved this problem. It appears that the Egyptian air force seem [sic] not to have found an answer yet.[62]

Integration problems also occurred on the Syrian side. When the Iraqi Air Force joined the battle, its initial engagements met with limited success. ". . . At least half a dozen [Iraqi MIGs] were promptly shot down by Syrian SAM-6s because their IFF gear . . . could not cope with the rapid switches in the SAMs' radar wavelengths."[63]

Conclusions

The Arab experience in the Yom Kippur War has many similarities to the air war in North Vietnam. Both defenses were built using Soviet equipment, technology, and tactics. Both defenses were attacked using American equipment and technology. The North Vietnamese and the Arabs used prolonged conflicts and cease fires to expand their systems and refine their strategy and tactics. Both defenses used a highly centralized command and control system. This centralization was essential to

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[62]Palit, p. 155.

[63]Insight Team of London Sunday Times, p. 315.

effective coordination of defensive resources and the use of integration tactics.

Despite these similarities between the North Vietnamese and Arab systems, there were also major differences. The North Vietnamese were given only the SA-2 and the SA-7, while the Arabs were given the SA-2, SA-3, SA-6, and SA-7. The North Vietnamese relied primarily on their vast numbers of antiaircraft weapons, using the SA-2 and MIGs as a high counterthreat to drive the American attackers into the low altitude AAA envelope. The Arabs relied on their SAMs as the primary weapon and used the ZSU-23-4 and the MIGs to complement the SA-2s, SA-3s, SA-6s, and SA-7s. The last major difference between the two defenses concerns the overall strategy of the conflicts. Whereas the North Vietnamese were concerned with a strategic conflict in defense of Hanoi and Haiphong, the Arabs were mostly oriented toward a tactical ground battle. These differences influenced the overall employment strategy of the air defense resources.

The integration doctrine and tactics used by both defensive forces resembled the Soviets' "zonal" defense (see Chapter III, pages 40-41). This is a system whereby MIG interceptors are used in geographical zones outside the effective ranges of SAMs or AAA. The North Vietnamese and the Arabs (especially the Egyptians) used MIGs on the flanks, forward, and/or to the rear of their SAM belts. They also used MIGs to complement their primary defense weapons. This was accomplished by forcing the enemy to react to the MIG threat, thereby exposing

himself to other systems. They also occasionally used the MIGs as bait to drag the enemy into the SAM rings.

The other integration tactic employed in both conflicts was what the Soviets refer to as "single zone" operations. This is where MIGs and SAMs or AAA operate in the same envelope and are separated by altitude or by the control of higher headquarters. The North Vietnamese, who were more centralized and coordinated, used this system quite effectively. The Arabs tried single zone operations, but their results were less productive. The IFF separation was used sparingly and, as the Syrian experience demonstrated, was not an effective means of integration.

The final questions to be answered in the examination of these defenses are how effective was their integration and was it a viable option? In the case of the North Vietnamese, integration tactics certainly proved highly effective. Through selective employment of their limited MIG resources, the North Vietnamese were, at times, able to create havoc with attacking strike forces. The Arabs, on the other hand, had less success with their MIGs. Effectiveness, however, was not always measured by the ratio of air-to-air kills. On the defense, success was measured by defeating the attack. If, as in the case of the Arabs, the enemy was made to drop his bombs prematurely, forced to miss the target, or dragged into a missile belt, the air defense mission was accomplished. Also, due to the multi-mission capability of Western fighters, the more aircraft tied up in the counterair role (escort, MIG

sweeps, and airfield attack), the less these resources were available for ground support. Here, Arab commanders felt they were successful despite their own aircraft losses to friendly defenses.

As for the question of integration viability, both defensive forces had little choice in their employment options. Given the limited offensive characteristics of their air resources (MIG-17 and MIG-21), it was more realistic to construct a workable integrated defense than to attempt offensive counterair operations against the enemy. The offensive capabilities of the enemy also forced these countries into constructing a sophisticated and coordinated defense. The North Vietnamese were highly outnumbered, while the Arabs were suffering from the qualitative inferiority to the enemy's equipment and pilots. These factors forced these countries' air forces into the defensive counterair mission and made the integration of their defensive resources a mandatory requirement.

Thus, it has been seen how integrated air defenses have been employed in the past decade. Different integration tactics have been used in these conflicts with variable success. The primary integration procedure was zonal employment, whereby interceptors and ground defenses were separated by geographical zones. Regardless of the integration procedures employed, a highly centralized command and control system was used. Finally, the decision to employ a defensive counterair strategy was dependent on the offensive capabilities of the belligerents.

CHAPTER III

THE THREAT

> An important role during the period of the fire preparation is accomplished by aviation. The main objectives of the bomber strikes and strikes of fighter-bomber aviation are the enemy means of nuclear attack, control points, reserves, especially tank reserves, radio technical means, and other important objects which are located, as a rule, beyond the field of fire of the artillery. This permits the more rational exploitation of the capabilities of various means of destruction and facilitates the organization of coordination.[1]
>
> A. A. Sidorenko, Colonel, Soviet Army

Introduction

Soviet tactical air doctrine has been updated in the past decade to reflect the offensive character of modern Soviet military strategy. As expressed in the latest writings from leading Soviet military theoreticians, heavy emphasis will be placed on offensive operations, to include surprise, mass, and maneuverability. This doctrine calls for aviation and artillery to provide the massive fire support the offense requires.[2] This is an important change as far as tactical aviation is concerned. Prior to this new doctrine, tactical aviation had been

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[1] A. A. Sidorenko, The Offensive (A Soviet View) (Moscow, 1970), p. 124. (Translated and published under the auspices of the United States Air Force [1973].)

[2] Ibid., p. 119.

relegated to a defensive posture that was mainly concerned with defensive counterair operations over friendly troops. Past United States planners were confident that Soviet tactical aviation did not possess a capability in equipment or technology to launch a sustained offensive attack. This has all changed, however. Today Soviet tactical aviation has the mission as well as the equipment and technology to conduct offensive operations.

The primary threat to the tactical defensive counterair mission of the United States is the offensive tactical air employment of the enemy. As the enemy's offensive tactical air doctrine and capabilities change, so must the United States defensive counters be reexamined. Prior to evaluating the United States capabilities, an extensive look into the threat must take place.

The Soviet Union is the primary threat to the United States. It is also the major exporter of tactical aviation hardware to America's potential adversaries. Since many countries use Soviet tactical aircraft, doctrine, and tactics, an examination of Soviet tactical aviation will provide the data required for evaluation of United States defensive needs in large scale land operations and small contingency forces. Soviet tactical aviation's organization, doctrine, and tactics are examined in this chapter.

Organization and Doctrine

Tactical aviation in the Soviet Union falls under the purview of Frontovaya Aviatsiya or Frontal Aviation (FA), one of three components

of the Soviet Air Forces. The other components are Long Range Aviation (LRA) and Military Transport Aviation. Additional major aviation forces are in the Soviet Navy and in PVO Strany, a separate air defense service assigned the protection of the Soviet homeland. In certain situations, units from PVO Strany and LRA would support FA.[3]

Frontal Aviation is organized into air armies and deployed with ground units in military districts throughout the Soviet Union and Europe. In wartime, air and ground units are organized under a centralized command known as a Front. Each Front is assigned one or more air armies, with the Front commander (a ground commander) in overall control. The air army commander is normally assigned the role of deputy Front commander, and employment of FA forces is coordinated into the overall battle plan.[4] In addition, the air army staff headquarters and the Front headquarters are collocated for joint planning.[5] Thus, the mission of the air army is to support the ground forces of the Front, with centralized command and control by the Front commander.

Although the organization of FA has remained fairly centralized and rigid over the years, the doctrine for FA employment has changed.

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[3]Colin Gray, "Soviet Tactical Airpower," Air Force Magazine, March 1977, p. 62.

[4]Department of the Army, Office of the Assistant Chief of Staff for Intelligence, Military Operations of the Soviet Army, USAITAD Report No. 14-U-76 (1976), pp. 235-37 (hereinafter cited as DA, OACSI).

[5]Leslie R. Drane, Jr., "Soviet Tactical Air Doctrine" (Report No. 5894, Air War College, 1976), p. 32.

During the Khrushchev era, FA was assigned defensive operations and Soviet rocket troops were given the mission of tactical nuclear destruction. Aircraft built for FA in that era reflected this strategy, because the MIG-17, the MIG-19, and early models of the MIF-21 were short range interceptors with a limited air-to-ground capability. In the post-Khrushchev era, a more offensive doctrine developed. Frontal Aviation was given the expanded mission of combined arms nuclear suppression along with the rocket troops and LRA. In addition, FA would gain and maintain battlefield air superiority through offensive counter-air operations designed to destroy the enemy's air forces in the air and on the ground.[6]

This FA doctrinal development is a result of the Soviets' recent emphasis on frontal offensive operations. As Soviet military theorist V. C. Sokolovskiy stated:

> In land theaters the mission of armed combat will be accomplished primarily by offense. But this will be done by the Ground Troops, by fronts, including front line aviation, without the direct support of other services of the Armed Forces. . . .[7]

This offensive strategy has required FA to expand its capability to perform the five basic missions of attaining air superiority, suppressing enemy nuclear capability, supporting ground operations, conducting

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[6]Drane, pp. 50-51; and Friedrich Wiener, The Armies of the Warsaw Pact Nations, trans. William J. Lewis (Vienna: Carl Ueberreuter, 1976), p. 157.

[7]V. D. Sokolovskiy, Soviet Military Strategy, ed. Harriet Fast Scott (New York: Crane, Russak & Company, Inc., 1975), p. 283.

reconnaissance, and conducting tactical airlift operations.[8]

Past United States reliance on multipurpose aircraft, such as the F-4, has allowed the Soviets to satisfy the first two requirements with airfield interdiction. Enemy airfields are a high priority target for FA aircraft as part of the counterair and nuclear suppression campaigns.[9]

Recent reports on FA doctrine give strong indications that initial operations would entail an air blitz conducted against the enemy's air forces and his nuclear capabilities. A massive air offensive, supported by LRA units and strategic rocket troops, would begin with a preplanned surprise attack against enemy air bases, air defenses, nuclear delivery means, logistic installations, and command posts.[10] Egypt demonstrated this type of air blitz on the first day of the 1973 Yom Kippur War.

As described in Chapter II (page 20), Egyptian preplanned air attacks against Israeli airfields, communication centers, and Hawk sites were doctrinally and tactically in line with Soviet strategy. The only drawback the Egyptians experienced in their attack was the lack of advanced Soviet equipment in electronic countermeasures (ECM) and third generation fighter-bombers. Had the Egyptians been equipped with the capabilities of Soviet FA, their air offensive possibly would have been

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[8]Drane, p. 51. [9]DA, OACSI, p. 243.

[10]DA, OACSI, pp. 232-33.

bolder and longer lasting. Unlike the Egyptians, the Soviet Union FA forces have the capabilities to support their offensive strategy.

Capabilities

Total Soviet FA forces number approximately 5,500 aircraft. Most of the Soviet force, 3,825 aircraft, are deployed in the European districts. Taking into consideration an additional 2,300 aircraft from Warsaw Pact nations, the force in Europe alone is staggering.[11] The numbers alone, however, do not tell the whole story. Capabilities of the FA aircraft stationed in Warsaw Pact countries have been summarized as follows:

> The new Pact aircraft are more sophisticated and more capable than previous Soviet aircraft. Another disturbing aspect is the increase in munitions delivery capability. Warsaw Pact in-place air forces now can deliver in one sortie several hundred percent more munition tonnage over more miles than in 1971. Their nuclear weapons delivery capability is growing commensurately.[12]

Besides longer ranges, higher payloads, and nuclear capabilities, Soviet advancements in ECM technology and avionics are also in evidence in FA aircraft. Laser designators, doppler navigation computers, chaff and flare dispensers, the advanced High Lark radar, and ECM pods are found on many new aircraft. A 1977 special report on Soviet aircraft penetration capabilities concluded that "the Soviets appear more capable of penetrating the NATO [North Atlantic Treaty

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[11] Gray, p. 63.

[12] George S. Brown, United States Military Posture for FY 1978 (Washington: Government Printing Office, 1977), p. 37.

Organization] air defense network than their potential adversaries."[13]

Advancements in low altitude navigation and penetration capability represent another important improvement in Soviet technology.

> . . . Recent developments have altered the ground attack profile of FA. The new Fencer-A, Flogger-D, and Fitter-C, in that order of importance, give Soviet FA a low-level interdiction capability that previously was missing. . . . With its terrain-avoidance radar and its laser rangefinder, the Fencer-A, flying in a lo-lo-lo mode, poses a novel threat to NATO. . . .[14]

Overall improvements in FA have complemented the changes in Soviet doctrine. Large numbers of aircraft with a greater low altitude penetration capability are the backbone of the offensive strategy. Large numbers of FA aircraft with new capabilities will penetrate the enemy defenses on a broad front.

Tactics

This section deals with the tactics that FA pilots fly. As stated before, the five basic missions of FA are air superiority, nuclear and conventional interdiction, close air support, reconnaissance, and airlift. Each of these missions is discussed separately; however, the fact is that Soviet strategy calls for a combined arms offensive that will include simultaneous employment of all resources.

Air Superiority

The mission of air superiority is divided into two roles:

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[13]"Can Soviet Aircraft Penetrate NATO's Air Defense?," Electronic Warfare, May-June 1977, p. 62.

[14]Gray, pp. 63-64.

defensive counterair and offensive counterair. The historical role of FA was the protection of the ground forces by defensive operations over friendly territory. Tactics consisted of short range interceptors (MIG-17, MIG-19, and MIG-21) being vectored throughout an attack by a ground-controlled intercept (radar) (GCI). Today, however, with the massive buildup of mobile ground-based air defense systems, FA aircraft have been released from this traditional role and are being used for more offensive operations. In Europe, this has resulted in the combination of non-Soviet air units used in the defensive air intercept mission and Soviet FA forces operating on the offense.[15]

While discussing defensive counterair tactics, it is interesting to note how the Soviets perceive the problem of integrated air defense. As found in their writings and later confirmed by actual Egyptian employment, the Soviets believe in "zonal" deployment. They maintain that one type of defensive weapon system should not limit the application of the other but that, rather, they should complement one another. Their concept is an organization of coordination by zones whereby fighter aircraft operate outside the field of fire of the ground defenses. The fighters are to operate on flanks, forward, or to the rear. They discuss "single zone" operations in which fighters and ground systems operate together. In this case there are two ways of controlling the operation: altitude separation and target distribution.

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[15]John Erickson, "Soviet Military Capabilities in Europe," Military Review, January 1976, pp. 61 & 64; and Gray, p. 63.

Altitude separation is accomplished by having the fighters operate above the ground defenses. Target distribution is a centralized management of target identification and allocation of targets to the best defensive system.[16] As discussed in Chapter II (pages 25-29), the Arabs tried all three concepts in 1973.

The current defensive counterair strategy of the Soviet Union can thus be summarized as mainly a zonal defense that consists of ground-based systems and interceptors. The ground systems will be the primary defensive weapon. The non-Soviet FA interceptors will be comprised of older aircraft like the MIG-17, MIG-19, and MIG-21. Interceptor regiments in FA air armies are equipped with the newer MIG-23S Flogger-B. These units could possibly be reinforced by PVO Strany aircraft like the TU-28P Fiddler, SU-15 Flagon E, and MIG-25 Foxbat-A. All of the aircraft mentioned will operate under the typical GCI environment.

Offensive counterair operations have traditionally not been a major factor in FA operations. With the doctrinal change discussed previously (pages 35-36), however, offensive counterair operations have become one of the Soviet FA's priority missions. Interdicting the enemy's air bases, disrupting his command and control, and suppressing his air defenses are primary objectives of the initial air blitz. Large

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[16]T. A. Bordeaux, "Comparison of U.S. and USSR Land-Based Battlefield Air Defense Systems (U)," Report No. RDA-TR-5500-003 (Santa Monica, Calif.: R & D Associates, May 1974), p. 6-16; and Gray, p. 69.

air battles with more than 50 aircraft may occur over the battlefield of the future as they did over the Suez in 1973. The Soviets realize that Western air forces are outnumbered multi-missioned. They also know that if they can engage these forces in large air encounters, the aircraft so engaged will be unable to perform their nuclear or conventional bombing roles. These air battles will not be GCI controlled. They will be more like the aerial dogfights of World Wars I and II. As one source explains:

> . . . In a conventional localized conflict, escalation in Western Europe would be inevitable, since attacks against airfields would be against the sites where many of NATO's nuclear weapons are stored. The emphasis on the struggle for aerial superiority has thusly evolved to the air space over the battle area, according to Warsaw Pact planners in recent years. This essentially has meant a return to the "classical" form of aerial combat where air superiority (at a minimum over the combat zone) is the objective. . . .[17]

Besides the Soviet counterair interdiction campaign, which should be the major concern for United States air defense planners, FA offensive counterair missions also will include the tactical fighter sweep. Soviet writers explain sweep operations as fighter aircraft missions that are designed to intercept low-altitude enemy targets without the aid of GCI. These missions are not representative of classic Soviet operations; however, Soviet tacticians have not overlooked lessons that may be learned from Vietnam and the Middle East. A study on Soviet tactical air literature includes the following statement:

. . . Although Soviet resources note that ground-controlled

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[17]Wiener, p. 158.

> intercept has become the rule, it is also pointed out that there is still a place in air combat for tactical fighter operations which rely primarily on visual means of search and detection, such as independent fighter sweeps and the countering of low-flying targets.[18]

The text of the same study notes: ". . . Indeed, some Soviet writers assert that it is 'essential to train all fighter pilots in sweep tactics,' because this may prove to be the only means available 'in complex battle conditions.'"[19]

Fighter sweep operations as practiced in FA exercises consist of the following tactics:[20]

1. Operating several pairs of fighters together, without GCI control in visual search operations.

2. Establishing search zones by flying fixed patrols over friendly territory or beyond the forward edge of the battle area, with air superiority.

3. Flying the straight leg of the patrol pattern at right angles to the probable attack. This is done for better visual and/or on-board radar detection.

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[18]Thomas W. Wolfe, "Recent Soviet Literature on Tactical Air Doctrine and Practice (U)," Report No. RM-6336-PR (Santa Monica, Calif.: RAND Corp., July 1970), pp. vii-viii.

[19]Ibid., p. 57.

[20]Ibid., pp. 55-59. (Although this information is pre-1970, my personal opinion is that the Soviets have given sweep tactics more than a cursory glance. Their recommendations for visual search and sweep tactics are the same as the ones Aggressor Pilots at Nellis Air Force Base use. The procedures for Aggressor Pilots were developed late in 1976, after many Red Flag operations in which low altitude non-GCI intercepts were practiced.)

4. Flying missions at medium altitudes. There is, however, one account of a "new method" whereby the fighter operates by alternating between flying at very low altitudes and zooming to great heights.

5. Keeping the sun at the side of the attacker's heading when the sun is low, 20° to 30° to the horizon. Searching toward the sun if the sun is high, which illuminates the target better and makes it easier for the pilot to see the shadow of a low-level attacker.

6. Employing variable speed: high speed for fast low-altitude targets; medium, "economical speed," for slow targets.

Interdiction

Interdiction is another priority mission that is not historically associated with FA. As stated before, it was accomplished by either strategic rocket troops or LRA. With the advent of the new doctrine and third generation aircraft, however, interdiction has taken its proper place in FA planning. The Flogger-D, Fitter-C, and Fencer-A aircraft are specifically built for the interdiction role. Their low altitude, long range, and high payload capabilities make them ideally suited for this mission. These aircraft will be supplemented by older medium bombers from FA and LRA forward deployed units. The YAK-28 Brewer and IL-28 Beagle light bombers are being phased out, but the YAK-28 Brewer-E modified with ECM equipment and the TU-16 Badger-H (LRA) will perform ECM escort duties on interdiction missions.[21] The LRA

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[21] "Can Soviet Aircraft Penetrate NATO's Air Defense?," p. 58; Gray, p. 71; and Wiener, p. 160.

medium bombers with ECM escort will supplement the FA interdiction campaign. Aircraft such as the TU-16 Badger-G, which launched Kelt missiles against Israel in 1973, or the TU-22 Blinder-B will be used.[22] Also, the TU-VG-Bomber Backfire-B, which has been introduced into LRA units, possesses an even greater low altitude penetration threat to interdiction defenses.[23]

A widely held belief in Western quarters is that the Soviet interdiction campaign will begin with a massive preplanned "Air Operation." The priority targets will be nuclear strike assets (primarily bomber and fighter-bomber bases), command and control centers, nuclear storage depots, and nuclear missile launchers.[24] It is also generally agreed that this "Air Operation" will be conducted almost exclusively at low altitude and that ECM aircraft and counterair interceptors will participate as escorts.[25] Penetration corridors through the enemy's air defense network will be opened by initial strikes against early warning radars, surface to air missile (SAM) and/or air defense artillery fire control radars, interceptor aircraft on the ground and airborne, and air

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[22]DA, OACSI, p. 245; and S. W. B. Menaul and Bill Gunston, Soviet War Planes (London: Salamander Books, Ltd., 1977), p. 45.

[23]"USSR, Pact, and PRC General Purpose Force Capabilities," Commanders Digest, 29 April 1976, p. 6.

[24]DA, OACSI, pp. 241 & 245.

[25]DA, OACSI, p. 229; Gray, p. 71; "USSR, Pact, and PRC General Purpose Force Capabilities," p. 6; and Wiener, pp. 157-64.

defense command and control network components.[26]

Low altitude penetration tactics as seen demonstrated in the Middle East War are practiced daily. About 80% of all operational flight training is devoted to low-level exercises and all-weather operations.[27] Six reasons given in Soviet literature for the emphasis on low level, high speed operations are that they:[28]

1. Provide the element of surprise.

2. Avoid radar detection.

3. Reduce the enemy's antiaircraft artillery and/or SAMs and interceptor effectiveness.

4. Assure prompt response to calls for close air support from ground units.

5. Provide for rapid destruction of known and newly detected targets.

6. Make it possible to destroy the enemy's aircraft and missiles on the ground, before they are launched.

Typical interdiction missions are flown at 200 feet and at high speeds. Normal practice during some exercises is to fly the ingress leg at 650 feet to 950 feet over friendly territory and then drop to

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[26]DA, OACSI, p. 241.

[27]Department of the Army, Foreign Science and Technology Center, "Tactics and Organization of Soviet Ground Forces Different Parts," trans. R. Lagerwerft (Charlottesville, Va., 1974), pp. 22-23 (DDC Doc. AD B001901L); and Wiener, p. 164.

[28]Wolfe, p. 21.

200 feet over simulated enemy areas until the target is spotted.[29] The delivery technique is usually left to the pilot's discretion and depends on the type ordnance carried. Against airfields or highly defended targets, the following procedures apply:

> . . . Where possible, the target should be struck in a single pass at high speed, but if the nature of the target is such as to require action by several groups of aircraft (e.g., a large airfield complex), the successive waves of attacks should be compressed into a minimum period of time and coordinated to come from various directions. . . .[30]

Most weapon delivery methods begin from the low altitude approach. The four basic bombing techniques are low-level approach with pop-up tactics, dive bombing from a medium altitude, level bombing, and the "Surovikin" method (known in the West as loft bombing).[31] Some typical bombing techniques are shown in Figures 2 through 7. Fighter-bomber units prefer the low-level approach with pop-up tactics, with the recommended maneuver at the top being either the half loop or combat turn. Other recommended tactics in the ground attack delivery mode are:[32]

1. Attack out of the sun.

2. Fly along woodlines and use pop-up delivery.

3. During flak suppression missions, make the first attack against radio-radar installations.

4. During squadron sized attacks, the squadron commander and

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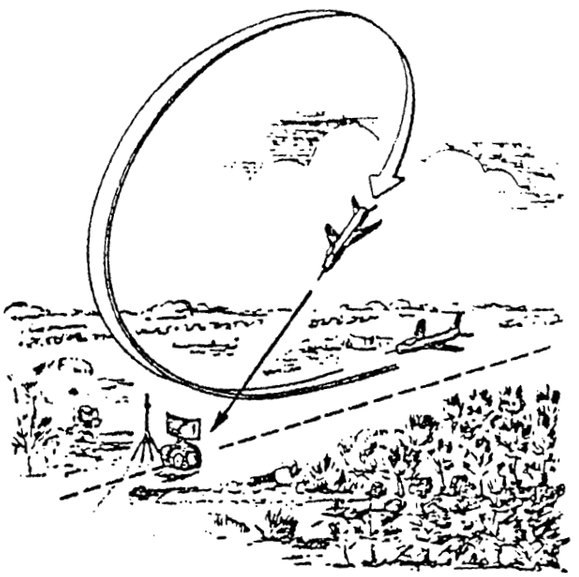
[29]Wolfe, p. 28.

[30]Wolfe, p. 29.

[31]Wolfe, pp. 29-33.

[32]Wolfe, pp. 30-35.

Fig. 2. Attack From a Loop



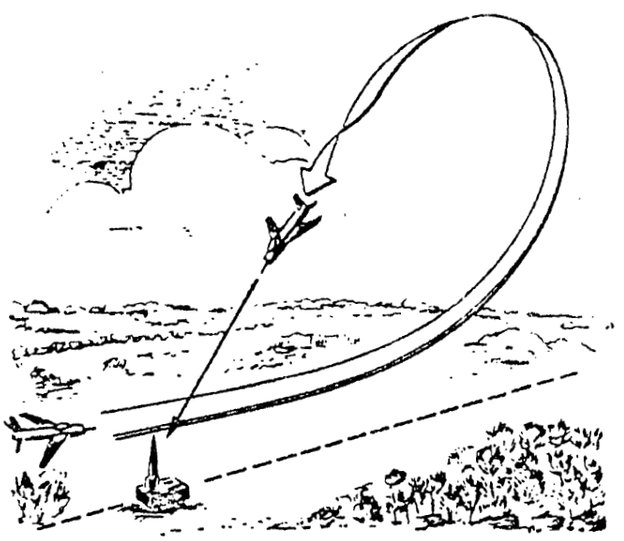


Fig. 3. Attack From a Half-Loop.

SOURCE: Thomas W. Wolfe, "Recent Soviet Literature on Tactical Air Doctrine and Practice (U)," Report No. RM-6336-PR (Santa Monica, Calif.: RAND Corp., July 1970), p. 32.

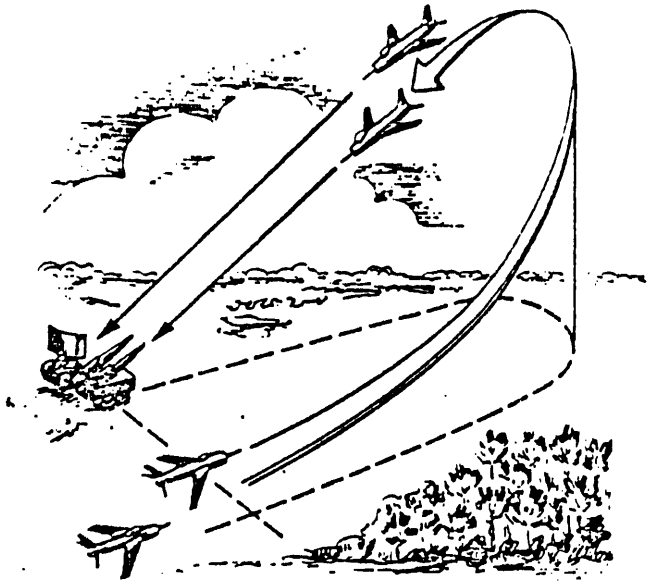


Fig. 4. Attack From a Combat Turn.

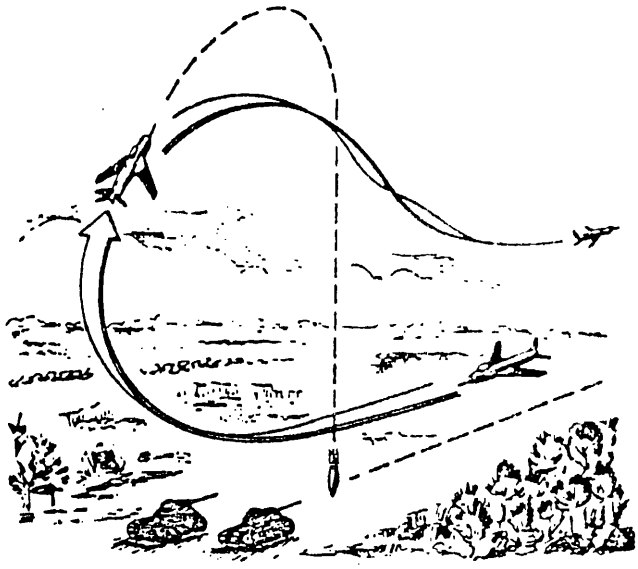


Fig. 5. Bombing From a Climb--"Surovikin" Method.

SOURCE: Thomas W. Wolfe, "Recent Soviet Literature on Tactical Air Doctrine and Practice (U)," Report No. RM-6336-PR (Santa Monica, Calif.: RAND Corp., July 1970), p. 32.

Fig. 6. Attack From Loop and Roll-Off

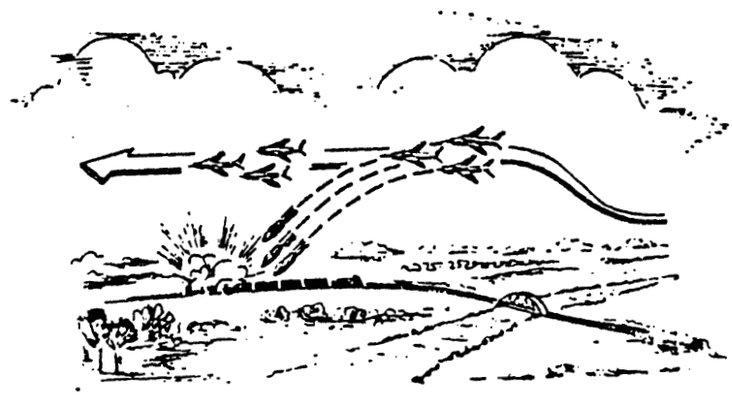


Fig. 7. Level Bombing After Climb

SOURCE: Thomas W. Wolfe, "Recent Soviet Literature on Tactical Air Doctrine and Practice (U)," Report No. RM-6336-PR (Santa Monica, Calif.: RAND Corp., July 1970), p. 33.

the wingman should make the first attack and should be followed by pairs in tandem at short intervals.

5. Flight leaders attack first, with the wingman flying cover. After the attack, the first pair will cover for the following pair.

6. All attacks will be in two- or four-ship attacks or in spaced pair attacks.

7. Commanders will brief the overall mission, but the attack techniques will be left to the discretion of the pilots.

Close Air Support

Traditionally, close air support as employed by the United States has not been a major mission of Soviet FA. As stated in the U.S. Army intelligence analysis on Soviet ground forces:

> . . . Soviet FRONT Aviation does not normally utilize high performance aircraft to provide close air support along the line of contact except in certain specialized operations and situations such as mountain operations, hasty river crossings, and while supporting penetrations and exploitations which have outrun the bulk of the supporting artillery.[33]

The main mission of close air support in FA is to provide air strikes as an extension of the artillery. There are no airborne forward air controllers in FA as there are in the U.S. Air Force. There is also no direct link between a Soviet battalion commander and his supporting aircraft.[34] Higher headquarters control most targets, which consist of regimental sized targets such as enemy forces on the flanks, enemy reserves, and concentrations of enemy forces at river crossings.[35]

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[33]DA, OACSI, p. 242. [34]Wolfe, p. 49. [35]Wolfe, pp. 17-18.

Reconnaissance

Air reconnaissance is emphasized as an extremely important FA mission. The principal missions assigned to air reconnaissance units are:[36]

1. Locating enemy missile launchers and weapon depots.

2. Locating enemy airfields and determining preparations for and direction of enemy counterattacks.

3. Uncovering enemy's defensive system.

4. Locating enemy reserves, especially tanks and artillery.

5. Discovering enemy's supply installations and routes.

The aircraft employed by reconnaissance units are the all-weather MIG-21R and MIG-21RF (Fishbed-G/H), YAK-28R (Brewer), IL-28R (Beagle), YAK-25R (Flashlight-D), and the new MIG-25R (Foxbat-B).[37] Penetration routes are at a very low altitude and are carried out to a depth of 50 to 200 kilometers.[38] Specific altitudes vary according to aircraft, equipment, and targets, but generally they are not more than several hundred meters above the ground.[39]

An interesting mission associated with reconnaissance is the mission the U.S. Air Force refers to as strike control and reconnaissance and/or armed reconnaissance. The Soviet version of this mission

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[36]DA, OACSI, pp. 242-43.

[37]Menaul and Gunston, p. 26; and Wiener, pp. 156-57.

[38]Wiener, p. 157. [39]Wolfe, p. 69.

is explained below.

> In addition to such routine observation by tactical pilots, there is also the use of what the Soviets call "hunter tactics," which amount essentially to armed reconnaissance. Soviet sources place a good deal of emphasis on "free hunt" missions, usually by fighter-bombers, which are intended especially to search out and destroy, or at least to "disorganize" operations of the enemy's nuclear and missile forces.[40]

These hunter/killer flights will either destroy the target themselves or call for reinforcements and mark the target for follow-on flights.[41] Colonel Sidorenko emphasized the "hunter" mission as being effective for nuclear suppression when he said:

> The most effective battle with enemy nuclear missile weapons can be conducted by fighter-bomber aviation employing the independent search and destruction of targets which have been discovered, that is, the "hunting" method. This method of accomplishing the combat mission was widely employed by our aviation during the Great Patriotic War. Now, it will be employed with consideration of the changes which have taken place in the airplanes themselves, their armament, as well as the enemy air defense and the nature of the targets (objectives).[42]

Airlift

The final major task of FA is its support of tactical airlift operations. This role has received increased emphasis in recent years. The Soviets realized in the late 1960s that large airlift operations were essential to taking advantage of offensive nuclear warfare and to capitalizing on nuclear strikes. In Colonel Sidorenko's words explaining the missions and targets of tactical airborne operations:

> . . . Tactical airborne landings will be employed at any time

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[40]Wolfe, p. 70. [41]Wolfe, p. 70. [42]Sidorenko, p. 136.

> and they will be assigned the most diverse missions: timely exploitation of results of nuclear strikes; capture and destruction of enemy means of nuclear attack, airfields, depots, and other objectives; capture and retention of important positions, crossings, mountain passes; disorganization of troop control and rear area operations; prevention or delay of the approach of reserves from the depth, or of enemy withdrawal, and assistance to troops attacking from the front in destroying the enemy. Tactical airborne landings have an especially important role in exploiting the results of nuclear strikes. . . .[43]

The operations mentioned in the preceding excerpt could entail air assault and airborne missions with transports and troop helicopters. Unit tactical airborne operations are usually associated with motorized rifle battalion sized forces.[44] Of course these operations will coincide with the total offensive and will be supported by other forces. ". . . To assure the landing of a large air-drop at a great depth the enemy air-defense must be neutralized by ECM, air operations, and rocket strikes."[45]

Conclusions

The major air threat to front line tactical forces today is Soviet Frontal Aviation or its exported equivalent. Large in numbers and qualitatively improving, this threat is indeed impressive. Because of its increased capability to strike at deeper targets with larger payloads, Frontal Aviation forces complement the new Soviet offensive

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[43] Sidorenko, p. 103.

[44] DA, OACSI, p. 244; and Sidorenko, p. 103.

[45] Sokolovskiy, p. 294.

strategy. This strategy calls for a massive preplanned air offensive in the early stages of the war. This attack will be targeted against the enemy's air forces, air defenses, and nuclear capabilities.

The primary tactic to be employed will be low-altitude penetration with electronic countermeasures and air escort support. Large scale reconnaissance and airlift/air assault operations will take place over enemy territory. Independent fighter sweeps and armed reconnaissance "hunting" missions will permeate the forward edge of the battle area. The majority of the air battle, both offensive and defensive, will be fought at extremely low altitudes and high speed.

This chapter has explained the changing Soviet Frontal Aviation doctrine and its implications for the United States defensive counterair capability. Integrated air defense doctrine and procedures must consider the large scale offensive tactics the enemy is prepared to employ. Defensive counterair doctrine should concentrate on defending the priority targets of Frontal Aviation and must be prepared to intercept attacking aircraft at extremely low altitudes and high speeds.