

The experience of the 54th Fighter Wing¹⁹⁶ indicates that in the first days of the campaign Soviet bombers usually operated in flight sized units at altitudes of approximately 6,500 feet and without fighter protection, and that the attacking units were, as a rule, completely destroyed by German fighters and antiaircraft fire. In the weeks and months that followed, attacks in the German rear were usually flown at altitudes of around 10,000 feet, by small units of up to six aircraft but sometimes by larger units, and always with fighter escort. P-2 units in particular maintained excellent flight discipline and supported each other with well directed fire. During the initial stages Soviet bombers, when under attack by German fighters, would move into close line or wedge formation to obtain maximum rearward fire power. Toward the end of 1941 the Soviets had adopted the German method of flying in flights with each successive flight slightly higher than the preceding one. The general rule, however, seems to have been for bombing units under attack by German fighters either to continue doggedly on their set course without any evasive maneuvers or immediately to cease their approach flight and endeavor to slope down toward the Soviet lines, if possible at ground altitude.

According to Generalmajor Uebe¹⁹⁷ bombers attacking targets in the near front areas released their bombs--usually medium calibers or small fragmentation--in horizontal flight, and then departed at an increased speed toward the front. Aiming was poor and a large percentage of the bombs frequently fell within the Soviet lines.

Admiral Moessel¹⁹⁸ reports that the Soviets carried out no systematically planned bombing operations at sea during the period under discussion, but restricted their activities to occasional, small-unit daylight attacks during fair weather. Owing to the loose manner in which these attacks were executed, poor flight discipline, and defective navigation, the results achieved were nil.

Colonel von Beust¹⁹⁹ places the strength of Soviet bomber units at an average of 10 to 20 aircraft. According to him the maintenance of unit flight formation by Soviet bomber pilots was their best accomplishment. This was an essential feature of Soviet bomber operations because of the activities of German fighters and because in many cases only the Soviet unit leader and his deputy were furnished the necessary data for the performance of the mission. All other planes in the unit merely followed the leader, releasing

their bombs when the target was sighted or on a signal given by the lead plane. The sole tasks of these aircraft crews were, therefore, to maintain unit formation and to repel German fighters. The reasons for this may have been inadequate training and the desire of the Soviet Command to insure unconditional execution of the assigned mission.

Von Beust adds that the system adopted to repel German fighters was for all planes to fly in as close formation as possible. This enabled the unit to deliver heavy fire from all guns but also complicated the systematic direction of fire. On encountering anti-aircraft fire the units flew stolidly through the fire area without any attempt at evasive maneuvers. Once the German defenses succeeded in scattering a bomber formation or in shooting down the lead plane, the result was usually the loss of the entire unit.

4) Bombing Operations in the Battle Area in Support of the Army or Navy. Whereas it was consonant with the nature of the ground-attack air arm to consider attack operations in the battle area as its primary mission, the Soviets' use of their bomber forces in similar missions was undoubtedly out of keeping with the specific nature of bomber units. That the Soviets employed their bomber forces, similarly to their ground-attack air forces, primarily in the near front areas in support of army operations is authenticated by the unanimous statements of German command personnel. Since the army was most affected by these operations, army command personnel will be quoted first on the subject.

Concerning the northern area Generalleutnant Frankewitz²⁰⁰ reports that in the initial stages of the campaign the Soviets only carried out frequent night harassing attacks, particularly in the Narva region and against the Narva River bridges. These attacks had a considerable nuisance effect but did no real damage. It was only at the beginning of December that the Soviets became more active in bombing and strafing attacks by single planes or flight-sized units against the main highways in the German rear. Although these attacks had no decisive influence on the tactical or supply situation, they did inflict casualties and they did affect troop morale. Frankewitz states that German troops took notice of them but did not allow them to interfere with their duties.

Writing on the central area, Lieutenant Colonel Wolff²⁰¹ reports that Soviet bomber units were encountered in strengths of

six to twelve aircraft in the first days of the war, but that they were unable to operate against German fighter and antiaircraft artillery defenses. In the days which followed no Soviet bombers appeared. It was not before 7 July that Soviet bombers again were sighted. From then on they repeatedly attacked the advancing German troops but at irregular intervals in units of up to ten aircraft. The attacks were directed against main highways and other advance routes, troop concentrations and assemblies, river crossing points, occupied villages, etc. Between 7 July and 11 December, Wolff continues, he experienced 24 attacks of this type.

From the voluminous supporting study submitted by General-leutnant Huffmann,²⁰² it appears that the Soviet bombers attacked in strengths of three to twelve aircraft during daylight at altitudes of between 1,300 and 2,600 feet. As a rule only medium caliber bombs were used. The attacks occurred at various times of the day. In critical situations they were repeated at intervals of from two to three hours. When weather conditions permitted, the attacking planes approached above the cloud cover over areas with strong ground defenses. The attacks, which were very disturbing for the German troops, were directed at all types of ground targets, but particularly at areas in which German troops were advancing and at crossing sites. In many cases good and useful integration of bomber and ground operations was observed, although the Soviets rarely developed a clearly defined area of main effort.

It has been mentioned repeatedly that Soviet air power was particularly effective in the zone of Army Group South, and this also applies to the Soviet bomber arm. Soviet bombers cleverly exploited the open terrain and the congestions which necessarily developed at crossing points over the Dniester, Dnieper, and Southern Bug Rivers, at the Perekop and Ishun isthmuses,* and during operations on the

* Editor's Note: The Ishun Isthmus is, in reality, a part of the Perekop Isthmus. Named after the town of Ishun (45° 57' N, 33° 49' E), it is located at the southernmost extremity of the Perekop Isthmus, where the latter joins the Crimea. Bordered by the Black Sea to the west and the Sea of Azov to the east, the Ishun Isthmus is further constricted by a series of lakes, making it the narrowest part (2 miles wide) of the Perekop Isthmus and the last obstacle to the German 11th Army's battle to gain entrance into the Crimea. See note, p. 86, also Field Marshal Erich von Manstein, Lost Victories, Henry Regnery (Chicago, 1958), pp. 217-20.

Crimean Peninsula. At times they inflicted telling losses on the German troops.

Soviet bomber operations increased considerably after the end of August 1941, when the German advance was approaching the Dnieper River, and continued with almost unchanged intensity throughout operations on the Crimean Peninsula. Army commanders, whose troops were constantly exposed to these air attacks, were therefore not entirely unjustified in their view that the Soviets had air superiority in these areas of the eastern theater.

Field Marshall Erich von Manstein gives expression to this view when he states²⁰³ that the Soviet air forces had command of the air over the Perekop Isthmus,* their bombers and fighters continuously attacking every visible target. According to von Manstein, shelters had to be dug not only for the front-line infantry, but also for vehicles and horses, even in the rear areas, and anti-aircraft batteries risked immediate destruction when they opened fire and thus disclosed their location to the Soviet aircraft. Moelders† appearance in this area, however, caused an abrupt change as he succeeded in ridding the skies of Russian aircraft during the daylight hours.

Thus, the commander in chief of the Eleventh Army [von Manstein] and his unit commanders agree that Soviet bomber operations very adversely influenced the German Army operations. In a final appraisal of the Soviet bomber forces in the southern area it must be admitted that their tactical operations, which were properly coordinated with army operations, resulted in heavy German losses in personnel and materiel and that a large percentage of these losses must be ascribed directly to action by Soviet bombers.

The situation in the southern area has been treated so exhaustively because it actually constitutes an exception in the campaign in the eastern theater. Conditions were entirely different in the northern and central areas. The nature of the missions assigned Soviet bomber forces there and the manner in which bombing attacks were executed were admittedly the same as in the southern area.

* See notes above, pp. 86 and 133.

† See note above, p. 62.

However, the general consensus of opinion of all German command personnel, from battalion commanders to the army group commanders in chief, is that attacks in their areas were not very frequent, had only small effects, and did nothing to delay the German advance. Thus, it is reported that the seven corps controlled by the Second Army, each of which was assigned only one road for its two or three divisions, executed their march movements during daylight without any interference by Soviet air forces. Even during crossing operations at the Western Dvina River, during the Smolensk battle of encirclement and the double battle of Vyazma - Bryansk,* and during fighting in the Baltic areas Soviet bombers at no time appeared in such strength that they could have exercised any important influence on the decisions of the German commands or the operations of the German troops.

These impressions of German army command personnel concerning the tactical activities of Soviet bombers are confirmed by Luftwaffe command personnel.²⁰⁴ Their reports mention attacks against panzer spearheads and assemblies, river crossings, and other bottlenecks on the German routes of advance. The results of these attacks, they agree, were meager because of inaccurate bombing and the effective operations of German fighters and anti-aircraft artillery which, together, inflicted heavy losses on the Soviet bomber forces.

Generalmajor Uebe²⁰⁵ points out that the tactical targets of Soviet bomber forces were the same as those selected for ground-attack aircraft, and that air attacks on these targets were often part

* Editor's Note: The Western Dvina River, Smolensk, Vyazma and Bryansk were all successive objectives in the 1941 offensive of Army Group Center, whose ultimate objective was Moscow. After breaking through Russian defenses on the Dnieper-Dvina line in July, Army Group Center launched a large-scale enveloping maneuver, which it successfully closed (6 August 1941) to the east of Smolensk. This was the second of the great battles of encirclement in 1941 (see note, p. 115). The double battle of Vyazma-Bryansk (18 October 1941), which is usually counted as the seventh and last of the battles of encirclement during the 1941 offensive, was the opening phase of the final drive on Moscow. During the course of the Vyazma-Bryansk encirclements Army Group Center purportedly took over a half million prisoners. See Kurt von Tippelskirch, Geschichte des Zweiten Weltkriegs, Athenaeum (Bonn, 1951), pp. 218-42 passim.

of the Soviet artillery fire plan, so that Soviet bomber forces frequently were nothing but an extended or long-range arm of the artillery.

Whereas operations by Soviet ground-attack and fighter forces against the German Navy were not even noticed in 1941, Soviet bomber forces did undertake such operations, although only on a small scale.

Admiral Moessel²⁰⁶ reports that there was no evidence of any systematic employment of sizable Soviet bomber forces against German seaborne traffic or German naval operations in the Baltic or in the Black Sea. Only a few insignificant attacks by units not larger than ten bombers are reported. These were carried out in favorable weather and produced no important results. The use of aerial mines or air torpedoes was not observed in 1941. Moessel's opinion is that the Soviets were too heavily engaged in the conduct of land warfare to make sizable air forces available for naval operations.

5) Soviet Bombing Operations in the German Rear. Only a few Soviet bombing attacks in the German rear were directed against strategic targets. The large majority of attacks was directed against tactical targets located near the front, such as railroad junctions, bridges, supply installations, troop concentrations of all types, and particularly German airfields.²⁰⁷

Captain Kath and General Plocher report similarly on the complete failure of a Soviet bombing attack against the railhead and loading installations at Gumbinnen (Gusev)* on 23 June.²⁰⁸ The Soviet force of 30 SB-3 bombers attacked without fighter protection, approaching at an altitude of approximately 10,000 feet in loose flight formation at echeloned altitudes. Whereas some of the bombers were downed during the approach, the unit leader and a few of the flights reached the target area, where they scattered their bombs

* Editor's Note: Called Gumbinnen by the Germans while it was in East Prussia. The city was renamed Gusev by the Russians in 1945. At the time of the Russian bombing attack mentioned above, the combat headquarters of 1st Air Corps, First Air Fleet was located in Gumbinnen.

without aim over Gumbinnen. The unit then broke up into individual flights, pairs, and single aircraft attempting to escape at ground levels. All were shot down over German-held territory.

A number of Luftwaffe command personnel describe Soviet bombing attacks against German airfields. Captain Pabst²⁰⁹ experienced six Soviet bombings of his airfield at Kiev during the 21-26 July 1941 period. The attacking forces varied in strength between three and ten aircraft, some of which cleverly exploited the existing cloud cover. The attacks were carried out at various altitudes, without fighter escorts, and with inconceivable doggedness, no attempt being made at evasive maneuvers. German casualties and damage at the airfield were insignificant, but in most of the attacks all of the attacking planes were shot down by German fighters or anti-aircraft artillery.

Writing also of the July 1941 period, Lieutenant Colonel von Riesen²¹⁰ described an attack by nine SB-3 bombers against the Banak* airfield in the Polar area. This attack also was flown without fighter escort and took the Germans completely by surprise because the attacking force approached from the sea. From an altitude of approximately 13,000 feet the bombers released small caliber bombs at brief intervals. The bombs injured a few of the servicing personnel and caused minor damage to some of the parked aircraft. Although the attacking force encountered no defensive action whatever and could therefore carry out its attack without interference, most of the bombs landed outside of the airfield area. On its return flight the bomber force was intercepted and almost completely destroyed by German fighters.

Major von Cossart²¹¹ describes a well executed surprise attack by a flight of SB-2 bombers at an altitude of 10,000-13,000 feet against the Pskov (Pleskau) airfield in the summer of 1941. After an undisturbed approach, the Soviets destroyed three German planes and damaged a few others with well-aimed, small-caliber bombs. The bombers, flying without fighter escort, were then all downed by German fighters. Under interrogation one of the captured crew members stated that the flight had become separated from its

* See note above, p. 128.

parent unit and had no knowledge concerning the assigned unit target or any other flight or target data. All this information had been furnished only to the unit leader.

Finally, Generalingenieur Thomsen²¹² reports on an attack against the Soltsy airfield, northern area, in early September 1941 approximately as follows: The surprise attack was flown by twenty twin-engine bombers, escorted by six to ten fighters, at an altitude of around 5,000 feet and carried out in two bombing runs. During the second run the escort fighters attacked aircraft on the field and the defending anti-aircraft battery with weapons fire from an altitude of 300 feet. The bombs were well placed among the parked German aircraft, but the damage done was small. The bombs penetrated deeply into the ground, which reduced their fragmentation effect. The attacking unit departed at the same altitude as that at which it had approached. The attackers displayed no imagination, carrying out no evasive maneuvers even within the anti-aircraft fire zone. In this attack the Soviets suffered no losses.

In other operations in the German rear Soviet bomber forces frequently suffered exceedingly heavy losses when attacking targets protected by anti-aircraft artillery. This was due to excellent teamwork between the German anti-aircraft and fighter forces. Anti-aircraft fire broke up the attacking units because of the Soviets' habit of continuing doggedly on their set course. Once scattered, single planes, flights, or pairs of bombers were then downed without difficulty by the German fighters. Thus, whenever possible, Soviet bombers avoided targets with strong ground defenses.²¹³

6) Night Bombing Operations. Whereas Soviet ground-attack aircraft carried out no night attacks in 1941, bombers frequently attacked at night. In these attacks a fundamental difference was noticeable between the permanent harassing night attacks on the front lines--as a rule by single U-2 aircraft--and night attacks against tactical targets in the near front areas or in the German rear.

Luftwaffe command personnel give approximately the following description of harassing night attacks:²¹⁴ Attacks by U-2 aircraft occurred during moonlit or starry nights, occasionally also when the sky was covered and when there was a low cloud ceiling. They were carried out by single aircraft at intervals of five, ten or fifteen minutes at altitudes of between 700 and 5,000 feet, the aircraft using

the same routes for their approach and return flight. By these methods the Soviets succeeded in maintaining incessant harassing operations in the entire front area, to a depth of approximately six miles, from evening dusk until after midnight and sometimes even until early morning.

The regularity of the approach flight and the clearly visible exhaust flames facilitated the defensive employment of searchlights and anti-aircraft guns, and the U-2 aircraft disappeared immediately when these went into action. The extreme maneuverability of the U-2 and the great difference between its speed and that of the fast German fighters complicated the defense by night fighters.

The tactics employed in these attacks were primitive-- frequently the planes glided in to the attack with stopped engines. Only the wind whistling through their stays could be heard. Bombing, sometimes by hand, was inaccurate.

It would nevertheless be wrong to underestimate the effects of the attacks, since they were so unpredictable and therefore were extremely disturbing. The pilots dropped their bombs on any light or other target sighted, and the constant disturbance reduced the already short rest of the troops and had an adverse effect on supply operations, although the actual physical damage done in the raids was small.

The above observations of Luftwaffe command personnel are confirmed in all respects by their counterparts in the army. Thus, Generalleutnant Huffmann²¹⁵ reports that the Soviet night harassing plane--nicknamed "sewing machine" or "duty sergeant" by the troops-- was known to every soldier who served anywhere in the eastern theater. In every divisional sector these planes made their appearance after dusk, to continue their operations in a shuttle service frequently until dawn. The raids were generally restricted to the immediate areas of the front, but occasionally extended as far as 16 miles in the German rear. On the whole the fragmentation bombs used, which were sometimes preceded by flare bombs to light up the target, did little real damage; and frequently they were dropped in open terrain. Because of them, however, it was necessary to be extremely cautious with lights, to construct shelter trenches, and take other measures which seriously curtailed the already short night rest period, particularly during the German advance. The troops thus

found the Soviet night bombers quite disturbing, although the bombers hardly ever inflicted any actual losses.

No night bombing attacks at sea in 1941 are on record.²¹⁶

In addition to the night harassing raids just described, the Soviets also carried out night bombing attacks against tactical targets in the near front or rearward areas. Such attacks, however, were far less frequent and, as was the case with daylight attacks, were directed primarily against German airfields.

Captain von Reschke²¹⁷ describes Soviet air attacks on the Sea of Azov port of Mariupol [now Zhdanov], which were repeated on several successive nights. The raids were carried out by individual, 4-engine bombers at altitudes of between 1,300 and 2,000 feet. The planes approached from the land side between 2300 and 2400 hours each night and departed across the sea after stick bombing with heavy calibers, which, however, caused very few casualties and very little damage.

Captain Pabst²¹⁸ in 1941 experienced only one night attack against the airfield on which his unit was based. This attack took place on a very light, moonlit night, and was flown by a single plane which dropped a number of demolition and incendiary bombs without doing much damage.

Generalingenieur Thomsen,²¹⁹ in contrast, reports that the base airfield of his group in Smolensk-North was attacked approximately three times in 1941, each time before midnight. In each case three or four bombers, operating singly, attacked during fairweather at an altitude of approximately 5,000 feet. Some of the planes dropped a few bombs. Because of the large size of the airfield and the large number of planes stationed on it the results were satisfactory from the Soviet point of view. The high-explosive fragmentation bombs caused, in some cases, serious damage to parked aircraft, and a hangar containing aircraft burned down. No casualties occurred. No hits by the defending light and medium antiaircraft guns were observed.

Colonel von Beust²²⁰ comments favorably on the manner in which Soviet night harassing raiders carried out their missions and on the effects these raids had on the German troops in the front lines,

on supply and general traffic movements, and on German airfields, although the tangible results achieved in 1941 were small. The Russian talent for improvising and their thorough exploitation of all available means and possibilities is illustrated by the way they used otherwise obsolete aircraft in night attacks in order at least to achieve a nuisance effect, which they were decidedly successful in doing.

In evaluating Soviet night bombing attacks against tactical targets von Beust concludes that such air operations were more successful than daylight raids, although they were only carried out occasionally and in isolated cases and at best caused only a certain degree of unrest and delay. Attacks aimed at German night-bomber units failed to prevent or in any serious degree impair German operations. In 1941 the Soviets carried out no large-scale night attacks.

The quick decision of the Soviet Command to employ its obsolete aircraft--which were useless for daylight operations--in night operations, and the way in which the bomber crews adapted themselves to night operations merit acknowledgement.

7) Operations during Special Weather Conditions. Surprisingly enough, practically no comments by German command personnel are available on this subject. Generalleutnant Huffmann²²¹ states that unfavorable weather had no influence on the operations of Soviet bombers, and adds that bomber units continued to fly their missions in winter when temperatures were as low as -22° F. and during snow flurries.

Such a statement, however, might be misleading. In accomplishing their tactical missions, Soviet bombers had no opportunity to show whether they could carry out long distance combat missions under really difficult weather conditions, and the few operations in which bombers penetrated deep behind the German lines were not carried out under such conditions.

In a careful evaluation the proper conclusion would probably be that Soviet bomber crews were unable to execute bad weather missions. Their training in such subjects as all-weather and instrument flying was inadequate to the requirements of such missions, as were the instruments installed in their planes. Furthermore, the accomplishment of such missions was not required of them in 1941.

8) Bombing Missions in Cooperation with Other Arms of the

Air Forces. As already mentioned, it was only during the last months of 1941 that bomber units were always escorted by fighters.

According to the experience of the 54th Fighter Wing,²²² its units occasionally encountered sizable Soviet bomber forces with strong fighter escorts. On such occasions the assigned I-153 and I-16 fighters maneuvered and remained in the immediate vicinity of the bomber formation, while the faster I-18 or I-26 fighters flew at a higher altitude, sometimes completely out of sight and sometimes above an irregular cloud cover, to render indirect escort support.

On the whole, German commanders²²³ reported that during an approach flight the direct escort planes maintained their proper positions in the immediate vicinity of the escorted bomber formation, but that the situation usually changed when German fighters attacked. As a rule, German fighters experienced little difficulty in luring away escorting Soviet fighters, who showed little sense of responsibility for the escorted unit and were anxious only to protect themselves. The bomber units, meanwhile, made the mistake when under attack of executing their bombing mission at top speed and then diving away. In many cases this reduced the effectiveness of the escort, since the speed of Soviet bombers and fighters was about equal.

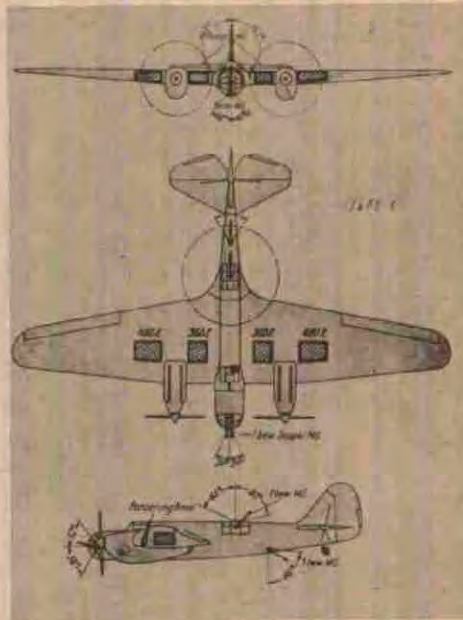
Integrated Soviet bomber and fighter-bomber action has been described in Section IV of the present chapter, so that there is no necessity to treat this subject here. Although they achieved no major successes, Soviet combined fighter-bomber and bomber operations had a disturbing effect on the German troops.

D. Aircraft Types, Weapons, Other Equipment.

At the outset of the campaign Soviet bomber units were equipped with obsolete TB-2, TB-3, and TB-4* four-engine aircraft and more up-to-date SB-2, SB-3, and DB-3 models. During the summer months they also received P-2 twin-engine planes.

Luftwaffe commanders considered the four-engine models unsuitable for daylight operations.²²⁴ They were sluggish, extremely

* Details on this aircraft are lacking.



The Soviet SB-2, employed for both bombing and reconnaissance



The DB-3, a Soviet bomber

vulnerable to gunfire, and inadequately armed, and were thus completely obsolete and unable to cope with German fighter and ground defenses. Soviet bomber units equipped with these types of aircraft suffered such annihilating losses in the first weeks of the campaign that they were withdrawn from use in daylight missions and employed only in night attacks and transport missions.

German commanders²²⁵ were more favorably impressed by the SB-2, SB-3, and DB-3 twin-engine models. These aircraft were also by no means perfect, but could nevertheless be employed with some chance of success. In speed and at high altitudes they were about equal to the German Ju-88 and He-111, but had a smaller operating range, carried a smaller payload, and had less fire power.

SB-2 and SB-3 planes had a speed of approximately 240 miles per hour, carried a crew of three, and were armed with three swivel-mounted machine guns. Their fire power was inadequate against fighters, in spite of the fact that their bottom gondola, a feature unknown to the German Luftwaffe prior to the war, made it possible for them to fire downwards to the rear and sideways to the rear. They could carry a bombload of 2,200 pounds and are not known to have delivered heavier calibers than 550 pounds. The main weakness of these aircraft was their high inflammability. Their fuel tanks were unprotected, and the drop-feed fuel tanks over the engines were easily ignited by weapons fire, thus causing the engines to burn.

DB-3 aircraft were more difficult to shoot down. The pilot was well protected by armor-plating, the fuel tanks were protected, and on the whole these planes were more ruggedly constructed and therefore less vulnerable to weapons fire. Their speed was about equal to that of the SB-2 and SB-3 models, but they could carry a bigger payload.

The best Soviet bomber type was the P-2, used increasingly from the summer of 1941 on. It was fast and highly maneuverable, had very effective fire power upward and downward, including rocket projectiles, and was difficult to shoot down, particularly since the entire plane, including the engine, was hard to set on fire.

The effectiveness of Soviet bombs was considered small, and it is stated repeatedly that only small losses in personnel and materiel were caused by Soviet bombs. This was due in part to

the inadequate training and experience of personnel in bombing and in part to deficiencies in the bombs, detonators, and aiming instruments.

E. Appraisal of the Soviet Bomber Arm.

On the basis of the observations and experience of German command personnel the strong and weak points of the Soviet bomber arm in 1941 can be summed up approximately as follows:

1) From the outset the significance of the Soviet bomber arm was smaller than that of the fighter and ground-attack arms. This situation did not change in 1941, particularly because it was consonant with the concepts of the Soviet Command. At the end of 1941 performances gradually improved, simultaneously with a reorganization and general improvement of the arm.

2) In spite of weaknesses due to the inherent features of the Russian mentality, Soviet bomber aircraft crews flew their missions courageously. Since they were fully aware of their inferiority their behavior is particularly praiseworthy.

3) In accordance with Soviet operational doctrines, Soviet bombers were not employed on strategic missions but exclusively in the performance of tactical missions designed to support army operations. No development of power concentrations was noticed.

4) Accordingly, bombing attacks were directed primarily at targets on the field of battle or in the near front areas. In the southern area these attacks had a considerable impact on the German troops, in the northern and central areas the effects were small.

5) Bombing attacks in the German rear were also directed against tactical targets. In comparison with the effort expended and the losses incurred the results achieved were insignificant.

6) Operations by Soviet bomber forces against German naval forces and other bombing operations against seaborne targets were hardly worth mention.

7) Harassing night attacks by Soviet bombers against German troops had a considerably disturbing effect, tactical bombing attacks

at night against other targets produced only negligible results.

8) The conduct of bombing attacks was stereotyped and displayed little versatility. After their initial heavy losses during the first few weeks of the campaign Soviet bombers were assigned fighter escorts. Cooperation was not always satisfactory between the bombers and their escorts. Combined attacks together with ground-attack aircraft increased in scope but produced no significant results.

9) The four-engine aircraft with which Soviet bomber units were equipped were completely obsolete and useless in daylight operations. Even the newer types of twin-engine aircraft in some units were only conditionally capable of meeting modern requirements and were markedly inferior to German fighters. The only Soviet bomber really capable of performing the missions of a bomber plane was the P-2, of which only a few were available at the time. At the end of 1941 the technical standards reached by the Soviet bomber arm were not much higher than at the beginning of the campaign.

At the outset of the campaign the bomber arm was the stepchild of the Soviet air forces. In 1941 the arm made little technical or tactical progress. Nevertheless, Soviet bombers did not fail to achieve some measure of success--particularly in missions over the battlefield--within the narrow scope prescribed by these circumstances, although these successes were entirely disproportionate to the costs.

The status of the Soviet bomber arm is succinctly stated by Generalmajor Uebe:²²⁶ "The Soviet bomber arm was the oldest but at the same time the weakest member of the Soviet air forces family."

Section VI: Special Air Operations²²⁷

A. General.

Little information is available from German commanders on the employment of Soviet aircraft for such special purposes as air transport, courier, liaison, command, and supply missions. Army commanders obtained no personal information at all on the subject and Luftwaffe commanders obtained what little information they had from observations made on the ground at captured Soviet airfields.

No Luftwaffe commander reports having sighted Soviet aircraft

on transport, courier, or liaison missions during 1941. It can thus be assumed that the Soviets made small use of aircraft for these purposes during this period.

B. Transport Aircraft

According to German commanders the Soviets employed four-engine aircraft of the TB-3, 4, 5, and 6 types, the PS-84 (the Soviet version of the Douglas),* and the U-2 single-engine aircraft for air transport purposes. German commanders also noted a gradual increase in air transport activities.

In September 1941 Generalingenieur Thomsen²²⁸ examined a number of three-engine transport planes of the Ant type found standing on the Soltsy airfield in the northern area. His findings were as follows: clumsy fuselage; corrugated metal outer covering; wings of the customary Junkers construction of the time; water-cooled Russian vertical engines; rough and defective workmanship; primitive panel instruments; uncomfortable pilot's seat with poor visibility. Apparently the planes were intended for general transportation purposes and for the movement of paratroopers, but in Thomsen's opinion they could not be taken seriously.

C. Courier, Liaison, and Command Planes

According to Luftwaffe commanders²²⁹ the Soviets employed types R-5 and U-2 aircraft for courier and liaison purposes. Although not a modern aircraft, the R-5, which was fabric covered, was just as suitable for these purposes as the U-2. It was known that the Soviet Command used aircraft in its communication services but the scope of this use was unknown. It cannot have been great in 1941, however, since such aircraft were rarely encountered airborne.

An unusual air mission is reported by Major Blasig²³⁰ from the Polar Sea front. A German pilot shot down and captured during an attack on Murmansk was treated well by his Soviet captors. After promising that he would fly a German Ju-87 aircraft to the Soviet lines and land it on a precisely specified airfield, where he was then to train

* In the original draft of this study the author calls the PS-84 a "three-engine" plane. No evidence of such a type has been found, and it is believed that the plane had two engines. It is reported to have been armed with five machine guns.

Soviet pilots in dive-bombing, he was parachuted through the bomb-shaft of a Martin bomber near the Polar coast. From there he returned to his unit. Similar cases were reported at the time by the Finnish air forces.

D. AirBorne Partisan Supply Missions.

According to Lieutenant Colonel Mahlke,²³¹ Soviet air units played an important role in their cooperation with partisan units operating in the extensive forest and swamp areas in the German rear. Weapons, equipment, medical supplies, and on a small scale personnel, were flown in to the partisans at night.

Although four-engine transport aircraft, which had to land on makeshift airfields, were sometimes used for this purpose, the usual plane employed was the U-2, which could land in a small area and in winter could land on skiis. In order to increase carrying capacities, a long ply-wood container was mounted under each wing of the U-2. Each of these containers could carry one man and was useful to fly in replacements or to evacuate casualties.

Navigation was by ground orientation, for which purpose directional signals were placed close to, and on the Russian side of, the front line. Light beacons or other light signals were used in the partisan area. Lanterns or straw fires identified the landing or air-drop points. These markings were changed daily in accordance with a pattern of irregular sequences and repeated after a period of several days. This pattern was determined beforehand by radio orders or by a predetermined code signal. German efforts to trap the supply aircraft and lure them to German airfields were frequently successful. Thus six planes of a U-2 squadron were trapped in one night.

If night landings were impossible, particularly during winter, because of the nature of the terrain, or for other reasons, the supplies were dropped, sometimes without parachutes, while the plane flew low and slowly over the supply point. In many cases even personnel were required to jump, without parachutes, into the deep snow from low-flying aircraft. Reports state that only slight injuries were sustained in such cases.

The circumstance that Soviet night attacks were flown by individual planes, the existing gaps of the aircraft reporting network

in the German rear, and the lively Soviet night-harassing air operations made it practically impossible to keep track of penetrating aircraft. It can be assumed, however, that the majority of Soviet aircraft entering the German rear, apart from those on missions against tactical targets, were on partisan supply missions.

It must be admitted that with improvised means the Soviets maintained an excellent supply service for their partisans, a system that can almost be considered ingenious in its simplicity.

In summary, the Soviets made no significant use of aircraft for transportation, courier, command, and supply purposes in 1941. At least, no such use was observed on any large scale. For this reason no opinion can be ventured on the success or failure of such operations. In the matter of airlifted supplies for partisans the performances of Soviet airmen with their primitive and extemporized means were exemplary, and the aircraft employed on these missions were in every respect suitable for the purpose.

Section VII: Ground Service Organization; Air Force Technology; Supply System in 1941²³²

These were subjects with which German army command personnel had no contact whatever and in which Luftwaffe command personnel had little and varying experience. On one point, however, all opinions are unanimous: the Soviet ground service organization, air force technology, and supply system were inadequate and primitive by western standards, with the partially justifiable reservation that this very primitiveness was in many cases better adapted to the conditions in the eastern theater, particularly in winter, than the so-called technological perfection of the west.

A. Ground Service Organization.

1) General. In the opinion of Luftwaffe commanders²³³ most Soviet airfields were primitive, but the ground service organization was flexible, met Soviet requirements, and was under constant expansion. Numerous landing strips existed, but there were few properly developed airfields with permanent-type installations.

During their retrograde movements in the first year of the



The U-2, equipped with plywood containers for carrying partisan agents behind the German lines



A close-up of the U-2's plywood container

campaign, the Soviets as a rule succeeded in evacuating important materiel and equipment. This was due in part to their ruthless exploitation of the civilian population for transportation purposes, and in part to the fact that no large stocks of materiel, equipment, and spare parts were stored at their airfields. It was only natural that aircraft and other equipment were frequently left behind when an airfield had to be abandoned in a hurry, but usually what was left behind consisted of aircraft destroyed on the ground and other items of useless materiel. Captain Kath²³⁴ reports that during the German advance in the northern area fourteen airfields of various sizes, which were subsequently occupied by his units, were found to have been completely stripped by the Soviets before they withdrew.

2) Operational Doctrines; Organization; Chains of Command. These were subjects on which Luftwaffe commanders had little or no information.

Colonel von Heimann and Major Jaehne²³⁵ express the view that ground personnel were not permanently located at specific airfields, but moved with the air unit to which they were organically assigned. When new ground personnel arrived in an area they were identified as such by the German radio intercept service. When a large number of newly arrived ground service units were thus identified, this was taken as an indication that the Soviets were massing air power in the area.

It is known that the above assumption was at least correct so far as the mobile air bases were concerned, so that the prewar Luftwaffe High Command estimate in this field can be considered as confirmed.

It must be emphasized, however, that what is said here is based on only a very few opinions by persons who had no detailed information on the subject. German command personnel were unable to obtain any deep insight into the organization and operating procedures of the Soviet ground services.

3) Airfields and Airfield Installations. Luftwaffe commanders became acquainted with numerous Soviet airfields during the German advance in 1941, and a large number of opinions are available.²³⁶ Although these differ in details, the overall picture they present is as follows:

The outlay of Soviet airfields was simple and primitive by German concepts. Large airfields with all installations considered essential, such as concrete runways, repair hangars, halls, permanent-type billets, fueling and munitioning facilities, and repair shops, were relatively rare. The large majority of fields resembled German advance airfields, and had only a few widely distributed structures, such as small and medium prefabricated and wooden sheds. As a rule they were properly adapted to the local terrain and were also well camouflaged.

Most runways had only a firm grass surface and were not properly maintained. Permanent runways with a concrete or timber surface were a rare occurrence. Large airfields frequently had runways with a surface of octagonal concrete paving stones two yards square in size. The stones were set in a honeycomb pattern without mortice. Besides the time saved in construction--the paving stones could be set as soon as the top surface of the ground was leveled--the advantages of this type of surface were that it was very stable, was better adapted to the difficult conditions of the mud seasons, and because paving stones damaged by air attack could easily be replaced.

It is reported that airfields of this type were constructed in an inconceivably short time. Thus, fields were constructed in forest clearings measuring 2,000 by 500 yards, and the runways were completed in the manner described within one day for use by fighter aircraft. It must be emphasized, however, that ruthless use was made of the civilian population for such purposes. Frequently, women constituted as much as 90 percent of the labor force employed. The completed job was ugly and sometimes slipshod, and the construction equipment used was primitive.

Larger airfields had one repair hangar, storage sheds, an armory, a photographic shop, and some additional shed space, but lacked garages and permanent-type fueling facilities. Buildings on airfields were poorly maintained.

All structures and roads were extremely simple and often in poor condition, with unnecessarily long distances between buildings. The location of the various buildings in relation to each other showed no understanding of the requirements of air operations.

Airfields in this category usually had facilities for a radio

locating service, airfield lighting, weather services and local defense. No detailed information is available on the operation and effectiveness of these facilities.

If Soviet airfields were far below western standards, it must be borne in mind that their very simplicity was an advantage, particularly in view of wartime conditions in the eastern theater. Also, there was the factor of Russian frugality. The Soviets made far more modest requirements in personnel and materiel than their German opponents. At any rate it is irrefutable that the Soviets with their primitive ground service organization frequently were able to adapt themselves to the requirements of war in their vast territories more readily and thoroughly than the German air units with their highly developed technical equipment. Other factors favoring the Soviets were their ability to improvise and the fact that their withdrawal in 1941 shortened their supply lines, while the German air forces were constantly moving farther and farther away from their home sources of supply.

German commanders fully realized that in spite of its inadequacies the Soviet ground service organization had some important advantages.

B. Air Force Technology.

Little is to be found in the reports of Luftwaffe command personnel concerning the technical aspects of the Soviet air forces. What they have to report on the subjects of aircraft, engines, weapons, ammunition, bombs, and general aircraft equipment has been dealt with elsewhere.

In other technological respects, the general trend evident in the reports²³⁷ is that the Soviet air forces were considerably inferior to the Luftwaffe, without being definitely bad. Their aircraft were of simple and robust construction, the engines were copies of foreign prototypes but on the whole were usable and in some cases good. The only trouble was that both fuselages and engines were overworked, which resulted in numerous losses. Whereas small repairs and first echelon maintenance were carried out in mobile workshops near the front, aircraft or engines requiring major repairs had to be sent to rearward permanent workshops or to factories. In major engagements the technical operability of the units decreased rapidly and required a long time to recover.

No special types of equipment or installations permitting other than the usual means of fueling, munitioning, or bomb-loading became known in 1941. Thus, as a rule no fuel, no fixed fueling facilities, and hardly any fuel-tank trucks were found at captured airfields, so that it was often hard to imagine how the Soviets had been able to execute their missions at all.

On the other hand the Soviets proved inventive and dexterous in implementing measures to facilitate winter operations. Thus, at times when the highly technical heating wagons of the German units failed almost completely, the Soviets still succeeded in pre-heating and starting their engines with primitive means in a short time in spite of extreme temperatures. In some cases, a hand-driven ventilator was used to blow the hot smoke from a wood or gasoline fire through a strainer directly on to the engine. In other cases they poured oil heated over a primitive gasoline stove into the engines.

C. Supply System.

German commanders obtained no insight into the organization and operation of the Soviet air forces supply system. For this reason the few statements available on the subject²³⁸ are of a general nature and give no details. According to the little information offered, the replacement of personnel, aircraft, and other materiel functioned with relative smoothness after initial difficulties had been mastered.

The means of transportation used were inconceivably primitive and not liable to disturbance. The Soviet withdrawal and the resultant shortening of supply lines from main supply bases produced definite advantages. Furthermore, the supply bases and routes were only temporarily exposed to German air attack, so that no serious and lasting disturbance of the supply services was achieved. Apart from the usual difficulties and disturbances, supply movements proceeded regularly and according to plan, in which the ruthless employment of forced civilian labor frequently played a large role. This latter circumstance is the only possible explanation for the fact that, in spite of the quick German seizure of airfields and supply depots, the Soviets as a rule succeeded in evacuating everything that was still useful in the way of aircraft, equipment, and installations, leaving only practically useless materiel behind.

The Soviets made large use of their traditional modes of

transportation in their supply movements. With the aid of their hardy peasant horses and simple peasant wagons and sleds they managed to cope with all difficulties much better than their motorized opponents, particularly in the autumn mud season and in winter. In one case it was established that the inhabitants of the surrounding villages were required to roll hundreds of gasoline barrels from the railhead depot to an airfield.

The general statements which German commanders have made on this subject do not reveal any details concerning the manner in which the Soviet supply services operated or whether the Luftwaffe High Command views on the supply organization of the Soviet air forces were correct or not. They do reveal, however, that the supply problem for the air forces was solved, even though various difficulties arose and many improvisations had to be made.

Section VIII: Air Signal Services²³⁹

German commanders gained only a vague impression of the ramifications of the signal services of the Soviet air forces. Without any detailed knowledge on the subject, they estimated the Soviet air signal services more or less as follows:²⁴⁰

In comparison with the German Air Signal Corps, the Soviet air signal services were extremely backward and not very efficient. This applied to the aircraft reporting and air raid warning services, and even more to the internal signal communication services within the air forces.

Radio was the most important medium of communication. This became evident, for example, from the fact that information gained through the interception of practically all Soviet radio traffic in the first few days of the campaign clearly revealed the shock effect of the German surprise attack, while increasing radio traffic later revealed the initial consolidation of the Soviet fronts.

Both Army and Luftwaffe commanders comment frequently on the lack of radio discipline and on the transmission of messages in the clear. The interception of Soviet operations orders transmitted by radio frequently made it possible for the German commands to take timely countermeasures.

The defectiveness of ground-to-air and air-to-air radio communication and the generally insufficient number of radio instruments issued to the units have been dealt with previously. As early as in October 1941, however, lively ground-to-air radio traffic from air control teams in the main line of resistance was heard during the battles in the Yesna [sic]^{*} bend. The air directing teams not only transmitted instructions and directions to Soviet air units, particularly to airborne fighter and ground-attack units, but also through messages transmitted in German attempted to divert German dive-bombers to false targets. These observations were made at various points in the eastern theater. It was not possible to establish whether the air directing teams were army or air force units.

Another feature of Soviet radio communications in 1941²⁴¹ was that specific wave lengths were not assigned to specific units of the air forces, but that a complete wave band was allocated to one army group area. On this wave band the frequencies, and sometimes the call signals and codes, were changed arbitrarily, frequently as often as twice daily. Intercepted messages were thus often difficult to decipher; only the simpler codes were easily decipherable.

In comparison with the volume of radio traffic, wire communications played no significant role in the Soviet air forces and were inadequate. No trunk lines existed.

In the field of organization it was confirmed that the Soviet air forces had no organic signal service in 1941, in contrast with the Luftwaffe. The air signal service was part of the signal service system of the Red Army. It was also confirmed that signal staff officers at army, air division, and air regiment headquarters controlled the signal services and that signal channels, also in radio communications, were established from higher to lower levels of command.

The information obtained by German commanders concerning the signal communications of the Soviet air forces are too meager to permit a sound estimate of this service, particularly since no details are available on the organization and operational procedures or on the personnel and signal equipment and their capabilities.

* Editor's Note: Probably Yel'nya; see note above, p. 115.

However, from what is known concerning the operations of the Soviet air forces, radio traffic on the ground, ground-to-air and air-to-air traffic, and concerning such subjects as the inadequate provision of radio instruments for Soviet aircraft, the low status of training, and the frequently undisciplined behavior of personnel in radio traffic, the conclusion can be drawn that in 1941 the signal services of the Soviet air forces had achieved only low standards and could in no way meet the requirements of modern warfare.

Section IX: Training

Whereas German commanders, particularly Luftwaffe personnel, were able to form an opinion on the training standards achieved by Soviet airmen, a subject dealt with in the appropriate parts of this study, their reports and other available documents contain no information on actual training activities of the Soviet air forces, and particularly not on the methods and conduct of aviation training in 1941. Therefore, nothing can be said here on further developments in this field. However, it is probably safe to assume, and was actually substantiated by reports in later years, that no basic changes were introduced in the training system of the Soviet air forces in 1941 apart from a reduction of the time spent in training.

Section X: Parachute and Other Airborne Troops²⁴²

Although the Soviet Command had devoted special efforts to the establishment of strong parachute and other airborne troops, and although these troops were generally considered as an elite force, they were not employed on any appreciable scale in 1941. German Army and Luftwaffe command personnel could therefore form no opinion on Soviet parachute and other airborne forces, so that they hardly mention them in their reports.

The main reason why these units were not employed in operations similar to those carried out by German airborne troops is probably that in the general confusion caused by the German offensive the Soviet Command saw no opportunity to commit them. It is also possible that sufficient air transportation was lacking for large-scale airborne operations.

Because it did not appear possible to transfer the airborne

units to air bases far in the interior, and because of the succession of severe reverses suffered by the Soviet armies, the Soviet Command committed these excellently trained and equipped troops as infantry without proper planning. Through this precipitant employment, the forces suffered exceedingly heavy losses.

The only case in which airborne units were employed in a mission approximating that for which they were intended is that of the 214th Airborne Infantry Brigade. In July 1941 this brigade was moved through the German lines south of Smolensk to carry out partisan operations behind the German front for a period of three months pursuant to direct radio orders from the Soviet Army High Command. But even in this case the units were not air-carried to the operational area.

Otherwise, the only use made of these troops was as air-carried replacements for partisan battalions. These missions were only on a small scale and cannot be considered of major importance because personnel replacements could easily have been moved on the ground through the loosely connected fronts.

Untrained recruits drafted soon after the outset of the campaign and intended for employment in civilian clothing as partisans were captured together with paratroopers committed in combat as infantry.

Concerning the organization of Soviet parachute and airborne infantry in 1941, a later study²⁴³ reveals that they were separated from the air forces in the autumn of 1941 and assigned directly to the Peoples' Commissariat for Defense. In the process a separate high command was established. Under direct orders from Stalin ten airborne infantry corps, each with three brigades, were newly activated after October 1941 in the territories of the German Volga Republic.* Serious difficulties were encountered here because of the lack of jump towers. Training was restricted largely to infantry and ski training.

* Editor's Note: Located north and northeast of Stalingrad, the German Volga Republic was an area inhabited largely by Germans whose ancestors had, in 1760-61, been invited to settle there by Empress Catherine II of Russia. The district was organized as an autonomous republic in 1924 and abolished on 24 September 1941.

Section XI: Air Armament Industry; Military Economy; Transportation

It is understandable that practically no information is offered by German commanders on the subjects of the Soviet air armament industry, military economy, or transportation system, since these were subjects with which they had no contact. From the few statements made and views offered the following picture evolves:

A. Armament Industry.

In spite of the time and materiel lost in evacuating factories from the near front areas to the eastern territories, the Soviet air armament industry succeeded on the whole in meeting re-supply requirements in aircraft and equipment. A serious bottleneck did develop in this field in 1941, but together with the evacuated and re-established factories the enormous air armament industries along the Volga River and in Western Siberia managed to avert the threatening catastrophe of a complete collapse of the aircraft replacement system. This may have been due in part to the fact that no really effective attacks were carried out by the Luftwaffe against Soviet air armament installations.

B. General Military Economy.

So far as the general Soviet military economy was concerned, the use of the skilled specialists and installations evacuated from the western industrial areas made it possible within a relatively short time to increase the output of factories along the Volga River, in the Ural region, and in Western Siberia.

The Soviets, in spite of the early loss of all industrial plants in the western territories of European Russia, succeeded in evacuating all important machinery and other important industrial facilities. This was an astonishing and unexpected feat of their military economy.

C. The Transportation System.

Contrary to all expectations, the Soviet transportation system, and particularly the railroad system, proved capable of coping with all requirements in spite of the enormous difficulties which developed. At any rate the expected collapse of the Soviet transportation system did not materialize. The destruction caused by German bombing

attacks against railroad installations and rail depots was not lasting enough. Thus, it was established that after a direct hit with a 550-pound bomb on a rail track, traffic was resumed in full volume within forty-eight hours. The two-track rail route to Archangel made it possible to use this vital port for deliveries of military materiel, particularly aircraft and other air force equipment, from the Western Allies.

D. Conclusion.

Although future research may produce new information on the above subjects and thus modify some details of the picture presented here, it is hardly likely that the conclusion will be affected. That conclusion is that, in spite of the heavy losses suffered in 1941, the Soviet air armament industry, military economy, and communications system did not collapse but on the contrary continued to fulfill their missions and even helped to create conditions which made the later recovery of the Soviet military forces possible.

Section XII: Support from the Western Allies²⁴⁵

German commanders were unable to judge to what extent Allied support produced effective results for the Soviet air forces. Only those committed in the Polar Sea areas could obtain a limited impression, since part of the Anglo-American deliveries were imported into the Soviet Union through Archangel. Deliveries through Vladivostok and the Persian Gulf were beyond German observation and attack.

As early as October 1941 Soviet airmen flying American and British aircraft were encountered on the Finland front. However, even when flying these models, with which they first had to familiarize themselves, their performances did not improve. Allegedly, five or six squadrons of Hurricanes were identified in the Murmansk and Moscow regions. Allied airmen were observed in action only on very rare occasions.

The supplies shipped in through Archangel* included primarily

* Editor's Note: For an interesting British account of one of these early deliveries see: Denis Richards and Hilary St. G. Saunders, The Fight Avails, Royal Air Force 1939-1945, Vol. II, Her Majesty's Stationery Office (London, 1954), pp. 78-80.

aircraft (Airacobra, Tomahawk, Hurricane, and Spitfire), aircraft engines, weapons, ammunition, signal equipment, motor vehicles, high-octane aviation gasoline, and lubrication oil. In some cases terrific losses were inflicted on the convoys, but the Western Allies accepted these losses as a calculated risk.

A special case of Western Allied support was that of a low-level attack carried out on 1 August 1941 against the ports of Kirkenes and Linakhamari [Liinahamari] (in the Bay of Pechenga [Petsamo]) by British Swordfish torpedo aircraft operating from the carrier Glorious 120 miles off shore.* The attack was planned to coincide with a high-altitude attack by Soviet bombers. However, the Soviet aircraft were detected in time and German fighters took to the air. Owing to this circumstance the British failed in their attack and lost approximately twenty aircraft. †

The opinions of German commanders are that the support from the Western Allies in 1941 contributed materially to the maintenance of the striking power of the Soviet air forces and to the ability of the Soviet military forces in general to continue their resistance. Lacking Allied support, German commanders consider that the Soviet economy might have been unable to supply adequate materiel to sustain the Soviet forces in the field.

In the light of later knowledge concerning the extent of Allied assistance to the Soviet Union the above opinions are probably correct.

Section XIII: Summary

In a final review of the Soviet air forces in 1941 the fact

* Editor's Note: See Captain S. W. Roskill, R.N., The War at Sea, History of the Second World War, Vol. I, Her Majesty's Stationery Office (London, 1954), pp. 485-86. Roskill mentions raids conducted by torpedo-bombers from the carriers Victorious and Furious against Kirkenes and Petsamo on the same approximate date. He, however, makes no mention of the Glorious as a participant in this operation.

† Editor's Note: Roskill mentions only ten aircraft being lost, all of them from the Victorious.

must be emphasized that German commanders, particularly Luftwaffe personnel, had the opportunity to gain extensive experience concerning the Soviet air forces, their operations, their performances, and their development. It is only natural that they gained more experience on certain subjects, for example, on the Soviet fighter, ground-attack, and bomber arms, than on others, such as the supply and replacement, air signal, and communications systems, or the air armament industry. Consequently, the comments offered by German commanders are better founded in some subjects than in others.

The picture of the Soviet air forces in 1941 presented in this chapter as an outcome of the evaluation of the material offered in a large number of contributions can nevertheless probably be considered appropriate. Furthermore, by comparison with the Luftwaffe High Command prewar estimate of Soviet air power, it permits the development of an opinion on how far the prewar views of the Luftwaffe High Command were confirmed by the experience of German command personnel and by the later course of events.

In brief, the estimate by German command personnel of the Soviet air forces in 1941 can be summed up approximately as follows:

The Soviet air forces as they existed at the outset of the Russian campaign were considerably inferior to the Luftwaffe in respect to tactical, technical, and aviation performances, command and combat experience, training standards, and materiel.

To this initial inferiority were added the destruction of the Soviet ground service organization, the disruption of the Russian Air Force's strategic assembly, heavy losses in personnel and even greater losses in materiel. During the first days of the German surprise attack the Luftwaffe shot down many Russian aircraft and destroyed an even larger number on the ground. Thus, during those first days of the campaign the Russian Air Force saw itself forced over to the defensive and German air superiority was established for the duration of 1941. Even the numerical superiority of the Soviet air forces did nothing to change this fact.

In 1941 Soviet air activities were restricted almost exclusively to support of Army operations. Although these activities were conducted without any recognizable development of areas of main effort and produced no significant or lasting results, local successes were

occasionally achieved, particularly in the southern area. Furthermore, the operations served to support the morale of the Soviet ground forces, which were fighting under almost insurmountable difficulties. The influence of Soviet air operations on the German Army in 1941 was negligible.

In their combat behavior Soviet aircraft crews proved, in general, aggressive, courageous, frequently rashly determined, but seriously lacking flexibility. As an individual fighter the average Soviet airman lacked confidence and personal initiative; operating in a formation he proved a tough opponent who was not to be underrated.

Measured by the experience of German command personnel the Luftwaffe High Command prewar estimate of the probable capabilities, effectiveness, and status of the Soviet air forces and behavior of Soviet air personnel was fairly accurate; however, the strength of the Soviet air forces was considerably underestimated.

The inability of the German Command to destroy the rearward sources of power of the Soviet air forces, the energetic measures employed by the Soviet command to reconstruct its forces, the determined efforts of the remaining Soviet air units, the early winter (which gave the Soviets a breathing space toward the end of the year) all of these factors combined to enable the Russians to initiate a slow recovery of their air power.

Chapter 3

THE RUSSIAN AIR FORCE IN 1942 AND 1943

Section I: GeneralA. The Course of Air Operations; Over-all Developments in the Russian Air Force.

During 1942 and 1943 the course of air operations and thus also the employment of the Russian as well as the German Air Force became more and more dependent on the vicissitudes of the ground fighting. Strategic air force missions gradually assumed a secondary role even for the Germans; the support of the Army in offensive operations became the primary and almost exclusive task. For this reason, one can understand the aspects of air warfare in Russia during that period and the evaluation of the Russian Air Force by German field commanders only if one is aware of the salient features of the ground fighting. The following decisive combat actions make up the most important military operations:

1942

January - March	Defensive fighting along the entire German front in Russia
May - September	German offensive, primarily in the south (Crimea, Caucasus, and Stalingrad)
November - December	Russian counteroffensive on both sides of Stalingrad and along the Don

1943

January	The Russians capture Stalingrad and its German garrison
January - February	The Germans are engaged in serious defensive fighting, particularly in the south
March	German counterattack near Kharkov

July	German attack near Kursk and Russian offensive in the Kharkov-Orel sector
August	Withdrawal of Army Group South toward and beyond the Dnieper
October - December	Heavy defensive fighting continues in the Army Group Center and South areas

This brief chronology indicates that the decisive combat actions took place almost exclusively in the Army Group South area, while the fighting in the Army Group Center and North sectors was relatively slow by comparison. For this reason the Russian Air Force made its main effort in the southern part of the theater; it was therefore in this area that German field commanders both of the Army and Air Force gathered most of their essential experiences pertaining to the Russian air forces; moreover, it was there that Russian air operations, developments, and performances made themselves particularly felt.

As shown in the preceding chapter, the Russian Air Force had overcome its worst crisis at the turn of 1941-42, after which it gradually began to recover from the serious losses of 1941. Despite many new reverses this strength-gathering trend continued during the following two years and led to a certain equalization of air strength in the Russian theater. Quite apart from the Russian factors contributing to this situation, which will be analyzed in detail in this chapter, there also were a great number of German factors which aided this shift of balance. The most significant of these were the great demands and stress placed on the German Air Force in other theaters of war, leading to the withdrawal of sizable air forces from the Russian theater; the heavy losses of the German Air Force in the fighting for Stalingrad--especially of bomber and transport aircraft--where irreplaceable crews and training personnel vanished forever; and the resultant weakening of the Luftwaffe in Russia because of these and other causes, together with the concomitant strengthening of the Russian Air Force. In evaluating the Soviet Air Force during the years 1942 and 1943 these factors must not be left out of consideration since they are essential for the understanding of this period.

The numerous evaluations of German Air Force field commanders¹ on the course of air operations, the over-all developments, and the conduct of the Russian Air Force in 1942-43 agree almost unanimously

on the following points:

1) As of spring 1942 the growing strength of Soviet air power made itself felt. This recovery was only slightly impeded by the new Russian losses suffered during the German summer offensive of 1942. Progress in 1943 was even greater. In the same ratio in which the Russian Air Force grew stronger, especially numerically, the Germans lost their air superiority. As of autumn 1943 equality in the air was solely achieved by balancing the great Russian numerical superiority against German quality. The Germans were at that time capable of achieving only local air superiority, if they concentrated air forces at certain points for a limited period.

2) With certain exceptions the Russian air force units were committed en masse at points of main effort of the ground battle. Their task was almost exclusively to support the ground forces. For this reason, the air battle during this period took place in the southern sector of the theater.

3) In accordance with the concepts of the Russian command concerning the mission of air forces, the buildup and technical development of ground-attack and fighter units was given maximum priority, whereas bomber and reconnaissance units were neglected.

4) Training and combat effectiveness of the Soviet crews did not keep pace with tactical and technical developments. Because of this, the Luftwaffe was able to hold its own, despite growing numerical disparity, and was even capable of achieving temporary and local air superiority by concentrating its forces.

The following observations from German Air Force field commanders substantiate the above conclusions:

Major Jaehne reports that in the winter of 1942 the German Air Force units suffered their first serious reverses in front of Moscow, where the Russian fliers were able to hold their own. Although the Soviet Air Force had by no means fully recovered at the beginning of 1942, the situation had definitely changed in favor of the Russians. There followed a concentrated buildup of Russian close-combat aviation, particularly ground-attack and fighter units. The offensive tactics of the air units improved as better trained and more spirited crews made their appearance. In 1943 the Russian

aviation improved even more and benefited from its production, supply, and training facilities being situated in undisturbed rear areas, and from Allied assistance. Even though morale and fighting spirit were far from perfect, the Russians successfully equalized these deficiencies by mass commitment. The Germans thus gradually lost the air superiority they had achieved during the first year of the Russian campaign; they regained it occasionally, however, during individual operations.²

According to Major Schlage, the German Air Force enjoyed air superiority in the Finnish Theater during 1942, and near Leningrad even in the summer 1943. But in August 1943 the situation in the Army Group Center area was quite different, with the Russian Air Force becoming stronger and more effective until equality was achieved by the end of 1943.³

While Russian fighter strength in the north and central sectors was inferior in 1942, Major von Cossart and Major Stoll-Berberich state that it grew stronger in 1943; an increase in strength was especially noticeable in the south near Stalingrad, in the Caucasus, and in the Kharkov area.⁴

In the summer of 1943, in the central sector of the Russian front, a reconnaissance flier, Captain a. D. K. H. Wilke, encountered aerial combat on 6.5 percent of his missions. This figure increased to 19 percent during the German offensive in the Kursk salient and 31 percent during the defensive fighting in the autumn of that year. At the beginning of this same period, Captain Wilke encountered anti-aircraft fire on 48 percent of his missions. This figure later rose to 90 percent of his missions.⁵

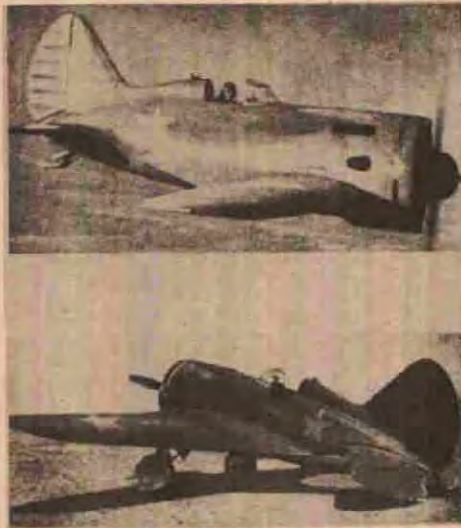
According to Generalleutnant a. D. H. J. Rieckhoff,⁶ the reconstruction of Soviet air power proceeded slowly because of constant attrition and sizable losses in defensive battles and counter-offensives. But the priority given to ground-attack and fighter aircraft benefited the Red Army which was no longer threatened by German air superiority and was able to attack after 1943 under the protection of Russian air power.

All German commentators⁷ agree that the manpower reorganization did not keep pace with the production effort. This personnel buildup required more time. Moreover, it was psychologically

difficult to instill confidence in the Russian crew members who had, during the first year of the war, acquired inferiority complexes. In this connection one must not forget that the Russian mentality, personality traits, and education did not particularly develop individual combat spirit. The primitive and often dull Russian remained inferior in individual combat because his basic concepts of life made him a less tough and stubborn fighter than his German adversary. The suppression of individuality led to failure as an individual fighter, which does not imply any general lack of courage or toughness. But a person who thinks and acts collectively lacks the mental flexibility essential to a good individual fighter. For this reason the Russian fliers performed much better as members of a collective unit than as individuals. Added to these personality traits were considerable training deficiencies, above all the impossibility of coordinating training with production. This delay in the personnel buildup enabled the Luftwaffe to hold its own with the numerically far superior Russian Air Force even through 1943. But ever increasing signs indicated that Russian pilots were becoming more ruthless, confident, and self-assured. During 1943 the Germans encountered individual Russian pilots and units whose performance almost equalled their own. Although this was still exceptional, it indicated the coming trend.

In concluding these evaluations, Colonel von Beust's⁸ summary of the 1942-43 period is paraphrased as follows:

When the German advance was stopped in November 1941, this also meant the end of a period of hopeless inferiority for the Russian Air Force and the beginning of a recovery which at first was hardly noticeable. The factors that had hitherto determined German air superiority, such as the systematic methods of conducting air operations, the concentration of forces at points of main effort, as well as the precision and frequency of attack operations, were of minor importance in winter fighting. With the over-all pressure relenting, the Russians were able to recover. Their air force was able to equalize the situation so that morale improved; at the same time, the Russian command tried to remove the tactical, operational, organizational, and technical deficiencies. This development, however, was at that initial stage difficult to discern since the Germans still enjoyed superiority of air personnel and materiel. As a result, the Germans failed to correctly evaluate their Russian adversaries or the existing ratio of strength.



An I-16 (Rata) one-place Russian fighter.
See description, pp. 101-02.



Captured Russian flying officers

The winter-imposed calm in the ground and air activities* created the prerequisites for the buildup of Russian air power, for intensifying training, and for accelerating technological progress. The effects of this recovery made themselves felt in the summer of 1942. The Russian air units were employed more systematically and with more prior planning. This in turn showed that the intermediate level of command and the unit commanders themselves had learned much and that the training of fighter and ground-attack pilots

* Editor's Note: While the characterization, "the winter-imposed calm," is essentially correct as far as any large-scale German offensive air operations were concerned, it is also a little misleading. After the rapid advances of 1941 which brought the German forces to the east of Leningrad in the north (the city itself remained in Russian hands), to the outskirts of Moscow in the center section of the front, and saw the short-lived capture of Rostov in the south, the Russians, at the turn of the year, unleashed powerful counteroffensives all along the front. Thus, they retook Rostov, relieved the pressure on Leningrad, and pushed the Germans back from Moscow. In the center section of the front Russian operations precipitated a serious crisis for all of the German forces in Russia. Since Hitler, for reasons of prestige and morale, refused to allow any of his commanders to retreat and thus shorten the length of the front, large German forces were surrounded at several points, but principally at Kholm and Demyansk where approximately 100,000 troops had to be maintained by air supply until the spring. Although the Germans were able to stem the winter offensive and the threatened rout did not take place, the winter offensive had serious and far-reaching consequences. The German armies in the East temporarily lost their initiative to the Russians and permanently lost their operational freedom to Hitler, who assumed direct command over the Army. From his strategy of "no retreat," which proved successful at that time, Hitler drew all the wrong conclusions. Thus, the success of Kholm and Demyansk was but a prelude to the failure at Stalingrad. And the idea of holding ground--instead of using retreats to create strategic and tactical advantages--became an obsession which was to cost the German Army heavy losses as the campaign wore on. See Richard Suchenwirth, Historical Turning Points in the German Air Force War Effort, USAF Historical Division (Research Studies Institute, Air University, 1959), p. 103; Tippleskirch, Geschichte des Zweiten Weltkriegs, pp. 242-50.

and crews had improved. In contrast to the events of 1941 that had brought Soviet aviation to the brink of disaster, the summer of 1942--with its territorial and combat strength losses of hardly lesser dimensions--did not diminish the recovery of the Russian air power. This difference was the significant indication for a positive change in the Russian Air Force potential. Thus, in the autumn of 1942 when the German offensives at Stalingrad and in the Caucasus ground to a halt, the Russian Air Force was unimpaired and ready for impending winter operations with better equipment and greater confidence than ever before.

The Battle of Stalingrad with its extremely high personnel and materiel losses* decisively affected all future German air operations in the Russian theater. At the same time, this battle proved clearly that Russian aviation matched that of the Germans who had lost their earlier superiority. Even the prowess of the German individual flier, who retained his superiority and continued to retain it, did not change the facts of the situation.

After the beginning of 1943 the Luftwaffe was mostly on the defensive, also because of the course of the ground fighting; the Russian Air Force, however, was on the offensive and was able to take the initiative. The German efforts to regain air superiority during the summer 1943 offensive had no continued or full success. After the last German attacks in the Kursk salient had failed in the autumn of 1943, the Russians definitely ruled in the air. Only quality, individual bravery, and greater experience enabled the German airmen to prevent their numerically much weaker units from being wiped out by the Russians.

In concluding, this author states again that the Russians purposely neglected strategic air operations and all problems connected with their development, giving top priority to fighter and ground-attack strength. The Russian strategic air force units thus remained outside the above-mentioned progressive development.

This generally accurate Luftwaffe picture of the Russian Air

* Editor's Note: Luftwaffe losses at Stalingrad amounted to 488 aircraft and about 1,000 flying personnel. Figures from the diary of Generalfeldmarschall Milch (Milch - Tagebuch), p. 87, G/VI/4d, Karlsruhe Document Collection. See also, Suchenwirth, Historical Turning Points in the German Air Force War Effort, pp. 100-107.

Force in 1942 and 1943 is essentially substantiated by Army commanders.

One of them, Generalleutnant Huffmann,⁹ states that the Russian Air Force was committed mainly in support of the ground forces and concentrated at the focal point of the ground fighting. Occasionally the points of main effort for ground and air fighting did not coincide. Even the German Army units, which had improved and increased their ground defenses, felt a gradual increase of Russian air power during intensive battles, although the Russian fliers still showed their appreciation of German fighter prowess. Increasing Russian ground-attack aircraft intervention brought about such German reactions as the sending of more antiaircraft artillery to the front and improving its equipment and organization. Soviet air-ground coordination was generally effective.

The increased strength of Russian air power was felt primarily by German Army commanders in the southern part of the theater. New and better types of aircraft, stronger armor, reduced vulnerability of the ground-attack airplanes, and more effective bombs were observed, quite apart from growing over-all strength. The development of fighters seemed to be slower than that of the ground-attack aircraft. The Army commanders joined the Luftwaffe commanders in criticizing the training weaknesses of Soviet crews in 1943. Russian flying units did not seem to receive adequate replacements and the units' performances varied between good and bad; the same pertained to the performances of individual fighter pilots. In general, the Army commanders did not consider the Russian Air Force to be a well-balanced and uniform element of power at that time.

During the period 1942-43, the Russian Air Force concentrated its effort in the southern part of the theater: the Crimea, the Kuban Bridgehead,* and Stalingrad. As of December 1942 it struck hard against the German forces in the Stalingrad pocket, against transport aircraft approaching the encircled forces, and against the supply

* Editor's Note: The Kuban Bridgehead was a holding action in the Caucasus, begun during the Stalingrad crisis. By leaving a force of 400,000 men on the Caucasus' side of the Kerch Strait, Hitler hoped to tie down large Russian forces in the region and keep open a path to the Caucasus' oil fields. In addition, he hoped to deny the Russians the use of Novorossisk, an important port on the Black Sea. The holding action continued until 15 September 1943, when the Germans were forced to retreat to the Crimea.

airfields so that the already inadequate supply system of the Germans at Stalingrad, for this and a number of other reasons, collapsed. On the other hand, the Russian Air Force, in conjunction with the Russian ground forces, was incapable of bringing the entire German southern sector to a definite collapse, or of preventing German recovery and reorganization in this area. Perhaps the Russians did not have sufficient forces, or perhaps their leadership was lacking.

Compared to the south, the situation in the central and northern part of the theater was far more stable and the air force far less active. In these areas interest focused around the Rzhev-Orel (Central front) and the Leningrad areas. In the summer of 1942 the Russian Air Force was growing noticeably stronger in those areas. The Germans no longer enjoyed absolute air superiority, and during the defensive fighting of 1942-43 the German ground forces noticed greater equality in air combat. Russian superiority in numbers, however, did not influence the course of fighting decisively; strength was dissipated by local attacks without depth which were hardly more effective than during the German advance in 1941. This was probably caused, at least in part, by the concentration of forces in the south.

In summarizing, one Army general evaluates the course of operations and the conduct of Soviet air units during this period as a slow recovery from the heavy losses of 1941, with the Air Force giving a very uneven performance. Along some extended sectors Russian air power was almost non-existent. While 1942 was still a year of German air superiority, 1943 reversed this trend: the Russians enjoyed local and temporary superiority because of their great numerical strength, but they did not yet demonstrate their capability to fully exploit local successes.

A similar conclusion was reached by Generalleutnant Frankewitz,¹⁰ who stated that the Russian Air Force gradually outgrew its infantile weaknesses. Its ability to concentrate its forces and select targets indicated better control and proper use of command principles. By summer of 1943 Russian bombing attacks in the Leningrad area proved very effective. There, the Russians had air superiority; wherever the Luftwaffe operated in strength, it was still superior but its forces were insufficient to guarantee constant superiority.

Joint Russian Air Force-Navy Operations Against German Sea Traffic and Naval Installations. Operations of this type remained

insignificant throughout 1942-43, in comparison with the other air activities of the Russians. German commanders found, however, that the Soviets flew more missions over the Arctic Ocean and the Black Sea, whereas there were no significant engagements in the Baltic area. When Soviet fighter-bomber and light-bomber aircraft intensified their attacks on coastal shipping in the Arctic in 1943, the Germans, according to Generaloberst a. D. Hans Juergen Stumpff,¹¹ had to build airfields for fighter aircraft in northern Norwegian coastal areas. Russian losses, however, were out of proportion to the damage inflicted on German shipping.

According to German officers¹² Russian air operations in the Black Sea area also increased in mid-1943, especially after the German withdrawal to Sevastopol. While, previously, outdated aircraft or single-engine naval planes had been used in this area, these were replaced by more modern types of aircraft. These engaged in bombing and torpedo attacks directed mainly against German naval convoys from Constanta or Odessa to Sevastopol. Although such missions were fairly frequent, they caused little damage. Repeated high-altitude bombing attacks against German-held port installations in the Crimea were equally ineffective. The Russian air units in the Black Sea were at that time rather primitive and exercised only a very insignificant influence on military operations.

Antiaircraft Artillery. Both Luftwaffe and Army officers agree¹³ that Russian antiaircraft artillery became increasingly effective during the period under review. The Russian flak grew numerically stronger, developed its command technique and materiel, and improved its overall performance. Antiaircraft fire above the Russian ground forces constantly increased in intensity. During Russian ground attacks, light and medium flak were integrated into the advance parties and armored spearheads.

B. Command and Conduct of Operations

In evaluating the command and conduct of Russian air operations during 1942-43, German Air Force officers agree on the following points.¹⁴

- 1) The Soviet Air Force was even more exclusively committed for ground support than in 1941. This opinion is substantiated by the Russian directive on air-ground cooperation, dated 21 December

1943,¹⁵ which indicates the dependence of air force missions on ground operations and their requirements.

2) Russian conduct of operations increasingly conformed to the concept of concentration of forces.

3) The conduct of operations gradually showed signs of more thorough preparation, greater flexibility, and better adaptability; here, the Russians partly imitated German doctrine of command and operations. Such improvements were noticeable especially at the intermediate level of command, whereas the lower level still lacked self-reliance and flexibility.

4) In contrast to the first year of the campaign, the Russians began to stress the offensive. This was particularly noticeable in the ground-attack units, while the fighter units continued to adhere to their basic defensive concepts. Concurrent with these changes, the Russians began to fly more close formations in larger units.

As of 1943 Russian aviation, according to Major Schlage,¹⁶ concentrated all its efforts on direct front-line support of ground forces at points of main effort. Fighter and ground-attack aircraft were predominant, while long-range missions with fighter escorts were unknown until the autumn of 1943. The attacking aircraft flew in close formation up to group strength; only rarely did they fly deep into German-held territory, and their methods were generally primitive and inflexible.

Major Stoll-Berberich¹⁷ states that the Russians changed their attack tactics as early as the spring of 1942, when the ground-attack aircraft in particular began to fly in major formations and refused to break formation even under German fighter attack. Especially during the winter months the German ground forces in the Leningrad area suffered heavy losses from this type of air attack.

Reporting on the Orel area, Captain Wilke¹⁸ remarks that up to the start of the German offensive on Kursk--5 July 1943--there was little activity in the air and ground fighting, but then the situation changed very abruptly. Russian fighter, ground-attack, and bomber aircraft were committed in great numbers and almost exclusively in support of the ground forces. This still predominantly defensive conduct of operations became an offensive in October 1943, when Russian aviation directed incessant attacks on German ground forces

and also on airfields near the front, in support of the Army's attack.

The gradual improvement in Russian Air Force command methods and conduct of operations was most impressively demonstrated by the evolution of the Battle of Stalingrad,¹⁹ While the Luftwaffe was at first able to match the Russian Air Force, the ratio of strength soon changed in favor of the Russians because of the growing distance between the encircled forces and the German Army Group South bases. By mid-December 1942 the Russians were flying more and more missions in squadron and group formations. By mid-November 1942 German air transports could no longer approach in close formation, and by the beginning of January 1943 even individual transport airplanes were intercepted by Soviet fighters in daytime. By mid-December 1942 the Russians intensified their bombing attacks on German air supply bases to such a degree that the airlift was disrupted and the personnel and materiel losses became very serious.

Generalmajor Uebe²⁰ states that, in general, the Soviet Air Force selected its operational areas judiciously in accordance with the principles of concentration of effort. During Russian offensives the targets of the ground-attack and bombing aircraft were tactical and were integrated into the artillery fire plan. Immediately after a penetration the air units, with the armor, became the primary weapons of attack. The beginning of an attack was usually heralded by combat air reconnaissance; the point of main effort along a wide zone of attack often became manifest by the employment of ground-attack units, with attempts at deception being only rarely observed by the Germans. As of 1943 ground-attack and bomber units no longer attacked without fighter escorts. Although flying by instruments alone was unpopular, the Russian fliers became increasingly accustomed to less favorable and even bad weather, and flew night missions in any weather.

During this period, according to Colonel von Beust,²¹ the Soviet command made every effort to change its conduct of operations and to introduce the principle of economy of forces. There were no more unplanned attacks or mass sacrifices. Even though the command wanted to disregard personal danger, missions were ordered only if the success promised to be in proportion to the effort, and procedures were improved accordingly. The advantages of forming

points of main effort had been recognized and the conduct of operations was made more flexible.

This evaluation of the Russian command and its conduct of operations in 1942-43 is in agreement with the opinion of Army officers who obviously had less insight into these matters than did the Luftwaffe field commanders.

C. Order of Battle and Chain of Command

There is almost no direct information from German field commanders concerning the Russian Air Force's chain of command and order of battle in 1942-43. Major Jaehne²² is of the opinion that the organization, top-level command structure, authorized strength figures, and chain of command had changed little since 1941.

A comprehensive publication of the German Air Force High Command, however, gives a clear picture of the Soviet Air Force's order of battle as of June 1943. This document provides the following general information on this subject:²³

Using foreign organizational and operational principles as models, the Russian Air Force command had, without any show of prejudice, adapted valuable foreign methodology to Russian conditions. In so doing, the Russians indicated their extremely high esteem for technical matters by appointing expert technicians to all key positions in the technical service.

Top-level organization* remained basically unchanged: the Soviet Air Force was still not an independent third service; instead, it was split up into the Red Army Air Force Units and the Soviet Naval Air Force Units. These two air force elements were controlled by the Peoples' Commissariats for Defense and for the Navy, respectively. Both commissariats were controlled by a "Headquarters" which in turn was subordinate to the State Committee for Defense--the top-level political and military organization. The Peoples' Commissariat for Defense controlled, within the framework of the Red Army, the following air force elements: The Red Army Air Force Units; the Long-Range Bomber Command; the Air Defense Command with subordinate flying units; the Commander of Airborne Troops of the Red Army, including

* See Figure 4.

TOP-LEVEL ORGANIZATION OF THE RUSSIAN AIR FORCE, SUMMER 1943

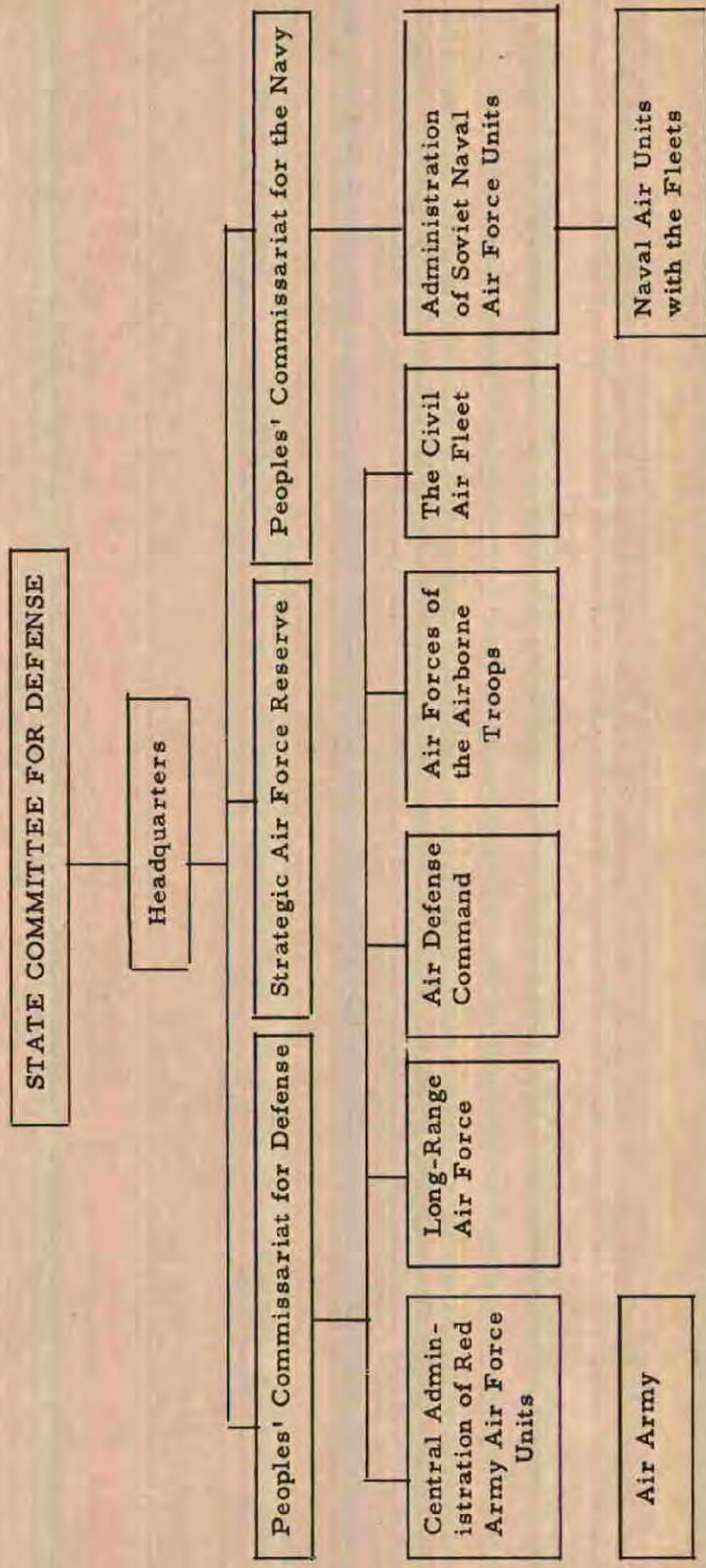


Figure 4

subordinate flying units; and the Civil Air Fleet (when used for military missions). The Peoples' Commissariat for the Navy controlled all naval air force units.

The Red Army Air Force Units were commanded and administered by the Central Administration of Red Army Air Force Units, which was part of the Peoples' Commissariat for Defense and which actually fulfilled the functions of an air force department.

The Central Administration of Red Army Air Force Units was, then, the top-level command and administrative agency of Red Army aviation. It combined two functional spheres--command and administration--thus assuring smooth cooperation. Under it came ten different divisions: The War Council, Staff, Central Administration for Rear Area Services, Central Administration for Technical Services, Inspector General, Economics Division, Personnel Administration, Navigational Administration, Administration of Military Schools, and The Administrator of Air Gunnery Training. Operational command was held by the Staff of the Red Army Air Force Units, which was really the general staff of the air force, controlling the air armies and replacement units for tactical employment.

An air army,* in its turn, was responsible for air force matters within an army group (front) area. The air army was under the operational command of the army group staff to which it was assigned, but was subordinate to the Central Administration of Red Army Air Force Units for all other matters. The establishment of air army commands was supposed to grant more freedom of action and decision to the air forces.† The commander of an air army was a member of the war council of his respective army group, over which presided the army group commander, and as such he took an active part in all operational planning and decisions. The air armies--there were 13 in European Russia--were committed exclusively in the theater of operations and not in the zone of interior. According to the needs of the respective army group sectors, they were composed of a varying number of uniform or composite air divisions and separate air force units. Air armies were

* See Figure 5.

† Author's Note: The Luftwaffe High Command concluded that this development indicated a progressive separation of the air force units from the ground forces. This conclusion eventually proved to be incorrect.

reinforced at points of main effort by employing air corps.

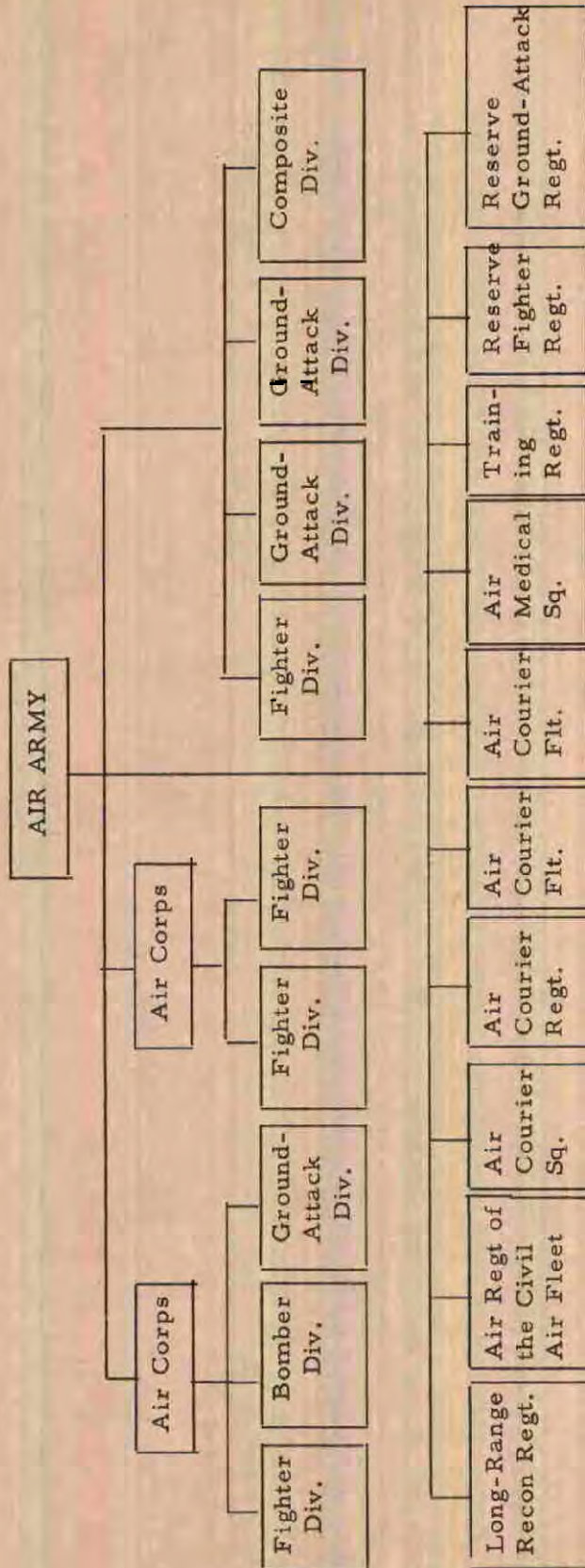
The air corps were merely tactical staff organizations, within the framework of an air army, which directed the employment of subordinate air divisions through air corps headquarters. The air corps supported Army operations in cooperation with the respective army, armored corps, or integrated combat group headquarters. The air corps headquarters were usually tactically subordinate to air armies, having no administrative, supply, and service functions and no organic ground organization. The number of air divisions subordinate to corps headquarters for tactical missions varied, but never exceeded three divisions. By the summer of 1943 the Germans had identified 25 air corps in Russia.

The air division, which occupied the next echelon, was a tactical unit of the air army--to which it was directly subordinate--but usually operated under the control of an air corps headquarters. The air division was to cooperate closely with Army headquarters in carrying out the orders it received from air army or corps headquarters. Its equipment could consist of fighter, bomber or ground-attack, aircraft or it could be a composite air division. With the exception of the latter, all air divisions were composed of only one type of aircraft. One exception were those ground-attack divisions which occasionally included escort fighter regiments. Fighter and ground-attack divisions usually were equipped with the same model aircraft within each regiment; this was not so with the bomber divisions. The composite air divisions, whose versatility in employment was their main feature, were preferably committed in quiet sectors. The Russian Air Force had no reconnaissance divisions. The average division was composed of three air regiments.

The air regiment was the smallest tactical unit of the Russian Air Force. Organizationally, it formed either part of an air division or was directly subordinate to an air army. There were fighter, bomber, ground-attack, long-range reconnaissance, reconnaissance, composite, and training air regiments. The composition of an air regiment was fixed at three squadrons, whose strength varied according to the type of aircraft. At the beginning of the war the Russians had planned to have five squadrons in each regiment, but this plan was abandoned.

As of 1942, the Long-Range Air Force (ADD) /Aviatsia Dalneyo Dyetsviya/ was composed of all long-range bomber and transport units

ORGANIZATION OF A RUSSIAN AIR ARMY, SUMMER 1943



NOTE: Air divisions are operationally subordinate to the air corps; for all other purposes they are directly subordinate to the air army.

Figure 5

with the exception of the units stationed in the Far East. It was under the control of the Peoples' Commissariat for Defense and received its orders from the Long-Range Air Staff, not from the air army headquarters where its units were stationed. This type of commitment and chain of command was used, for instance, near Stalingrad. Since this force also had its own ground organization, replacement regiment, and aviation schools, and, furthermore, had selected personnel, the Russian command seemed to be specially interested in its development.* The long-range air force was composed of divisions with two or three regiments each. Plans called for the organization of air corps as tactical command staffs and of long-range bomber divisions with two regiments of two or three squadrons each.

The air defense units of the Red Army were subordinate to the territorial military headquarters in the zone of interior. An air defense commander assigned to each headquarters was responsible for the organization and commitment of the fighter and anti-aircraft artillery units in his military district. Air replacement elements were also utilized for air defense purposes in rear areas.

The Air Forces of the Airborne Troops of the Red Army were activated in October 1942 and put under the direct control of the Commander of Airborne Forces of the Red Army. They consisted of glider and transport units and were apparently being reorganized.

The Soviet Armed Forces also had a Strategic Air Force Reserve at its disposal, which consisted of a number of composite air corps, air divisions, and air regiments. These were committed in accordance with orders from Red Army headquarters issued by the Red Army General Staff and used at the points of main effort. By 1943 this entire organization was still in flux, the trend being to organize all strategic reserves within the framework of air corps. The Strategic Air Force Reserve, the size of which varied considerably, was composed of all types of aircraft.

The Soviet Naval Air Force, which was directly subordinate to the Peoples' Commissariat for the Navy, was commanded by the Naval

* Author's Note: The Luftwaffe High Command concluded from this fact that there would be more long-range bombing attacks on strategic targets in the near future. This hypothesis also proved to be wrong.

Air Force Commander, who was also its administrator.

The various fleets of the Soviet Navy--the Baltic, Black Sea, and Arctic Fleets, for instance--each had naval air force elements generally consisting of air brigades with three or four regiments, each composed of three or four squadrons. Aside from these brigades there were a few separate regiments and squadrons which were directly subordinate to the Naval Air Force Commander. The naval air elements of a fleet were controlled by a fleet air force commander who was under the operational command of the fleet commander, but for all other matters directly responsible to the Naval Air Force Commander. Shipborne aircraft were controlled by the ship's captain. Air defense of naval bases by fighter and flak units was the responsibility of the local air defense director.

The aviation outside of Red Army control consisted of the Civil Air Fleet, the NKVD* air forces, the air units of the executive councils, and the air forces of the Peoples' Commissariat for Economics. Of these forces only the Civil Air Fleet was subordinate to the air force staff of the Red Army for operational purposes at the beginning of the war; the Civil Air Fleet remained otherwise independent. In 1943 plans for integrating the Civil Air Fleet into the Red Army air forces were under way. Thus, for instance, the "air groups" of the Civil Air Fleet were transformed into air regiments and partly assigned to air armies; they remained subordinate to the central administration of the Civil Air Fleet for administrative and logistical matters, while receiving ground organization support from the Red Army air force units at their respective bases.

The other non-Red Army air forces mentioned above maintained their independence.

A comparison of the organization and chain of command of the Soviet Air Force of summer 1943 with conditions existing at the beginning of the war shows the following essential characteristics:

- 1) The fundamental principle of subordinating the Russian

* Editor's Note: The NKVD (Narodnyi komissariat vnutrennikh del = Peoples' Commissariat for Internal Affairs) was the Russian secret police organization from 1923 to 1946 when it was reorganized as the MVD (Ministerstvo vnutrennikh del.).

air forces to the Red Army and Navy, respectively, continued to be adhered to throughout 1943.

2) Within this framework, the establishment of air armies and their assignment to army groups (fronts) led to closer cooperation between ground and air force staffs, above all at the lower echelons of command. This new relationship increasingly replaced formal command and staff procedures. In accordance with the wishes and requirements of the ground forces and in close cooperation with them, the air force units conducted their operations with relative independence under the over-all direction of air army headquarters. This more flexible command relationship allowed the air forces more initiative in their conduct of operations than they had enjoyed in 1941.

3) The commitment of air units and the shifting of forces was facilitated by the formation of air corps as purely operational command headquarters.

4) The progressive transition to air divisions equipped with only one aircraft type (i. e. bomber, fighter, ground-attack, etc.) simplified command, operational, supply, and service procedures.

5) By detaching the long-range bomber units (1942) and the airborne forces (1941) from direct Red Army air force control, the Russians seemed to indicate the scope of their strategic planning for the future.

One may add, in conclusion, that both the organization and chain of command of the Russian Air Force corresponded to the Russian command and operational doctrines and were thus generally effective.

D. Strength Figures and Methods of Assembly

The German field commanders had no first-hand information on actual Soviet air strength in 1942-43. There were, simply, no important or detailed sources available. In general, the Germans felt that the numerical superiority of the Russian Air Force was steadily growing despite the heavy losses inflicted by the German fighter units. The air regiments, whose actual strength had been reduced to an average of 10-12 aircraft by the beginning of 1942, received a constant flow of reinforcements so that they were at

80-90 percent of their authorized strength in the summer of 1943. In addition, newly activated units strengthened the Russian air forces. The different estimates during that period--thus, for instance, the one made at the end of 1942 when the Luftwaffe High Command believed the Russians had 5,000 planes--were naturally inexact and rather too low than too high.

In the summer of 1943 the authorized strength of the Russian air regiment--the basic tactical unit--was 3 squadrons, with a total of 30 aircraft, regardless of whether the regiment was fighter, ground-attack, bomber, long-range reconnaissance, reconnaissance, or composite. In addition, most regiments were also assigned a liaison aircraft.²⁴

This uniformity in the composition of air regiments existed only for Red Army air force units. The Long-Range Air Force had bomber air regiments composed of 3 squadrons with 15 aircraft each or 45 bomber aircraft plus a command echelon consisting of one bomber, one liaison, and one transport aircraft. Guard (elite) bomber air regiments consisted of four squadrons.

No details on the methods of assembly used by the Russian air forces during 1942-43 are available in German field commanders' records. There are only some general observations indicating that the assembly of air forces usually coincided with the concentration of ground forces and that the arrival of new units at airfields, when recognized by German air reconnaissance or radio intercept, often was indicative of impending operations.

The Long-Range Air Force units were usually concentrated at airfields in the vicinity of Moscow, from which they were transferred to operational points of main effort as the need arose, as for instance in the winter of 1942-43 when they were moved to the Stalingrad area.²⁵

E. Types, Armament, and Equipment of Russian Aircraft

The impression of German officers at the turn of 1941-42, namely that technological innovations had begun to manifest themselves in the Russian air forces--particularly in types of aircraft--was increasingly confirmed in 1942-43. The German Air Force officers agree²⁶ that technological progress after 1942 was undeniable and that it became particularly obvious in the development and

standardization of new types of aircraft as well as in their equipment and armament. While the PE-2* was the principal reconnaissance aircraft, fulfilling all essential requirements, the well-known Mig, Lagg, and Yak types of fighter aircraft were further developed so that they became remarkably effective within a short time. Their capability was frequently considered higher than that of lend-lease fighters. In the sphere of ground-attack aircraft development, the Russians continued to adhere to their principle of sacrificing speed and maneuverability for stronger armor. In so doing, they used a diametrically opposite approach to that of the Luftwaffe which preferred a ground-attack aircraft without armor whose protection was its speed. The improved model IL-2 fulfilled all ground-attack aircraft requirements in 1942-43 and--according to competent Army and Luftwaffe officers--it was often considered ideal for that purpose. Aside from the DB-3 and PE-2, the bomber aircraft made the least technological progress; even these two types showed no outstanding features. The reason for stagnation in this field was probably the orientation of the Russian military command which intentionally gave preference to fighter and ground-attack aircraft over bombers. Allied bombers that might have brought about a certain equalization did not arrive in sufficient numbers. By the summer of 1943 there was only one Russian bomber division of three regiments composed of two squadrons each and equipped with American B-25's.

F. Summary and Conclusions

The impressions and data of German Air Force, Army, and Navy officers on the development and conduct of operations of the Russian Air Force in 1942-43 may be summarized as follows:

1) The Russian command adhered to the principle of subordinating air force units to the Army and Navy. The top-level command structure and employment of forces corresponded to this basic principle. For this reason, Russian air force units operated almost exclusively in support of the ground forces and as a rule were concentrated at the focal points of the ground battle. By this method the Russian ground forces were relieved from the pressure of German air superiority. The employment of air forces in support of naval

* Editor's Note: The PE-2 was a twin-engine bomber, dive-bomber, long-range fighter and reconnaissance monoplane (not to be confused with the shorter range P-2).

operations was of secondary importance.

2) During the period under review the over-all situation with regard to air operations gradually changed in favor of the Russians. An increasing strength of Soviet air power contrasted with a weakening of Luftwaffe capability. By the end of 1943 equality in the air could be restored spasmodically by the Germans because of the quality of their equipment and above all by the excellence of their personnel. Numerically, the Russian Air Force was far superior.

3) The reasons for this shift in air power--aside from over-commitment of the Luftwaffe in other theaters of war--were: the accelerated development, buildup, modernization and standardization of the Russian fighter and ground-attack forces with simultaneous de-emphasis of bomber and reconnaissance aircraft development; the rapid increase in the actual strength of Russian air units and the activation of many new units; the considerable progress made in command and operational procedures, with resulting improvement in tactics, planning and operations; the improved organizational structure and command relationships in accordance with the realities of the situation; and the gradually increasing combat experience of Russian pilots and crews.

4) The reasons Russian air superiority did not make itself felt more strongly by the end of 1943 are to be found in the greater ability of the German crews, the time lag between Russian technological progress and manpower organization, and the delays in improving the combat efficiency of Russian crews by intensified training. A contributing factor was still the Russian pilot's shortcomings as an individual fighter.

5) The Soviet Air Force flew almost no strategic missions during this period.

6) Russian antiaircraft artillery continued to improve and often was very effective in combating Luftwaffe attacks.

Section II: Reconnaissance

A. General

In 1942-43 German officers did not encounter much Russian

reconnaissance activity so that they arrived at the conclusion that there were few changes and little progress in this field. Only on rare occasions did they recognize a planned and systematic employment of Russian reconnaissance aircraft. On the other hand, the intensive Russian air activity, primarily above the battlefield, and the frequent use of fighter, ground-attack, and bomber aircraft for reconnaissance missions made it very difficult to obtain an adequate idea of the actual capability of the Russian reconnaissance units.²⁷

In any event, the Russian military leaders seemed increasingly to have recognized the importance of reconnaissance on the course of operations. Thus, for instance, two reconnaissance units were assigned to guard air regiments in February 1942 for the first time. The same tendency was expressed through such measures as using only officers as flight personnel of reconnaissance units, selecting as replacements personnel from experienced bomber crews, paying higher salaries, granting special incentives and giving priority leaves to reconnaissance fliers. Finally, the production of reconnaissance aircraft was increased by improvements in procurement and supply procedures. However, a shortage of sufficiently trained observers continued. Since the Russians did not use the expedient of retraining suitable Army officers as air observers and since flying personnel lacked any close acquaintance with ground combat methods and above all with hostile organizational, tactical, and operational peculiarities, and since furthermore there existed no specialized training for air observers at observer schools, the reports of Russian observers were usually limited to registering the obviously visible on the ground. Visual reconnaissance was therefore primitive and correspondingly depreciated; the main emphasis was placed on photographic reconnaissance which provided satisfactory results, occasionally even good ones.²⁸

B. Organizational Structure, Chain of Command, and Strength Figures

The information available to the Luftwaffe on the organizational structure, chain of command, and strength figures of Russian reconnaissance units was summarized in the Wartime Structure of the Soviet Air Forces, Status of June 1943 approximately as follows:²⁹

The basic tactical and organizational unit of the Russian reconnaissance arm was still the air regiment or less frequently the independent

squadron. The regiment was composed of three, sometimes only two, squadrons with a basic authorized strength of ten aircraft each. One differentiated among long-range reconnaissance regiments for strategic reconnaissance, independent regiments for short-range reconnaissance, composite air regiments for short-range reconnaissance missions and other assignments, and independent reconnaissance squadrons.

Every air army had one long-range reconnaissance regiment, several reconnaissance regiments, composite air regiments, and independent reconnaissance squadrons.

The long-range reconnaissance regiments were assigned their missions according to available information. Such assignments were often made directly by the Red Army air staff through the chief of the reconnaissance branch, (Intelligence officer). The individual long-range air reconnaissance regiments were under the operational control of the air armies or directly under the Red Army High Command in carrying out these missions. The long-range reconnaissance squadrons were usually equipped with only one type of aircraft, while the air regiments had squadrons equipped with different models; for example: two squadrons of PE-2's for daytime missions and one squadron of IL-4's for night flights.

The organizational structure of the independent reconnaissance air regiments for short-range reconnaissance corresponded to their mission; in general, these units were subordinate to air army headquarters.

The composite air regiments, committed at quiet frontal sectors as multiple purpose units to support the ground forces, were responsible for air support of an army. They were generally composed of individual fighter, ground-attack, and U-2 squadrons. For example, one composite air regiment, with one Yak-1* and one U-2 squadron, conducted daytime reconnaissance and fighter missions with its Yak-1 squadron, while the U-2 squadron transported ammunition to the front during daytime and flew reconnaissance and interference missions by night.

* Editor's Note: The Yak-1 was a single-seat, low-wing, cantilever monoplane, the forerunner of the Yak-9.



Russian PE-2 bombers in flight



The Russian Yak-1 fighter aircraft

C. Air Reconnaissance Operations

1) General. Russian reconnaissance operations were predominantly local, i. e. tactical and combat air reconnaissance missions flown by single PE-2's or pairs of fighter or ground-attack aircraft in good or bad weather. This type of reconnaissance gradually increased, as did night reconnaissance. The Russians usually flew armed reconnaissance missions that were often combined with nuisance raids, especially at night. The aircraft most used were the IL-2 for short-range reconnaissance, and the PE-2 for long-range missions. The pilots, however, were still afraid of German fighters and flak, and often failed to complete their missions when they encountered anti-aircraft fire or were intercepted by fighters. In such instances they dropped altitude and turned eastward. In carrying out their missions they avoided aerial combat, even against inferior or damaged German aircraft.³⁰

The reconnaissance missions were issued by the ground forces; the army group (front) headquarters assigned general missions to the air army, which in turn spelled out individual tasks in detail to the air reconnaissance units and prescribed the number of flights in some instances. Fighter, ground-attack, and bomber units also received reconnaissance missions, which were often the same ones issued to the reconnaissance units. Combat reconnaissance was mostly accomplished by composite air regiments; tactical reconnaissance by independent air reconnaissance regiments; and strategic air reconnaissance by long-range air reconnaissance regiments. The latter had better qualified personnel and special equipment for long-distance flights.

2) Long-Range Reconnaissance. At the end of 1942 each air army had one long-range air reconnaissance regiment composed of three squadrons for the sector held by an army group (front).³¹ The principal reconnaissance objectives that were to be systematically and daily observed were troop and supply movements along main roads, moving and stationary trains, and airfields. The air army staff maintained a traffic chart. The airplanes did not penetrate beyond 350 to 450 miles in depth, and for such missions only the most experienced crews were selected. In general, the two PE-2 squadrons flew daylight missions on alternate days; they flew an average of 8 to 12 missions per day in summer, and in winter proportionately less.

The Russian procedures of assigning missions and reporting

differed from the German. The "reconnaissance branch" of the army group headquarters, which corresponded to the intelligence branch of a German army group, received requests for information from the operations branch and transmitted these requests and missions to the reconnaissance branch of the subordinate air army headquarters. These requests were transmitted to the chief of staff or directly to the chief of the reconnaissance branch (Intelligence officer) of the long-range air reconnaissance regiment. He prepared the plan of operations after reporting to the regimental commander, and together with the squadron commanders he selected the crews for each individual mission. The mission assignment was therefore an intelligence, and not an operations, function. After returning from a mission, the aircraft pilot reported verbally to the chief of the reconnaissance branch. Important observations were immediately transmitted to air army headquarters. All reports were collected and transmitted to the reconnaissance branch of the air army by liaison aircraft at the end of the day, together with all photographs. Air army headquarters forwarded reports and photographs to army group. To maintain secrecy, reporting via radio was avoided, if possible. Photographic reconnaissance results were considered as important operational planning data, while visual reconnaissance was used only to supplement available information.

Thus, while the Russian command attributed more significance to long-range reconnaissance than hitherto and a certain degree of methodology in assigning and executing missions was recognizable, such progress was still considered as relatively minor and ineffective during 1942-43 by German Air Force experts.³² There were many reasons given: insufficiently trained crews; long and complicated training of long-range reconnaissance fliers; the assignment of missions was not extensive enough nor was it properly planned--a criticism that touches upon the basic principles of Russian conduct of operations; and finally, the fact that reports from agents and partisan units as well as other sources of information provided sufficient data on airfields, troop movements, transportation, supply, and military installations in rear areas to make long-range air reconnaissance largely unnecessary.

3) Short-Range Reconnaissance. According to German Air Force officers,³³ Russian short-range reconnaissance had become more effective in fulfilling its principal tasks of front reconnaissance and ground support. The tactical and operational procedures were

exclusively and successfully geared to the closest possible cooperation with the ground forces. By 1942 the Germans gradually felt the impact of this improvement at their expense, since the Russian command was no longer ignorant of what happened at the German front line and in the rear areas, as had been the case in 1941. The tactical and combat reconnaissance objectives remained generally the same. Tactical reconnaissance missions were rarely flown at altitudes below 13,000 feet; they consisted of taking photographs individually or in series. Area photographic reconnaissance--by photographing reconnaissance strips from parallel flight lines--was not noticed; nor, in 1943, was reconnaissance of airfield targets with follow-up attacks. In view of the intensive Russian air activity, Luftwaffe officers found it difficult to determine the intensity and effectiveness of combat air reconnaissance at the points of main effort. Nevertheless, higher frequency of tactical and combat reconnaissance missions usually indicated the imminence of attacks. The Russians rarely used aerial observers for artillery fire.

In good weather single PE-2's carried out short-range reconnaissance missions, in bad weather they were conducted by pairs of fighter or ground-attack aircraft.

In proportion with the daylight tactical reconnaissance, the night reconnaissance missions also assumed increasing importance. The missions flown during the hours of darkness stressed information on approach routes and assembly areas; they were carried out as armed reconnaissance, often with the use of flares.

No information is available on Russian procedures for assigning short-range reconnaissance missions and reporting after their execution. But it may be assumed that they were the same as for long-range reconnaissance.

4) Evaluation by German Army and Naval Officers. German Army officers³⁴ generally agree with the evaluation of their Luftwaffe counterparts. Obviously, they were more impressed by combat air reconnaissance than by Russian long-range reconnaissance. They stress that during the period under review the Russians made considerable progress in air-ground cooperation and that the effect of Russian air reconnaissance was much more noticeable than in 1941. This was particularly so in the southern sector of the Russian theater during 1943 at the focal points of the struggle. While reconnaissance activity in the air had been intensive in the Crimea as early as 1942,

the Russians flew few reconnaissance missions at other crucial points in the Army Group South area. This was true even during the Battle of Stalingrad and the withdrawal movement of the German army group in 1943. In the central and northern part of the theater, Russian air reconnaissance was restricted to minor missions in 1942, but grew constantly more intensive in 1943. Only rarely did air reconnaissance information affect top-level planning, but there was evidence of reconnaissance data obtained by Russian fliers having been used for immediate tactical decisions or for directing fire. These were additional indications for the smooth cooperation between air and ground forces. Artillery spotting by air was almost non-existent in 1942 and extremely rare in 1943. Nor was fire for effect, after adjustment fire with air observation, reported by German army officers. On the other hand, they agree that night reconnaissance activities increased considerably, and that these missions were used extensively to maintain contact with partisan units.

The little information on Russian Air Force activities in cooperation with the Navy³⁵ indicates that air reconnaissance played a very secondary part in naval planning and operations, as was the case in 1941. Even so, there was some progress: both in the Black Sea and the Lake Ladoga-Leningrad areas high-altitude reconnaissance aircraft flying daytime missions for Russian naval units warned of approaching German naval or air forces. Russian air reconnaissance flew regular missions in the Black Sea area to identify German naval convoys. But the reconnaissance aircraft did not maintain contact with the convoys; instead, they sent radio reports while on their return flights. By taking cross-bearings, German radio intercept stations were regularly able to ascertain the approach of Russian bomber and torpedo aircraft in time for German fighters to protect the naval convoys. This was another proof of Russian lack of flexibility. Moreover, for a long time Russian air reconnaissance did not fly any missions south of the 44th parallel. The Germans took advantage of this when plotting the course of naval convoys.

D. Types, Armament, and Equipment of Russian Reconnaissance Aircraft

All sources agree³⁶ that the outdated types of aircraft used for air reconnaissance in 1941 had disappeared, except for the U-2 that was still suitable for night reconnaissance. The others had been replaced by more recent models like the PE-2 for short-range reconnaissance

and the PE-3--a special modification derived from the PE-2--for long-range missions. These aircraft fulfilled all requirements regarding speed, climbing ability, maneuverability, armament, and depth of penetration. By eliminating a third crew member, the PE-3 was faster and had longer range than the PE-2. Elimination of the third crew member, however, also reduced the PE-2's firepower and made it more vulnerable to fighter attacks. At the end of 1943 the TU-2* was used as a multi-purpose aircraft for armed reconnaissance. Occasionally, the American Boston III (Douglas A-20) airplane was also reported as having been used on reconnaissance missions. Long-range night reconnaissance missions were flown by DB-3F (IL-4)† airplanes, while night reconnaissance was otherwise accomplished by U-2's. Combat air reconnaissance continued to be flown by such fighter aircraft as the Lagg-3, La-5, and Yak-7†† and by IL-2 ground-attack planes, which were also used for other tactical air reconnaissance.

The armament of reconnaissance aircraft was the machine gun, except for types of airplanes--such as fighter or ground-attack aircraft--that were equipped with cannon.

There is little information on special equipment provided for reconnaissance aircraft. The Germans established that the Russians had produced imitations of the German automatic aerial cameras, such, for example, as the 30 by 30 centimeter aerial camera that had a focal distance of 50 centimeters. This item of equipment was an exact copy of the German model; however, the lense was greatly inferior so that the photograph was less clear, which considerably affected the interpretation value of the photographs.

In summary, during 1942 and 1943 Russian air reconnaissance had made up for most of its backwardness of 1941. Short-range reconnaissance, in particular, made good progress, as did night

* Editor's Note: The TU-2 was a twin-engine, 3 to 4 seat attack bomber intended to replace the PE-2.

† Editor's Note: The DB-3F, or IL-4 which it was called after the spring of 1942, was a further development of the DB-3. A twin-engine transport aircraft, it was also used for towing freight gliders and for reconnaissance.

†† Editor's Note: The Yak-7, a single-engine, two-seat, cantilever monoplane, was an advanced training aircraft.

reconnaissance and, to a lesser extent, air reconnaissance at sea. Reconnaissance aircraft and their armament and equipment improved considerably during this period. Replacement personnel, training, and long-range reconnaissance remained weak and kept the Russian air reconnaissance performance below that of the Germans.

Section III: Fighter Aviation

A. General

German Air Force officers in the field³⁷ had ample opportunity in 1942-43 to acquaint themselves with Russian fighter aviation. This was equally true for German reconnaissance, fighter, bomber, and dive-bomber crews. Their evaluation of the Russian fighter arm during that period is essentially in agreement. They describe the operations and developments of this hostile air arm approximately as follows:

When the Russian command reorganized the Air Force after the disastrous defeat suffered in 1941, it made a special effort to make fighter aviation the elite arm. Because of the wartime pressures and the suffering of new losses, such an effort could obviously only be gradual. It was equally understandable that the units with the most modern equipment and the best trained and led personnel were committed at the points of main effort of the ground battle, while the weak fighter units equipped with old types of aircraft were employed along less active sectors. This meant that the Russians made their main fighter effort in the southern part of the theater.

Along the Leningrad sector, for instance, the Russian fighter command remained very reserved even through the first months of 1943, showing scarcely more aggressiveness than earlier when opposed by German fighter units. By contrast, however, the Russian fighter pilots committed in the Kuban bridgehead and on the Crimea were quite aggressive as early as 1942. There the Russians had employed their best units. Among these was a naval fighter brigade which excelled because of its good staff work, tenacity in attacking, outstanding ability, and wealth of experience. Thus, it was in the southern part of the Russian theater that Soviet fighters achieved tremendous numerical superiority for the first time. There, apparently up to two-thirds of the entire Russian Air Force was temporarily



Soviet TU-2 light bombers in flight



The Russian La-5 fighter

committed.

The real turning point, after which Russian fighter strength clearly was on the ascendancy, was the Battle for Stalingrad where the Luftwaffe suffered such heavy losses that the Russian fighter arm achieved absolute air superiority for the first time, especially after the German fighters could no longer provide air cover above the pocket because of excessive distances from their air bases. Stalingrad gave Russian fighter pilots the confidence they had lost in 1941, providing them with the inner strength necessary for rebuilding their disorganized arm; the technical prerequisites for such a rehabilitation had already been provided by modern types of aircraft and improved command and staff procedures.

Like magnets, the centers of ground fighting attracted all forces of both opponents, and the fighter forces were concentrated above the important attack, defense, and breakthrough points at the front. The Russian fighter arm grew steadily through 1943 in numerical strength and in command, staff, and operational capability as well as in flying techniques and aircraft. Improved and up-to-date Russian aircraft were reinforced by sizeable numbers of Allied fighter airplanes, whose presence was particularly noticeable around Leningrad. By the end of 1943 the Russian fighter arm had become an adversary whose strength was not to be underestimated. Russian numerical superiority, however, --they had several times as many planes as the Germans--did not affect the over-all situation in the air more strongly because most of the Russian fighter pilots lacked the training and experience of their German opponents. Even though the Russians had some very good units--the guards fighter regiments in particular--and outstanding individual pilots, the average unit or pilot was inferior to its or his counterpart on the German side. The Russian performance was geared too much to the ability and courage of the unit commander, whose qualities or deficiencies determined the performance of the entire unit.

The correctness of this evaluation was proved with particular clarity during Operation Citadel,* which started on 5 July 1943.

* Editor's Note: In comparison with the ambitious objectives of the summer offensives of 1942 (Stalingrad and the Caucasus), Operation Citadel had a more modest goal--the achievement of a stalemate in Russia. See Field Marshal Erich von Manstein, Lost Victories, Henry Regnery (Chicago, 1958), pp. 443-49.

During this last major German offensive in Russia, the Germans committed strong air force units in the Kursk salient. In the subsequent air battles numerous Russian aircraft were shot down by the Germans, who suffered few losses. Although the Russians employed far more fighter aircraft than the Germans, they were unable to achieve air superiority, which the Germans held undisputedly for the following weeks in that sector. The uninterrupted fighting, however, eventually lowered German combat readiness so that the Russian numerical superiority was able to achieve limited effects.

Colonel von Beust, in a very graphic and exact description of the over-all development of Russian fighter aviation in 1942-43³⁸ mentions that the severe winter of 1941-42 permitted the Russian command to rehabilitate and train its fighter units. By the spring of 1942 a fighter arm numerically superior to the German opponents supported the Russian war effort. Even though the Russians had not been able to compensate for German experience, training, and technical know-how, their greatest deficiencies in flying ability, operational procedures, organization, and command and staff methods had been eliminated. Russian fighter aviation had therefore become more effective and its losses had dropped proportionately. These developments naturally took time so that the German air superiority was still uncontested in the summer of 1942. Since the Russian fighter arm carried the brunt of the air war during the major German offensives, it suffered the relatively highest losses and its reorganization could not be but gradual and time-consuming.

According to von Beust, the Russians developed into remarkable adversaries in the struggle for air superiority. The slow but continuous deterioration of German air power was, to a considerable degree, attributable to Russian fighter aviation. In general, though, the Russians shot down relatively few German aircraft, not only because the Germans used better combat tactics and had more experience but also because of the previously mentioned personal deficiencies of the average Russian fighter pilot. The effectiveness of the Russian fighter aviation was essentially its ability to force the Luftwaffe, and above all the German bombers, to take measures and adopt dispositions that reduced the effect of German air operations and increased the German air effort without bringing compensating results. Thus, for example, considerably stronger fighter escorts had to accompany the bomber units on their missions.

Insofar as they are capable of evaluating the general development

of Russian fighter aviation in 1942-43, German Army officers endorse the above opinion of the Luftwaffe officers.³⁹ They note a considerable and steady increase in Russian fighters in 1943 with the fighter strength concentrated at the points of main effort, such as the Crimea, the Kuban bridgehead, near Stalingrad, Orel, Rzhev, and Leningrad. The Army officers also observed, however, that the Germans had air superiority during their attacks on Kerch and Sevastopol.

Nevertheless, the growing confidence of Russian pilots is dramatically illustrated by the remark⁴⁰ of 1st Lieutenant Peter Kulakoff, a Russian fighter pilot who had shot down nine German planes in severe battles during which he had frequently had to bail out. On 24 February 1942 he landed voluntarily on a German airfield. Much as he admired the performances of the Luftwaffe, when asked what chances he thought Germany had in the war he replied succinctly: "None."

B. Organizational Structure, Chain of Command, Strength Figures, and Methods of Assembly

The obviously not very comprehensive or pertinent information⁴¹ available from German officers regarding this subject can be summarized as follows: existing Russian fighter units were reorganized and decentralized and thus strengthened, while many new ones were activated. At the same time they were echeloned in depth from the main line of resistance $\overline{\text{MLR}}$ to rear areas. Only occasionally, at points of main effort in the ground fighting, were strong concentrations formed, and there they were almost unavoidable.

The fighter divisions were almost solely composed of fighter units to the exclusion of all other types. Internal cohesion within the division was, however, relatively loose.

The division was generally composed of three air regiments, each of which might be equipped with different types of aircraft so long as the intra-regimental equipment was uniform. The fighter regiment, in turn, was composed of 3 squadrons of 30 fighter aircraft and one liaison airplane (U-2) each. The personnel consisted of 34 flying officers, 130 technicians in officer and NCO grades who formed the organic regimental technical ground organization, and 15 men acting in various functions, for a total of 179. There was often a certain percentage of women, who were employed as weapons and

engine mechanics and in similar technical capacities, exceptionally also as pilots. The air regiment had no organic trucks or signal equipment, relying completely on the air-ground organization for this type of support. Supplies and personal baggage were kept to a minimum so that the air unit would be as flexible as possible and ready to move at short notice. The transport aircraft needed for such moves were requisitioned from the respective air army headquarters.

Night fighter units, whose activation was accelerated in the summer of 1943, also formed part of the air defense forces and as such were subordinate to the fighter divisions. There were night fighter regiments and separate night fighter squadrons as well as alert night fighter units forming part of air replacement and training regiments. In cases of emergency, these night fighter units could be employed by the air defense commander of a military district in the zone of interior.

C. Fighter Operations

1) Personal Conduct. In the 1942-43 period German Air Force officers continued to differ greatly in their opinions concerning the personal conduct and aggressiveness of the Russian fighter pilots. Some mention lack of combativeness, low morale, respect for their German opponents, little courage, even cowardice and lack of will power,⁴² while others emphasize pugnacity, confidence, self-assurance, tenacity in conducting operations, and even self-sacrifice and disregard of danger.⁴³ These apparent contradictions can be explained by differences in time and location, but even better by the fact that the Soviet fighter units varied greatly in quality during that period. There were individual pilots and units, such as the naval fighter brigade committed in the Kuban bridgehead fighting or the guards fighter regiments, which, especially when they had the benefit of numerical superiority, were equal to their German opponents in aggressiveness, courage, and tenacity. At the same time, there were units--until the autumn of 1943 they were probably still in the majority--lacking the above qualities. Characteristics based on the Russian mentality, personality, and education, which favored collective operations to the disadvantage of individual combat ability, were also recognizable in 1942-43 among Russian pilots. The German fighter pilot therefore continued to be a superior fighter in the air. But there was little doubt that, in general, the Russian fighter pilot had more self-assurance than in the past, and that confidence in his

modern aircraft and knowledge of his numerical superiority had strengthened his morale. The personal conduct of the Russian fighter pilot in the autumn of 1943 indicated that he had overcome the shock of 1941.

2) General Principles of Conducting Operations. Luftwaffe officers agree that Russian control of fighter operations from the ground and in the air improved considerably during 1942-43. To achieve such progress, the Russians adopted many of the German principles of conducting operations. The main characteristics of Russian fighter operations during that period were as follows:

- a) There was a gradual transition from a basically defensive to a more offensive conduct of operations.
- b) Fighter operations were focused upon the main line of resistance and the contiguous area; up to summer 1943 there were relatively few missions flown into the German rear areas, but thereafter such penetrations increased.
- c) The principal mission was pursuit in formation or fighter sweeps against German aircraft, while escort flights were secondary missions. Employment of fighters as fighter-bombers was infrequent.
- d) The commitment of fighters was no longer carried out without planning and in a piece-meal manner; instead, forces were concentrated at the points of main effort. While previously fighters were committed in pairs or in flights of four, they now began to appear in squadron strength and in even larger units. The units in the air were well directed from fighter control centers on the ground.
- e) When the Russians started their major offensives in 1943, they weakened the fighter protection covering their rear areas. The German Air Force officers⁴⁴ add, however, that important objectives, such as Moscow, continued to be protected by the most up-to-date Russian and Allied aircraft.

In endorsing these comments, one author⁴⁵ states that Russian fighter operations became more systematic and straightforward, the division of units into attack and cover elements more effective. This was particularly striking in the case of elite units which confronted the numerically inferior German fighters with increasingly dangerous

situations. Ground control methods, which were limited to observing the air space and conducting air operations against identified targets, also gained in effectiveness. The Russian conduct of operations was similar to the methods used in the West, even more so after the increasing arrivals of Allied aircraft in 1943. While low-level attacks by fighters in the zone of combat decreased, fighter thrusts into German rear areas with attacks on airfields were on the increase. The protection of Russian rear area objectives was gradually neglected; for instance, in the summer of 1943 the German surprise air attack on Grozny* achieved complete surprise and was not interfered with by Russian fighters.

A special method of fighter operations was observed in the Kuban bridgehead in 1943.⁴⁶ This method was designated "Kuban escalator" by the Germans; it consisted of Russian fighter units being committed in large formations at different altitudes. No outstanding success was scored by this method, which had the disadvantage that the simultaneous commitment of almost all fighter units resulted in the absence of fighter cover at other times.

3) Flying Technique. Except for the outstanding units, the flying technique⁴⁷ employed to the end of 1943 was still the tightly closed, uneven, and easily recognizable formation. Compared to 1941, the flight formation was better controlled. The approach flight altitude varied from 13,200 to 16,500 feet so that the pilots had sufficient space for maneuvering during aerial combat. This tactical grouping was quite effective under the conditions and with the type of aircraft of the first years. The conduct of Soviet fighter attacks depended on the hostile objective and will be dealt with in detail in the following sub-sections. The circular formation for defense was still of major importance to the majority of Russian fighter units, and the transition to other combat formations based on flying in pairs and on a division of responsibilities between attack and cover aircraft was slow. Surprise assaults were stopped prematurely as soon as the element of surprise had been lost.

In contrast to these units, the Russian fighter elite, such as

* Editor's Note: Grozny (sometimes spelled Groznyy), at the northern foot of the central Greater Caucasus, was an important German objective in the 1942 drive to capture the Caucasus' oil fields. The German forces were stopped 50 miles west of the city.

guards fighter regiments, units equipped with Allied aircraft, and a few other units, flew their approach in well organized, steady, and properly extended formation. These units were difficult to identify from a distance, had ample opportunity for observation from distinctly formed echelons of altitude, and thus almost completely eliminated the danger of being surprised. Their combat methods were based on the principle of attack and cover, they reassembled after attacking in a quicker and more effective manner than the other units, and their return flight was governed by the same principles as those governing the approach.

4) Combat with German Fighters. According to Major Rall,⁴⁸ modern-type aircraft and increased self-assurance gradually led to a change in Russian fighter tactics after the spring of 1942. Although the Russian fighters became more aggressive, their units were still not being effectively led in combat with German fighters. The circle formation was still standard. After the autumn of 1942 Russian fighter aircraft began to accept individual challenges on an increasing scale without immediately trying to get back to their unit. Pilots of guards regiments in particular were experts in individual fighting and flew their attacks on German fighter units in well-organized formations, divided systematically, the attack and cover elements alternating adroitly.

The Soviet pilots were not sufficiently familiar with the British and American types of aircraft to be able to get optimum performance from them. Nevertheless, the Airacobra (P-39) units, for instance, were serious adversaries, whereas the Spitfire units were quickly destroyed and never seen again.* Free French units that were mainly committed in defensive missions in rear areas were considered inferior to the Russian fighter units and quickly annihilated.

During 1943 the Russian fighter pilots not only accepted the challenges of German fighters but sought them out. This meant a considerable change from 1941. The Soviet elite air units, in particular, were masters in individual fights, having adopted Western

* Editor's Note: This is a somewhat puzzling statement, for the Spitfire was a far superior plane to the P-39. Perhaps the Spitfires in question were the earliest models, with inadequate armament; or perhaps the P-39's were flown by the best Russian pilots.

fighter tactics. Dog fights became more and more common, and even in the smallest unit--a pair--the pilots alternately flew attack and cover positions. When German fighters attacked by surprise, the Russian fighters would still form a defensive circle, a formation they mastered fully and one which gave them the opportunity to develop attacks under favorable circumstances. After combat, the Russian commanders showed better control than previously, since they reassembled their units much faster. Whereas the less skillful Soviet fighter pilots still tried to escape whenever their aircraft were in a position of inferiority, the experienced Russian pilots reacted differently. They took advantage of the maneuverability of their aircraft which excelled when flying steady horizontal curves. But despite these generally recognizable progressive developments, the Russian fighter pilots remained tactically inferior to their German adversaries through 1943, mainly because of training deficiencies, lack of experience, and certain technical handicaps.

Other officers⁴⁹ generally agree with the above opinion. Although some of them still emphasize, on the basis of their personal experience, that the Russian pilots continued to feel inferior to their German opponents and that they accepted aerial combat only under compulsion or fled when they observed German fighters and felt threatened by German cannon fire, these authors agree that aerial combat between fighters grew increasingly tough. The Russians frequently still used their old circular defense tactics, and thrusting into the defensive circle and breaking it up was a costly operation, leading to the sacrifice of the best German pilots, with the unit commanders from the lowest echelon to the wing level losing their lives first. Such losses could not be replaced simply by moving up the next ranking man.

5) Combat with German Bombers. In contrast with the previous year, German bomber units were increasingly and almost regularly attacked by Russian fighters during 1942-43. The basically defensive attitude adopted by Soviet pilots on encountering German bombers no longer existed. Only Lieutenant Colonel von Riesen⁵⁰ indicates that in 1943 in the Leningrad area strong Russian fighter units, observed in the vicinity of the target areas of German bomber units, did not attack. But the same author also remarks that Russian fighters launched frequent and disturbing attacks on German bomber pairs or flights whose target was the railroad traffic between Leningrad and Moscow. Since these Soviet fighter attacks were often carried out as early as during the German approach flight and since some 6 to 10 fighter aircraft suddenly appeared above the target area by the

time the German bombers arrived, the Germans arrived at the conclusion that the Russian aircraft warning service functioned well, even though at that time it was probably still primarily based on optical and acoustic observation. Equal efficiency could be attributed to the fighter control agencies. However, German bombers were often able to escape Russian fighters by flying into the clouds and by frequently changing their course.

Other Luftwaffe officers⁵¹ point out that the German bomber pilots gradually had to adjust their conduct of attack operations to the Russian fighter capability, with the result that their missions became more complicated. Thus, for instance, Russian fighter operations forced the German bomber units to increase the strength of their formations and to maintain them at such increased strength. In selecting flight routes and altitudes, for instance, they had to take the Soviet fighter defenses into account. Because of the advanced types of fighter aircraft used by the Russians, some of the German bomber operations had to be scheduled for the hours of darkness. Also, it became necessary to employ more and more German fighters as escorts. The Soviet fighters usually attacked above the combat zone and pressed home their assault with tenacity. If these attacks had been more systematized and launched from superior positions, they would have proved more effective. As it was, the Russian fighter defenses failed also in 1942-43 to divert the German bomber units from their targets or to stop their attacks.

Writing about his experiences on the Russian conduct of fighter attacks on German bombers, Major a. D. R. Brunner⁵² states that the Russians often attacked simultaneously from all sides to dissipate the German escort aircraft and open avenues of attack to the bombers which they usually assaulted from the rear by clever exploitation of the dead space of the Heinkel 111's. Oblique attacks from the rear and higher altitudes proved ineffective because they were easy to repel so long as the attacked bomber unit remained properly staggered and close together. The far more effective assaults from the rear conducted simultaneously from both sides of the bomber units were exceptional. Because of the well-directed fire of the bomber aircraft, the Russian fighters rarely downed German planes. Surprised by sudden bursts of accurately placed defensive fire, the Russians frequently veered off, returning only rarely for a second sweep. In many instances the Russian fighters committed their earlier mistake of opening fire much too soon and

thus wasting ammunition. Whenever the number of aircraft shot down by the Russian fighters was on the increase, this was to be attributed to deficient coordination and fire direction of the German bomber unit. In the German experience the Soviet fighter attacks rarely occurred just before or during the dropping of bombs, but usually at the moment just after they had dropped their bombs and were changing their course. It was then that the bombers' defenses were weakest. German bomber units often suffered considerable losses from attacks so timed. Finally, Major Brunner mentions that in view of their numerical strength the Russian fighter units could have prevented almost completely the daytime operations of He-111 and Ju-88 aircraft as early as 1943, if they had been better led, had demonstrated more aggressiveness, and had been better trained. But despite remarkable progress over the past, the Russians' 1943 performance was not sufficient to achieve such results.

Russian fighter operations against German bombers in 1942-43 can be summarized as follows: a) Russian fighter aircraft switched from defensive to offensive tactics in their operations against bombers and increased their attacks which forced the Germans to strengthen their defensive measures; b) whenever German defensive fire was effective, the Russians were reluctant to press home the attack and, in these circumstances, their success was usually out of proportion to their effort; c) Russian fighters generally were still opening fire at too great a distance; and d) their aircraft warning service and their methods of leading the fighters toward the approaching German bombers had improved considerably over the past.

6) Combat with German Dive-Bombers. By the spring of 1942 Soviet fighter pilots were no longer hesitant and defensive in their attitude toward German dive-bombers. As in the case of encounters with German fighter and bomber units, the Russian fighters became steadily more aggressive. Frequently, they attacked German dive-bombers as they came out of their dive, so that the Germans had to dive in closed formations to cover one another. All German commentators agree on this point. Captain Pabst,⁵³ states that at the beginning of 1942, during dive-bomber attacks on Black Sea ports, Russian fighters intervened rarely and then mostly too late so that the German escort fliers were able to disperse them. During the early stages of the Battle for Stalingrad the Russian fighters were still very reluctant in their attacks, often turning away when German escort aircraft made their appearance.

This situation, however, soon changed. The strong Soviet fighter defenses obstructed dive-bomber assaults very effectively by surprise attacks from below and by committing fighters armed with cannon. Sometimes, dive-bomber squadrons were attacked during their approach flight toward Stalingrad by 20 to 30 Russian fighters, which by engaging the Germans in aerial combat prevented them from carrying out their mission and forced them to reassemble farther to the rear. When the dive-bombers attacked objectives in the vicinity of Stalingrad, they became involved in stubborn dogfights with Russians attacking from all directions as well as from above and below until the Germans returned to their own lines. In such sorties the Russian pilots demonstrated courage that bordered on stubborn silliness. In this connection, Pabst relates how he was flying straight toward a Russian fighter, with both of them firing at each other at maximum rate, until Pabst turned off at the last moment. He concludes by saying: "The Russian was even sillier and more stubborn than I, and would have rammed me."

Major a. D. B. Meyer,⁵⁴ telling of his experiences near Orel in 1943, writes that his ground-attack unit was opposed by Russian fighters belonging to an elite unit, who were brave daredevils, well trained and excellent fliers with a sure flair for German weaknesses. Their aircraft--Yak-9's*--had powerful engines and were capable of climbing at a steep angle and attacking German aircraft from below. They attacked in a superior manner with short bursts of fire from all guns at short distances, directing their fire mainly at the lead aircraft of the German squadron or flight, eight of which were shot down in one week. On one occasion, when Major Meyer was engaged in aerial combat, his aircraft suddenly caught fire, with his Russian opponent returning to make another pass. He jettisoned his cabin roof, which flew straight into his opponent's propeller; this coincidence saved his life, since he was able to make an emergency landing close to the point where his opponent's aircraft had crashed. The dead pilot turned out to be a woman, without rank insignia, identification or parachute.

The elite unit, of which Major Meyer writes, was undoubtedly composed of outstanding Russian pilots. His study also reveals the type of performance of which Soviet fighters were capable even

* Editor's Note: The Yak-9, a single-seat fighter, was the all-metal, modified version of the Yak-1. With a top speed of 370 m. p. h., the Yak-9 was 35 m. p. h. faster than the Yak-1.

at that time.

Major Rall⁵⁵ also emphasizes the progress made by Russian fighter aviation in combat with German dive-bombers. German dive-bomber units, according to him, were exposed to continuous fighter attacks during their approach and return flights. If they were escorted, they could usually defend themselves against such attacks without suffering major losses. Russian fighter operations were obviously benefiting from the tremendously improved air warning system and the fighter control stations set up at the front, which provided the Russian fighters with precise and clear information. Even though the aerial combat technique of the Russian fighters engaged with German dive-bomber and ground-attack aircraft showed no particular change, the effectiveness of Russian fighter operations was increased by Russian numerical superiority, more systematic conduct, and the technical improvement of their aircraft.

7) Russian Fighter Attacks on German Reconnaissance Aircraft. The strategic as well as the tactical and combat reconnaissance sorties flown by the Germans in 1942-43 almost invariably encountered Russian fighter resistance, at least at the points of main effort. The German reconnaissance activities were thus greatly hampered.⁵⁶

German Ju-88 long-range reconnaissance aircraft, for instance, were picked up by Russian radar sets above the eastern Black Sea ports of Poti and Batum, whereupon they were caught by superior Soviet fighter forces. As a result, reconnaissance missions in that area could be flown only under cover of low clouds. Since low clouds were rare in summer and autumn in the eastern Black Sea area, no reconnaissance missions could be flown over these important ports for many weeks at a time.

In describing the tactics employed by Soviet fighter aircraft in their encounters with German reconnaissance planes, Captain Wilke states⁵⁷ that the Russians often attacked by surprise, mostly from a higher altitude in the rear or from whatever their position was at the time of encounter, without attempting to assume a more favorable attack position. The Bf-109-G's, used by the Germans as reconnaissance aircraft in the beginning, were capable of evading by climbing at a flat angle and outrunning the Russian fighters. Although the fighters attempted to follow, they would eventually fall

behind because of lack of speed. When a pair of Bf-109 reconnaissance aircraft would turn to counterattack, the Russian fighters often would dive down to a level where they were protected by antiaircraft fire.

Later, however, these attack methods changed. The Airacobras fighters, committed by the Russians near Smolensk in the autumn of 1943, were armed with cannon and had a superior rate of climb. Thus, their pilots gained a certain feeling of superiority so that they persevered in their attacks and often forced the German reconnaissance aircraft to turn back.

In the winter of 1943 Russian fighters flew defensive patrols above the main line of resistance near Orsha, thus preventing German reconnaissance aircraft from gaining access to the combat zone. These patrols were flown by four flights of four aircraft each. Two of these flights flew at higher altitudes but at different levels, one flight following a north-south course and the other flying in the opposite direction. The other two flights followed, respectively, east-west and west-east courses at a lower altitude and on two different levels. Whenever the lower flights passed each other the upper flights were reaching the end of their courses and about to turn, and vice versa. This system provided mutual protection and secured the air space.

These observations are supplemented by Major Schlage, who reports⁵⁸ that the Russian fighters dreaded the rear guns of the twin-fuselage Focke-Wulf-189's and therefore preferred to attack them in favorable weather by oblique surprise passes launched from clouds in the rear. Since these tactics were unsuccessful, the Russians formed several attack groupings, launching simultaneous attacks from the right, left, and rear. Even these tactics did not inflict any losses on Major Schlage's reconnaissance squadron, although his squadron was attacked almost daily. In many cases, effective defensive fire and good escort protection given by German fighters kept the Russian fighters at a respectful distance. In other instances, Russian flak and fighter barrages interdicted access to reconnaissance objectives to the Germans at points of main effort. In one case a Russian fighter intentionally rammed a German reconnaissance aircraft.

In summary, long and short-range German reconnaissance aircraft encountered strong fighter resistance in 1942-43, especially at the focal points of battle, and this resistance partly hampered

German reconnaissance activities. While this resistance was at first stereotyped and unsure, the Russians later used proper operational procedures and launched stubborn attacks. At particularly important sectors Soviet fighters flew defensive patrols, interdicting occasionally all German reconnaissance activity.

8) Russian Fighter Attacks on German Transport Aircraft.

During 1942-43 airlift operations to supply encircled German units were decisive in bringing about a favorable solution near Demyansk in 1942 but they were unable to avert disaster at Stalingrad in 1942-43.* For this reason, fighter intervention during this period, when the Soviet fighters were the chief adversaries of the airlift pilots, was of particular importance. German Air Force commanders state⁵⁹ that near Demyansk Russian fighter attacks on Ju-52's flying at low level during daytime were at first insignificant. But before long, the Russians committed more I-16's (Ratas) in preplanned assaults, thus making such daylight transport flights impossible. From then on the Ju-52's were sent on such missions only under fighter escort, whereupon their losses from Soviet fighter attacks became relatively slight. Supplies could be airlifted to the encircled forces until they were able to break out of the pocket.

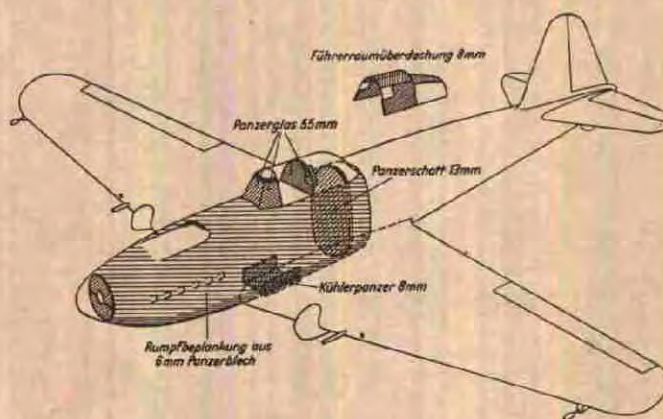
At Stalingrad the situation was different. There, also, supplies were airlifted to the encircled forces, even though losses increased steadily. Airlift operations were feasible so long as the Ju-52 and He-111 aircraft flying these missions were protected by German fighters and while the German fighters had at least temporary air superiority above the pocket. This situation changed radically as soon as the German fighters lost their bases to the Russian ground forces and could no longer secure the air above the encircled forces or land inside the pocket. As early as mid-November 1942, German transport units could no longer fly in close formation during daytime into the pocket; by the beginning of January 1943 daylight operations had to cease completely, even for individual aircraft, since overpowering Russian fighter interference interdicted access to the vicinity of Stalingrad. German transport aircraft losses from fighter interference had grown to intolerable proportions, accounting for one half and even more of the committed aircraft in some instances.† Once the German fighters had disappeared from the Stalingrad area,

* See Editor's Note, p. 167.

† For over-all Luftwaffe losses at Stalingrad, see Editor's Note, p. 168.



A German He-111 which was rammed over Gorki by a Russian aircraft on 7 June 1943



Anordnung der Panzerung. Das Muster wird nach in zweisätziger Ausführung (Heckhäute mit bzw. MG. hinter dem Panzerschiff)

A diagram of the IL-2, ground-attack aircraft. Shaded areas indicate armor (see page 227).

the Russian fighters reigned supreme. Even so, they did not take full advantage of their supremacy. Had they done a proper job, the entire German airlift supply effort would have collapsed by mid-December 1942.

The Russian fighters attacked the German transport aircraft usually in pairs or squadron formation within range of forward, operational airfields, in sectors where the flak defenses were poor, or above partisan-infested areas. Because of the weakness of ground and air defenses above the German pocket, the Russians preferred to attack there. They also made an effort to destroy the transport aircraft just before they landed or after they had taken off. While the transports broke formation or assembled, they suffered the heaviest losses. The Germans lost not only many personnel and much materiel, but the flow of supplies to the beleaguered Sixth Army was badly disrupted. Increasingly, the Russians combined fighter attacks on transport airplanes with sudden and clever fighter-bomber assaults. Soviet fighter attacks in daylight were generally unsuccessful if the Ju-52's flew individually in bad weather and hid behind clouds. In good weather the fighters, committed in units up to squadron strength, scored considerable successes, which were slightly reduced when the German transports flew in close-formation. The Soviet fighters attacked He-111's more carefully than they attacked Ju-52's, opening fire from greater distance. The concentrated defensive fire power of He-111 units often made Russian fighters reluctant to attack.

Russian night fighters rarely interfered with German airlift operations.

9. Russian Night-Fighter Operations. Nonexistent in 1941 and insignificant in 1942, Russian night-fighter operations were first improvised in the summer of 1943 after the Germans launched their first night-bombing attacks on Soviet war plants. After that, night-fighter aviation was actively organized.

Until mid-1943 the Russian command had obviously given a lower priority to night-fighter aviation as compared to daytime fighters.⁶⁰ The reason for this attitude might have been that the great majority of Soviet war plants were beyond the reach of the German bombers. Also, the German Air Force, much like its Russian counterpart, saw its principal mission in daytime support of the ground

forces in the vicinity of the main line of resistance. It thus happened that German bombers flying night missions against, for instance, such minor objectives as airfields, roads, and railroad traffic, and billeting areas, very rarely encountered enemy fighters, even during clear nights. It was not until the summer of 1943 that the Germans concentrated strong forces for surprise night attacks on Soviet war plants at Gorki, Yaroslavl, and Saratov which were then within striking range.* The Russians thereupon quickly organized night-fighter units, which suffered from all the deficiencies characteristic of such improvised measures. Since they had no trained night-fighter crews, they used pilots who had had a certain amount of night flying experience, but who usually lacked knowledge of fighter tactics. These pilots were committed from nearby airfields to protect the target area. They were, however, incapable of adjusting their speed to that of the German bombers so that they usually flew too fast. Moreover, they failed to take advantage of the light summer horizon in the north by approaching their target from the south, nor did they remain within the range of the Soviet flak. It was precisely over the target area that the night fighters had good opportunities of scoring hits because searchlights and burning fires lit up the vicinity. The silhouettes of the bombers were easy to distinguish. But no night-fighter attacks were launched within the range of anti-aircraft fire. Whenever German bomber pilots encountered a Soviet night fighter, they nosed downward and turned abruptly toward the dark southern sector of the target area, whereupon their pursuers lost track of them. During the long approach and return flights the German bomber units rarely encountered Russian night fighters. The

*Editor's Note: In the latter half of June, 1943, Sixth Air Fleet launched several, improvised, night-bombing raids on the following targets: the tank factory "Molotov" in Gorki, the automotive plant "Molotov No. 1" in Gorki, a synthetic rubber plant in Yaroslavl, an asbestos plant in Yaroslavl and petroleum refineries in Saratov and Konstantinovski. Of these attacks, those on the two factories in Gorki were the most productive; the production of the tank factory was temporarily reduced by fifty per cent. As a result, the Luftwaffe High Command began to consider freeing its bomber forces in Russia from ground support missions and committing them exclusively in strategic operations. It was already too late in the campaign for such a fundamental change. For more details on these raids and a discussion of the planning for further strategic operations, see Generalleutnant a. D. Hermann Plocher, *Der Feldzug im Osten, 1941-1945, Fuenftes Buch, Kapiteln 4 & 13 and Anlage 64, Karlsruhe Document Collection.*

Russian command apparently relied on optical means of detection such as directional searchlights and on antiaircraft fire, not yet on radio location. The fact that the German bomber units almost always flew the same route facilitated the improvisation of night-fighter aviation by the Russians.

Major Brunner arrives at the conclusion that the Russian night-fighter aviation had excellent opportunities, for a short while, of inflicting heavy losses on the German bomber units flying night missions, but that the Soviet fliers failed almost entirely because of their tactical and probably also technical inability.

Other authors⁶¹ are in general agreement with the above statements and mention that in spite of the progress made in the summer of 1943, Russian night-fighter operations remained primitive. They add, however, that a buildup on the Western pattern was underway.

10) Fighter Operations in Combination with Other Air Arms.
As escorts to Russian bomber or ground-attack units, the fighters performed their missions with increasing success.⁶² Through the summer of 1942 Russian escort aviation was still very deficient. When attacked by German fighters they allowed themselves to be drawn off--leaving the unit they were to protect instead of guarding it--and formed a defensive circle before returning to their bases under the protection of their antiaircraft guns. Aside from lack of combat experience and tactical know-how, this conduct might also have been influenced by the escort pilots' confidence in the flight stability and armor of the IL-2's and the greater speed and defensive capability of the PE-2's--the tail gunner had a three-barreled machine gun--which made it seem less essential to carry out the escort mission.

During Operation Citadel* in the Kursk area in the summer of 1943 the German fighters were still absolutely superior to the Russian escort fighters; for this operation, however, the Germans had massed strong fighter units. At the same time, German fighters operating above the Kuban bridgehead† area were immediately involved in aerial combat by numerous Russian escort fighters, thus having

* See Editor's Note, p. 191.

† See Editor's Note, p. 169.

no opportunity to carry out their mission of intercepting the Soviet bomber and ground-attack aircraft.

The above information indicates that the performances and success of the Russian escort fighters differed greatly, but were generally on the ascendancy after the summer of 1942. Some fighters stayed as close to the unit they were to protect as they possibly could, with other fighters providing protection from higher altitudes, flying up to 3,300 feet above the unit. After the summer of 1943 the Germans observed IL-2 and PE-2 units with up to 80 aircraft, being protected by direct and indirect fighter escort. The covering unit, stacked up high above and keeping down its speed, performed exactly like their German models, except that they rarely succeeded in carrying out their protective mission from above because their IL-2's were too slow. While on escort missions, the Russian fighters attempted repeatedly to neutralize German antiaircraft batteries by aircraft machine-gun fire and by dropping light bombs. Once the flak guns began to fire, however, they usually veered off immediately.

The Russian escort fighters for bomber and ground-attack units gradually improved so much that Colonel Kupfer,⁶³ commander of German close-combat aviation, in a lecture given in September 1943, considered them as exemplary. He stated that German ground-attack units could safely pass Russian bomber formations under fighter escort without any interference; the Soviet fighters remained obstinately with the unit they were ordered to protect.

Major Rall⁶⁴ agrees with other witnesses, but states that in spite of their progress, the Soviet fighters were rarely capable of warding off German fighter thrusts against the unit they were escorting so that Russian bomber losses still remained high.

11) Fighter Operations in Direct Support of the Ground Forces (Fighter-Bombers). Both Luftwaffe and Army officers agree⁶⁵ that Russian fighter operations in direct support of the ground forces and as fighter-bombers were insignificant during 1942-43, as they had been in 1941. In fact, low-level attacks by fighters decreased in proportion with the increasing commitment of IL-2 fighter-bombers for this type of mission.

The Soviet fighters generally caused little grief to the German ground forces. The damages caused by splinter bombs and a few short bursts of fire were slight. The Russian fighters flew singly, in pairs,

or in fours, often taking advantage of dawn for low-level attacks. Fighter-bombers were directed by radio detachments on the ground so that a certain degree of concentration of forces could be achieved at the points of main effort.

Even in the southern part of the Russian theater, where most of the fighting took place in 1942-43, relatively few Russian fighter-bombers were employed, and the commitment of fighters in direct support of the ground forces was insignificant. Stalingrad was the only exception. There, the Russian fighters were active, switching from the northern to the southern pocket according to the momentary point of main effort. Continual interference and nuisance raids launched by Soviet fighters at the centers of the ground battle and above the city gave strong support to the ground forces' operations.

Except for Stalingrad, the generalization was valid that fighter operations in direct support of the ground forces, above all by fighters serving as fighter-bombers, were without consequence and had little effect on the German military effort.

12) Fighter Operations under Special Weather Conditions. German commanders have almost no comments on this topic, a sign that no striking observations of any kind were made in this field. Opinions vary on the subject of Russian fighter operations conducted in bad weather. Some state that in bad weather no Russian fighters could be found in the air, while others say precisely the contrary: it was especially in very bad weather that the Russians would send out their fighters, launch fighter-bomber attacks from low clouds and during bad visibility from altitudes of 330 to 500 feet; such operations, however, suffered because the objectives could not be properly discerned and approached.⁶⁶

For 1942-43, the assumption is probably correct that fighter operations under special weather conditions depended greatly on the training status and that there was no important difference between Russian and German procedures.

D. Russian Fighter Aircraft, their Armament and Equipment.

Soviet fighter aircraft in 1942-43 were in the midst of a progressive and even at times remarkable development of aircraft models, armament, and equipment. Modern airplanes encountered by the Germans gave very striking evidence of this evolution, which

was accentuated by the increasing employment of Allied fighter aircraft.

Single-engine aircraft were still being used exclusively in fighter aviation; they were armed with machine guns and one cannon, sometimes even two cannons. German Air Force officers generally agree⁶⁷ that the older models--I-153 and I-16--had disappeared by the summer 1942. From that time on the various types of Mig, Lagg, and Yak models were encountered; by 1943 these were increasingly supplemented by Allied aircraft, such as Hurricane, Spitfire, Tomahawk, Kittyhawk, Airacobra, and even some Lightning models. Among the Soviet-constructed aircraft, the La-5, Yak-7B* and Yak-9 were the most advanced, being almost equal to the German Bf-109F and 109G models as well as to the subsequently committed FW-190's. The La-5's were capable of closer and faster turns than their German counterparts, which were unable to catch up with them in straight flight; the German fighters were faster only in oblique dives. The Lagg-3's and Yak-9's were equal to the Bf-109's in speed and armament (two machine guns and one or two cannons); these two types and the La-5 were the favorite Soviet aircraft, while the Mig-3's gradually disappeared.

The speed and rate of climb of the above-mentioned Allied aircraft, which played a decisive role in the Russian theater by 1943, were slightly below the Bf-109G's and FW-190's, even though there were certain differences between individual models.

According to available data Mig-3's, Lagg-3's, La-5's, Spitfires, PE-2's, and PE-3B's were used as night fighters. Statements by prisoners of war indicated that modern single and twin-engine night-fighter aircraft were being developed. The Soviet Air Force command considered the ideal prototype for night fighting to be a twin-engine, fast and maneuverable aircraft with a good rate of climb and good high-altitude performance as well as strong fire power. But no such aircraft were being mass-produced because final selection of a model had not been made.

* Editor's Note: Similar to the Yak-9, the Yak-7B was a single-place fighter plane which was equipped for night-time commitment.



The Soviet Yak-7B fighter



Another Soviet fighter, the Yak-9

Further progress had been made in the armament of fighter aircraft. The 7.6-mm machine guns were being replaced by 12.7-mm guns, and an increasing number of planes were equipped with 20-mm cannon, the Yak-9's even with 37-mm cannon. The highly explosive ammunition of the gas-pressure machine gun was very effective and was dreaded by the Germans.

No new information was gathered on the equipment of fighter aircraft, so that previously stated opinions retain their validity.

Thus, this period was marked by the modernization of Soviet fighters, which now were almost equal to the German models, the increased deliveries of Allied fighters and the improvement of armament on Soviet fighters. Their other equipment, however, showed no improvement and remained relatively simple.

E. Summary and Conclusions

Based on German observations and experience, the evaluation of Russian fighter aviation in 1942-43 can be summarized as follows:

1) The Russian fighter aviation recovered, first slowly then with increasing rapidity, from the disastrous setbacks of the first year of hostilities. Increasing combat experience, strong numerical superiority, and decreases in German operational strength resulted by the end of 1943 in the loss of clear air superiority by the Germans.

2) The personal conduct of Russian fighter pilots, insofar as it was determined by Russian characteristics, was still inferior to that of the Germans. But the successes they were achieving and the new models of aircraft with which they were equipped, strengthened the Soviet fighter pilots' confidence in their own performance as well as their self-assurance. They gradually lost their feeling of inferiority; as a consequence, the Russians developed an increasing number of good combat fliers and well-led fighter units.

3) The defensive attitude of Russian fighters was superseded by an offensive orientation. Committed within the framework of ground operations, the Russian fighter aircraft were concentrated above the points of main effort close to the main line of resistance. They operated primarily against German fighter, bomber, and ground-attack aircraft, acted as escorts for Soviet units, and occasionally as fighter-bombers. The operational principles, methods

of combat, tactics, and flying techniques were all geared toward attack.

4) The inferiority of materiel was overcome within a short time because of the technical progress in Russian aircraft construction and the Allied deliveries of planes. The up-to-date Russian aircraft were only slightly inferior to the German prototypes insofar as quality was concerned, while in quantity they were soon far ahead.

5) In combat with fighters the Russian pilots no longer avoided encounters, but on the contrary accepted and sought them out. The concentration of forces, numerical superiority, and flying experience of the Russian pilots led to success in aerial combat.

6) In combat with bombers the now aggressive Russian fighters hampered the execution of German bombing raids quite considerably.

7) In combat with dive bombers and ground-attack aircraft the Russian fighter pilots scored more and more victories because of their effective and stubborn attack methods. They no longer avoided encounters with German escort planes.

8) In combat with reconnaissance aircraft the Russian fighters increasingly hampered German strategic and close-reconnaissance flights, eliminating them almost completely at certain times at points of main effort.

9) In combat with transport aircraft the Russian fighter aviation scored so many victories that it eventually stopped all daytime airlift operations near Stalingrad.

10) Night-fighter operations--which did not get underway until the summer of 1943--did not show any significant results during this period.

11) Fighter operations in combination with other air arms made good progress, the Russian fighter pilots being generally capable of fulfilling their escort missions.

12) Fighter operations in direct support of ground forces and with fighter aircraft functioning as fighter-bombers were infrequent in 1942-43, showing little, if any, effect. Fighter operations in support of the Russian Navy were not observed.

In conclusion, Russian fighter aviation made progress during this period; its personnel, materiel, operations, command and staff procedures, flying techniques, and combat experience improved. The transition from defensive to offensive attitude and the growing numerical superiority brought about victories that eventually led to a limited superiority in the air, the effect of which was, however, circumscribed in space and time by the magnificent performances of German fighter pilots and units.

Section IV: The Ground-Attack Air Arm in 1942 and 1943

A. General

At the end of 1941, the Germans had observed that the Soviet ground-attack air arm was growing stronger. This tendency was accentuated during the following years, since the Russian command gave a particularly high priority to the development of ground-attack aviation. German Air Force commanders viewed this development along the following general lines:⁶⁸

As early as the beginning of 1942 Russian ground-attack aviation had, for the most part, recovered from the defeat of 1941. During the course of the 1941-1942 winter operations, it proved to be even superior to the Luftwaffe on several occasions. From then on the Germans observed a gradual strengthening of Russian ground-attack aviation despite the personnel and materiel losses suffered. By the end of 1943 it had become the strongest Russian air arm. The Russian command still used its ground-attack forces against targets near the main line of resistance in support of the ground forces. Surprise, low-level strikes with bombs, rockets, and aircraft weapons, especially at points of main effort, were the usual form of these attacks. Often, however, the ground-attack aircraft did not fly their sorties in sufficient strength and with enough consistency. Their employment as "flying artillery" complied with Stalin's concept of the paramount importance of artillery, which in turn might have contributed to the high priority accorded the buildup of this type of aviation. Thus, Russian ground-attack aviation developed into a tough opponent, encountered wherever the struggle was hard and attacking dangerously wherever the German bombers had not previously destroyed the Russian airfields, whenever the German fighters did not enjoy air superiority, or whenever the German air warning service did not operate smoothly.

The dependable IL-2 remained the standard ground-attack aircraft during this period of development; they were committed in even greater numbers in more and more units. In 1943 some smaller, aggressive, and well trained units equipped with Lagg or Yak models were observed by the Germans who obviously had difficulty in deciding whether these were ground-attack or fighter-bomber units.

Stalingrad was the turning point for Russian ground-attack aviation. From then on this arm became an increasingly powerful element whose strength did not become fully effective, however, because of high personnel losses, the shortage of replacements, and the inexperience and lack of training of new crews. Victories were therefore primarily local and, even though this arm inflicted losses in personnel and equipment on the Germans, it did not impair their morale or cause panic. The general training status of Russian ground-attack aircraft crews, whose capability might have been limited by their innate deficiencies, had considerably improved, as had their ability to hit targets on the ground. Even so, they were no match for the Luftwaffe crews, whose performance remained unimpaired. For this reason the Russians could not employ their ground-attack potential at points where German air units interfered, such as near Kerch, Sevastopol,* and Leningrad. But in the summer of 1943, during Operation Citadel, the German air forces that had been concentrated for this offensive finally proved insufficient for preventing Russian attacks at certain times and places; this fact was acknowledged by the Germans.

In describing the development of Russian ground-attack aviation in 1942-43, Colonel von Beust⁶⁹ states that ground-attack aircraft played the most important role as early as 1942; this continued subsequently when they operated in conjunction with fighters. They became the decisive instrument of air warfare from the time the Russian command assumed the offensive. The development of ground-attack aviation is the best proof of the Soviet principle of warfare, according to which air operations were an integral part of the ground battle without separate strategic plans, missions or objectives. Ground-attack tactics were closely coordinated with ground operations; within these limitations they were well planned and developed from

* Editor's Note: Sevastopol, on the Crimea, was the chief Russian naval port on the Black Sea and was the scene of very heavy fighting in June and July of 1942.

experience that dated all the way back to the Spanish Civil War. The technical development that took place along parallel lines brought about the evolution of the IL-2 ground-attack aircraft whose design, capability, and usefulness were much more oriented to a single purpose than was the case with German ground-attack aircraft types. Low-level employment and attacks on ground targets were essential requirements so that strong armament and armor had priority over altitude performance, speed, and range. The potential targets were generally troop assemblies, fortified positions, artillery emplacements, antiaircraft positions, tanks, vehicles, and more rarely, for instance, railroad installations, trains, and airfields. In 1942, while the Russians were still on the defensive and their ground-attack aviation buildup was still underway, the number of their ground-attack units was still relatively low and the arm was not yet fully effective as an offensive instrument. By 1943, however, it was the essential instrument of air warfare of the Russian command, having no doubt a decisive influence on the course of operations.

These impressions and experiences of German Air Force officers are generally endorsed by Army commanders.⁷⁰ According to the latter, next to bombers, Russian ground-attack aviation affected the German ground forces more than any other air arm, while its operational principles of very close cooperation with the ground forces remained unchanged. The ground-attack units increased in strength over the two-year period, but large units were not observed until 1943. Whereas in 1942 the Russians sometimes did not commit any ground-attack units, --even during extensive offensive operations such as those that took place along the Volkhov river, to the east of Leningrad--they employed ground-attack aircraft everywhere after the end of 1942. This did not imply that the frequency and power of the attacks was distributed evenly along the entire frontline. On the contrary, the ground-attack units were concentrated at the points of main effort such as the Crimea, the Kuban bridgehead, Stalingrad, the Orel-Rzhev area on the central front, and Leningrad, but predominantly in the southern part of the theater. Meanwhile, the Russians had learned a lot; the ground-attack aircraft coordinated their assaults with those of the ground forces and executed them in a powerful and persistent manner. They did not, however, penetrate deeply into the German rear nor did they concentrate their force

sufficiently. Without these deficiencies they would have interfered very much with the German withdrawal movements of 1943.*

B. Organizational Structure, Chain of Command, Strength Figures, and Methods of Assembly¹

During 1943 ground-attack divisions were subordinated to ground-attack corps--three ground-attack divisions and one fighter division per corps--and by the end of that year five such corps had been identified in European Russia. In general, however, these divisions were the largest ground-attack organizational units. The divisions were usually composed exclusively of ground-attack aircraft and consisted of three regiments equipped with IL-2 aircraft; however, there were also composite ground-attack divisions with one fighter and two to three ground-attack regiments. The ground-attack regiment was composed of three squadrons (30 IL-2's) and one or two liaison aircraft (U-2's). Each squadron had three flights, the first of which had two, while the other two flights had four aircraft each.

On 1 July 1943 the average actual strength of aircraft per regiment was 28, and two months later it had dropped to 20 planes. The total number of IL-2 aircraft committed in autumn 1943 was estimated at 3,000, while the 1943 production was approximately 8,000.

The personnel strength of a ground-attack regiment

* Editor's Note: The year 1943 saw the Germans forced slowly but surely back towards the West. In the southern sector Stalingrad was lost (and with it about 90,000 German prisoners and 100,000 German dead), the Caucasus were evacuated except for the Kuban Bridgehead (see note, p. 169), which the Germans held until September, and the rich industrial area of the Donets Basin was lost. After the failure of Operation Citadel, the Russians pushed the Germans back to Kiev (which then changed hands twice) and finally, towards the end of the year, approached the old Polish border. Throughout 1943 German forces in the northern sector, by contrast, managed to hold the Leningrad front. In the southern sector they also managed to hold the Crimea, whose loss might have affected Turkish neutrality and would have put the Russian Air Force within easy range of the important Rumanian oil fields.

was about the same as that of a fighter regiment: the total of about 200 men was composed of approximately 33 pilots, 20 to 30 aerial gunners--depending on the number of two-seater IL-2's that gradually replaced the single-seaters--and 140 to 150 technical and administrative personnel.

By the end of 1943 the Germans, along their frontline in European Russia, identified 28 regular and 3 mixed ground-attack divisions. In general, two to three ground-attack divisions were assigned to each air army, but their number varied greatly. At the points of main effort of the ground battle, ground-attack regiments formed up to 40 percent of total air strength. On an average, air armies in the southern and central parts of the Russian theater had 11 to 13 subordinate ground-attack regiments, whereas those in the northern part had 3 to 5.

In a war of movement the airfields of ground-attack aircraft were situated about 20 to 25 miles behind the main line of resistance, during position warfare about 32 to 37 miles behind the forward lines. These airfields were so situated that intermediate landings could be avoided in the execution of missions. Whenever a Russian offensive operation was imminent, the Germans observed an unusual concentration of ground-attack aircraft, which indicated to them that an attack was being planned. For such offensives, the Russians improved and constructed numerous airfields near the contact zone in order to reduce approach flights to a minimum. These ground-attack airfields were often so close to the main line of resistance--10 to 12 miles--that the German artillery was able to take them under fire successfully.

C. Ground-Attack Aircraft Operations

1. Pilot Conduct. The aggressiveness of the Soviet ground-attack pilots is favorably mentioned by most Luftwaffe and Army commanders reporting on the period 1942-43.⁷² They were impressed by the pilots' increasing operational toughness, their stubborn execution of assigned missions despite heavy losses, and their "fighting heart and bold courage." At the same time, the conduct of Russian pilots was generally marked by respect for the combat-tested and better trained German crews. Only Major Meyer⁷³ criticizes the low morale and total lack of soldierly conduct of the Soviet pilots. According to him, the Russian was a man with plenty of natural instinct who lost all willpower under compulsion and developed into an animalistic and fanatical fighter under certain

circumstances. The attitude of complete resignation of crews that had been shot down seemed to indicate repeatedly their disinterestedness concerning the over-all situation. This opinion, however, is in direct contradiction to all the others and draws much too radical conclusions from the well-known Russian characteristics.

2) General Operational Principles. These remained unchanged during 1942-43, except that they were further developed on the basis of combat experience. The principal characteristics seemed to be: a) maximum cooperation with the ground forces whose requests and wishes pertaining to the commitment of ground-attack aircraft were mandatory; b) operations almost exclusively above the combat zone and the direct support zone against targets that had to be attacked within the framework of the ground battle; c) increasing emphasis on concentration of forces; d) transition to larger closed formations for attacks; e) attacks launched only in daytime, often in conjunction with bomber units.

German Army and Luftwaffe commanders⁷⁴ elaborate on the above points somewhat as follows:

The close cooperation between the ground-attack aircraft and the ground forces was emphasized by the air units purposely neglecting other targets and limiting their efforts almost exclusively to targets near the frontline. Concentrated on the same points of main effort as the ground forces, the attacks of the ground-attack aircraft were primarily aimed at the main line of resistance, troop movements and assemblies of any kind, artillery positions, anti-aircraft batteries, heavy weapons emplacements, villages near the frontline, supply and service installations, road, rail and air traffic, and installations in rear areas. Surprisingly, these attacks rarely reached far in depth into rear areas. The German routes of withdrawal were not attacked so that the retrograde movements undertaken in 1943 never suffered, as they very well could have, from interference from the air. The operations of Russian ground-attack aircraft were often integrated into the artillery fire plan, so that this air arm could be considered as the extended, high-trajectory arm of the artillery.

Orders for operations were based either on instructions given directly by army group headquarters to air army or on requests made by Army agencies to the Air Force staffs responsible for coordination.

In the course of time the units conducting operations grew steadily in size, until they flew in closed formation in regimental strength and in tactical coordination with the concentration of ground forces. An individual ground-attack unit either had a separate mission, formed one attack wave among several, or it was integrated into a continuous attack. The forces assigned to such missions were often three or four times as many as the Germans would have committed against the same target.

Ground-attack units either approached their target under fighter escort or took advantage of the absence of German fighters by approaching at very low level. German light and medium flak, which was capable of defense and equipped with armor-piercing ammunition, forced the attackers to higher levels from which they were less effective. At points of main effort the Russians often launched continuous attacks over several hours with strong fighter escorts and, if a target was especially important, the combined high and low-level assault waves were composed of as many as 50 bomber, 60 ground-attack, and 100 fighter aircraft. Attacks in the combat zone were launched exclusively in daytime, either in closed formation with the aircraft veering off in low-level flight or individually by forming a chain, with the airplanes reassembling subsequently at maximum speed above the Russian lines. When German fighters were present, the ground-attack pilots showed a certain amount of reluctance to engage themselves fully, so that the success of the attack was jeopardized. If forced to give combat, the Russian ground-attack pilot first attempted to evade downward, and if that was not possible he would try to get rid of his pursuer by taking cover within the range of the extremely powerful Russian anti-aircraft fire. In other instances, however, the pilot continued to carry out his mission, relying confidently on the armor plating of his IL-2 aircraft to protect him, so that the flight formation generally remained unchanged even under German fighter attack.

3) Flying Conduct. In 1942-43 the ground-attack operations were better planned and more effectively organized and directed than previously.⁷⁵ Before starting on a mission, the crews were thoroughly briefed. This briefing would be all the more detailed if little opportunity existed to change orders after the take-off, recall the unit, divert it to another target, or issue warnings of the approach of German fighters. Air-to-ground and air-to-air radio were not always available. The type of approach depended mostly on the distance from the target. Over long distances the V formation was usually preferred, with flights

flying at a certain distance behind or beside one another. The transition to the attack formation (row, double row, and latterly staggered row), which always took place before reaching the target area, did not involve any major complications or delay. The formation did not undergo any further change during the approach flight and above the target. Objectives beyond the main line of resistance were approached from an altitude of 3,300 feet and higher, with the sun in the rear, first flying in gentle turns, then straight ahead, using secondary targets if orientation was difficult. The various row formations were used from the start when approaching objectives in the combat zone, so that the execution of the attack did not require any changes. For this purpose, a formation designated "Peleng" was preferred, which consisted of a staggered row pointing left or right rearward; its order of approach indicated the direction in which it would veer off and thus also the direction the attack would take. If the formation was to veer off to the left, as it usually did, the approach formation pointed to the right rearward and vice versa. Formations flying the "Peleng" mostly placed new crews and single-seater IL-2's in the center. They flew in very detached formation over flak areas, constantly changing course. In so doing, they more and more frequently flew formations in which pairs gave each other mutual cover and support, eliminating most of the effect of surprise assaults by German fighters by continual weaving as soon as the Germans approached.

In carrying out their missions the Soviet ground-attack pilots demonstrated flexibility in their choice of tactics. Strikes took place at different times, from various levels, from different directions, and in ever changing formations. The principal attack formations were the circle and the row, often flown at low altitude, for which the IL-2 was particularly well suited. When low cloud formations predominated, the ground targets were attacked from an altitude of 330 to 500 feet, whereas with good visibility the altitude varied from 1,320 to 2,000 feet. By the end of 1943 the Germans observed that low-level attacks became less frequent and that there was a transitional tendency toward adopting the attack methods of close-support and dive-bomber aircraft with attack levels around 3,300 feet. In the event of mass, concurrent attacks from both high and low levels, the target was approached from different directions simultaneously. During the attack proper the IL-2's peeled off, fired from all fixed guns during their inclined oblique approach flight, dropped bombs or fired rockets--usually one after the other--and fired their mobile guns as they turned away. The attack was launched only once or

repeated several times, depending on the intensity of the defensive fire, the location of the target in relation to the main line of resistance, and the type of mission. The attackers generally formed a circle, and if several attacks were launched, the aircraft would not leave until all bombs had been dropped, all rockets fired, and the ammunition expended.

The execution of the attack depended largely on the type and disposition of the target. Targets along the main line of resistance were usually approached at 2,310 to 2,640 feet altitude and attacked by pairs diving at a 30° to 45° angle. First, the rockets were fired, then the cannons, subsequently the machine guns; the bombs (usually two bombs weighing 220 lbs. and four 110 pounders) were dropped at an altitude of 825 to 1,000 feet, whereupon the aircraft pulled out of its dive. Tanks were approached at altitudes varying between 2,000 to 2,640 feet from a steep gliding flight or a dive. First there was gun fire, the rockets were released at about 2,310 feet then the bombs (preferably 220-pounders) were dropped, followed by cannon and machine-gun fire, and then the aircraft pulled out of their dive at about 800 feet. Vehicle columns were attacked from the closest distance with bombs and rockets and with all guns ablaze. March columns were often only strafed. Airfields were attacked with all weapons by diving from a 2,310 to 2,640 foot altitude. In order not to impair the maneuverability of the aircraft, the bombload consisted of small incendiary, high-explosive and fragmentation bombs totalling only about 660 lbs. in weight. The attack missions were broken down and assigned to individual pairs within the squadron. For instance, one pair was to attack the anti-aircraft positions, another was to prevent the take-off of enemy aircraft, and a third pair was to attack parked aircraft.

At low altitudes the return flight was carried out in loose formation; at intermediate altitudes, however, the formation would turn immediately toward the main line of resistance in an effort to reach fighter or flak protected areas or control points by the shortest possible route and thus escape pursuing German fighters.

Soviet ground-attack pilots attempted to evade aerial combat with German fighters and, during low-level flights, they tried to avoid exposing their unprotected fuel tank that protruded from the belly of their aircraft. If attacked by fighters, they either flew a defensive circle formation or, if they recognized the German threat in time,

a so-called snake formation that permitted them to move the scene of fighting more rapidly to their own territory than did the circle formation.

When encountering German reconnaissance aircraft of the FW-189 type, the IL-2's often proved aggressive. In such instances, they were confident of their armored protection, made oblique attacks from the rear from higher altitudes and fired cannons and machine guns. To make a kill they approached the German aircraft as closely as possible.

4) Ground-Attack Operations on the Battlefield. The great and steadily growing importance of Soviet ground-attack operations on the battlefield during 1942-43 is emphasized by German Army officers.⁷⁶ With the over-all shift in emphasis to the southern part of the theater during that period, the main effort of ground-attack operations was also to be found in that area.

In May 1942 south of Kharkov along the Donets, ground-attack aircraft operated in conjunction with attacking infantry and armor. These offensive operations were properly coordinated with regard to time and space, the targets were well selected, plans were effectively executed and correlated so that the operations produced a considerable effect on the Germans, especially on their morale. Along quiet sectors the Russian ground-attack aircraft were less active, launching mainly nuisance raids on rear area billets as well as supply and transportation installations. When major operations were imminent, the ground-attack aircraft concentrated their strikes on the combat zone; all identified targets on the battlefield were attacked. Gun emplacements were favorite targets, and neutralizing the artillery as soon as the infantry jumped off was the essential mission of the ground-attack aircraft which kept up a ceaseless bombardment for this purpose.

While the combat zone was thus subjected to intensive ground-attacks--marked by close cooperation with the ground forces--during Russian offensive operations, the German rear areas were relatively untouched, to the great surprise of the Germans. Moving up or withdrawing even major troop units was therefore no problem; the same was true of service units and supplies. The Russians' progressive achievements in supporting ground forces, however, were undeniable; the number and effectiveness of the ground-attack assaults increased steadily, particularly toward the end of 1943. Rigid control and concentration of forces, proper operational procedures, effective

selection of targets, and planned execution of attacks at the right time and at the decisive point led to some considerable successes against German troops, even though they did not yet turn the tide of battle. Indeed, the German Army felt the change which had occurred since 1941. This was mainly the case in the Crimea and near Sevastopol, at the Kuban Bridgehead, near Stalingrad, and during the German withdrawal toward the Dnieper. In the Army Group Center and North areas, where there was less fighting, this change was not quite so obvious; but even in these areas improvements in ground-attack aircraft operations made themselves felt.

Luftwaffe officers⁷⁷ agree with Army commanders that ground-attack aircraft were committed by the Russians primarily in support of ground operations and that the close interrelationship between ground-attack aircraft and the ground forces they supported was noticeable everywhere, their operations being fully integrated.

Russian ground-attack operations in 1942 were marked by many improvisations. In the summer, for instance, they set fire to the dry steppe grass in the Don area, thus forcing the German troops to change positions and causing losses of ammunition. In the Kuban Bridgehead they fired phosphorous incendiary bullets at the forward lines, flak batteries, and across the terrain to prevent the reserves from moving up. They thus hampered the Germans in their freedom of maneuver and caused casualties from burns. Toward the end of 1943 the use of artificial smoke increased. A thick smoke screen, about 300 feet high, was put up above the main line of resistance by aircraft; the ground-attack aircraft emerged from that smoke screen by surprise, attacked the German positions along the screen, and disappeared in the smoke as soon as the German fighters counterattacked.

The opinion of Army and Luftwaffe officers that the support of ground forces was the essential mission of Russian ground-attack aircraft to which all other operations were subordinated is also confirmed by the very detailed Russian instructions on air-ground cooperation and by the Luftwaffe High Command's publication on Soviet ground-attack aviation.⁷⁸

Air Force-Army cooperation followed the following pattern. Usually an air army instructed its subordinate units on the basis of orders from army group headquarters, but Air Force and Army staffs were joined together for limited offensive operations. They

achieved effective cooperation by coordinating missions, conducting operations in close proximity, constantly exchanging information, and dispatching liaison officers to ground forces headquarters. In this connection, it was irrelevant whether the ground-attack units were subordinate to the ground forces headquarters for specific operations or whether they just coordinated their missions; the latter method of employment was the more customary, however. The intensified commitment of ground-attack aircraft for strikes on supply and service installations, troop units, billets and fortified positions began about two days before the offensive proper. During the artillery preparation the ground-attack aircraft directed their assaults particularly at targets on the battlefield that could not be reached by the artillery. Immediately before the infantry launched its attack, the ground-attack aircraft made a concentrated assault on the German forward line; and while infantry and tanks were engaged in a struggle for the forward positions, the ground-attack aircraft incessantly attacked German ground targets. During the battle for rearward positions of a defensive system, some of the ground-attack units always remained above the combat zone while others were held in readiness for new missions that might be requested by the ground forces.

5) Ground-Attack Operations in Rear Areas. There is general agreement¹⁹ that ground-attack operations in rear areas during 1942-43 continued to play a relatively minor role. The majority of such attacks were directed against airfields, while others were aimed at supply installations, means of communication, and other rear area targets. Surprisingly enough, troop movements of even major units in rear areas were attacked only in isolated cases. For this reason, German Air Force elements that had to move cross country by road suffered few losses en route.

Russian ground-attack aircraft operating in rear areas usually appeared in squadron strength, rarely in larger units. They approached their targets either at a low or at an intermediate altitude, if possible under cover of clouds. When ground-attack aircraft launched attacks in regimental strength in the winter of 1942 in the Orel-Leningrad area against main highways, rail tracks, supply installations and dumps, the German Army suffered heavy losses. According to all available reports, however, operations directed against German airfields usually lacked proper planning and precision in execution so that only minor successes were achieved. Along the Stalingrad sector the initial Russian ground-attack aircraft

missions to neutralize the departure airfields of the German transport aircraft were not very well planned, nor were they properly executed. Although they disrupted daytime operations and delayed the airlift, they remained ineffective. By the end of December 1942, however, the Soviet ground-attack aircraft, in squadron strength, attacked these same airfields almost daily, seriously hampering preparations, causing major losses, and disrupting the routine of the crews and ground personnel.

6) Russian Ground-Attack Operations by Night. Records of German experts⁸⁰ give no information on night operations by IL-2's or other ground-attack aircraft units.

Night sorties flown by U-2's are designated as ground-attack operations by night in several instances; but it would be more correct to consider the night nuisance raids flown by U-2's as bomber sorties, which is the procedure followed in this study.

7) Ground-Attack Operations during Special Weather Conditions. The available data⁸¹ justify the statement already made in the previous chapter, namely, that bad weather or winter conditions did not stop Soviet ground-attack aircraft operations. While there are statements that dusk attacks and bad weather sorties were outstanding features of Russian ground-attack operations, others indicate that they never witnessed such operations and that the flight training given to the crews would not have sufficed for the execution of such missions. But both Army and Luftwaffe officers emphasize that ground-attack aircraft appeared even in the worst weather to support the ground forces and that IL-2 units were operating even in 10:10 overcast with only 1,000 to 1,300 feet visibility. Freezing temperatures and snow seemed to affect the commitment of Russian ground-attack aircraft very little.

8) Ground-Attack Operations in Conjunction with Other Air Arms. Earlier, this chapter has already dealt with combined operations of Soviet ground-attack and fighter aircraft. In addition to this information and with reference to joint ground-attack and bomber operations, German officers state⁸² that as long as no German fighters interfered and the clouds were low, the Soviet ground-attack aircraft were apt to fly without escort. In most instances, however, they flew with strong fighter escort with whom they maintained radio contact. The ratio between fighter and ground-attack aircraft varied from 2:1 to 1:1. If time and location of rendezvous with this fighter escort were

not properly prearranged, the ground-attack aircraft often suffered heavy losses. The operating procedures frequently varied: sometimes the fighters flew above the ground-attack aircraft and sometimes below, and on occasions they flew some 4,000 to 6,600 feet to the side to escape the antiaircraft fire directed at the ground-attack aircraft. At times the fighter units formed three groups: one that flew in the rear and higher than the ground-attack unit, one close protection group that flew next to or immediately above, and finally a so-called top-level escort group that took off earlier in order to clear the sky above the target area at altitudes varying from 13,000 to 16,500 feet. At dusk the ground-attack aircraft fired flares to alert their fighter escorts flying at higher altitudes in case of a German fighter attack.

According to a captured special order issued by the Sixteenth Air Army on 17 July 1943, fighter escorts exercised some sort of control over ground-attack units since they were instructed to fire on the latter if they did not fulfill their mission.

Joint ground-attack and bomber operations increased steadily at the points of main effort, such as the Kuban Bridgehead, the Crimea, and near Stalingrad, where the airlift supply fields were the principal targets for such operations. During these offensive operations the Germans encountered some 80 to 100 ground-attack aircraft (one ground-attack aircraft division) and 60 to 100 bombers (1 or 2 bomber divisions) protected by strong fighter escorts. Whereas the bombers dropped their missiles from altitudes of 6,600 feet to 10,000 feet on the targets proper, the ground-attack aircraft assaulted primarily the ground defense weapons. Meanwhile, the fighters escorted the attack formations and were also committed in strikes against German fighter airfields in order to hamper the German planes from taking off or immediately involve them in aerial combat so that they would not disrupt the operations of the bomber and ground-attack aircraft. During such attacks, ground-attack and bomber aircraft dropped their bombs simultaneously or at short intervals. Often they flew several sorties in spite of heavy losses. The losses and damages inflicted on the Germans, however, were usually minor because the attacking units were in many cases too weak and in disproportion to the size of the target and the intensity of the defensive fire. Also, their attacks were inaccurate and did not last long enough to be effective.

D. Types, Armament, and Equipment of Russian Ground-Attack Aircraft

All German sources⁸³ agree that the IL-2 was the standard ground-attack aircraft in 1942-43; other models, such as fighters or U-2's, were used only in isolated instances. The IL-2 achieved remarkable success and was the principal antagonist of the German Army. The two-seater aircraft (IL-3) with rear gunner gradually took the place of the single-seater. The robust construction of the cantilevered, strongly armored, low-wing aircraft was kept intentionally simple in an effort to speed up production and employ partly untrained labor. While the original plane was all metal, the outer wing sections and tail were subsequently made out of wood. The extensive and good armor, consisting of welded steel plates and bullet-proof glass, protected all vital parts of the aircraft in one large armored "vessel" which contained, for instance, the cockpit, the rear gunner's area, the engine, the fuel and oil tanks, the water radiator, and oil cooler. The aircraft was thus secure from machine gun and light antiaircraft fire with small arm, high explosive, and tracer ammunition even when fired from close range. A German Air Force officer stated somewhat laconically and sadly⁸⁴ that the IL-2 "does not even tremble under sustained fire." Thus it was a dangerous adversary for the German FW-189 reconnaissance aircraft, which it often attacked. The two-barreled, rear machine gun of the FW-189 was ineffective against the IL-2's armor. The IL-2 could be hurt only by hitting its few vulnerable spots, such as the unprotected upper part of the cowl, the sliding window near the pilot's seat, the plywood tail assembly, and the roof of the cockpit where it slanted downward behind the pilot's seat.

The armament of the IL-2 consisted usually of two fixed 7.62-mm machine guns, model Shkas, with 750 rounds each, one mobile 12.7-mm machine gun, model BS or UBT, with three clips containing 70 rounds each, and two 20-mm cannons, model Shwak, or two 23-mm cannons, model VIA, with 200 rounds each. In some instances the armament consisted of two 37-mm cannons with 80 rounds each, instead of the 20-mm or 23-mm cannons.

The machine guns fired armor-piercing, incendiary, tracer, and high-explosive ammunition, while the cannon used fragmentation, fragmentation-incendiary, and armor-piercing incendiary ammunition. A reflector sight was used as aiming device, and a tubular sight had also been introduced. The cannons had a relatively low rate of fire,

and their effectiveness in scoring hits was affected by training deficiencies. Under the wings there were launching rails for rockets; the rockets first used were of 82-mm caliber, later 132-mm caliber. Rocket projectiles of the fragmentation, armor-piercing, and high-explosive types were also available. The rocket release gear permitted individual release, bursts of fire, or salvos.

The bomb load averaged 880 lbs., with a maximum of 1,320 lbs. The bomb bays were capable of carrying bombs varying from 5.5 lbs. to 550 lbs. Considerably fewer duds were dropped than was the case earlier in the campaign. The light fragmentation bombs of the ground-attack aircraft were more effective and more feared by the German ground forces than the heavy fragmentation bombs used by bombers.

Other equipment consisted of a radio telephone set for air-to-air and air-to-ground traffic (models RSI-3 and RSI-4), customary flight and power plant control instruments, a reflector sight, oxygen equipment, and aerial cameras. Some ground-attack aircraft were also equipped with homing devices permitting instrument flight.

E. Summary and Conclusions

Based on German observations regarding Russian ground-attack aviation in 1942-43, the following evaluation seems justified:

1) Ground-attack aviation increasingly became the principal offensive arm of the Russian Air Force; it was also a valuable aid to the Soviet ground forces in decisive battles and inflicted heavy losses on the German ground forces. Although the Russian ground-attack aviation suffered considerable personnel and materiel losses, its buildup was hampered but not prevented by these losses.

2) The personal conduct of the Russian ground-attack pilots was generally characterized by aggressive vigor during attacks on targets on the ground, while a certain reserve was noticeable in aerial combat.

3) The principal mission of Russian ground-attack aircraft continued to be the support of the ground forces. By closely cooperating with the ground forces and concentrating their efforts at the centers of fighting, the Soviet ground-attack aircraft increased their influence on the outcome of combat operations, even though,

for a number of reasons, they were still incapable of deciding the issue.

4) The Russian ground-attack aircraft attacked primarily targets on the battlefield and achieved success by following proper procedures and executing their missions with stubbornness.

5) In contrast, attacks on rear area targets, which were mainly directed at German airfields, assumed a secondary role and usually produced little effect.

6) Flying technique and tactics had improved on the basis of experience, and were characterized by greater flexibility than previously. In most instances, units launching attacks were larger than before and were protected by correspondingly larger fighter escorts.

7) By developing the two-seater type IL-2 (or IL-3) and equipping and arming it better, the Russians seemed to have created a standard ground-attack aircraft that fulfilled all the requirements of that period.

8) The Germans did not observe night operations by Russian ground-attack aviation.

9) Russian ground-attack aviation made progress in operating jointly with other air arms. Both operations under fighter escort and in conjunction with bomber aircraft were usually conducted according to proper principles.

In conclusion, the improvements observed as early as 1941 with regard to making ground-attack aviation an effective offensive arm continued uninterrupted during the period 1942-43. By introducing appropriate command and staff procedures as well as operational principles, and increasing and improving their personnel and materiel, the Russians made their ground-attack aviation capable of accomplishing its principal task--the support of the ground forces--with ever increasing success.

Section V: Bombardment Aviation

A. General

During the years 1942-43 Russian military leaders intentionally

gave the buildup of the bomber arm a lower priority than that enjoyed by the fighter or ground-attack arms. Even though bombardment aviation also gradually grew stronger, especially after the spring of 1943, this progress was small compared to that of the two other air arms. According to the consensus of German Air Force commanders⁸⁵ this development took place in the following manner:

Bombing operations of the Russian air forces could not compare with those of the Allies in the West insofar as commitment en masse and effectiveness were concerned. The targets of bomber raids were rarely deep in the German theater of operations. Usually, they were located in the combat zone. During this period, the principal mission of Russian bombers remained the direct and indirect support of ground operations in close cooperation with the Army. At the beginning of 1942 all long-range bomber and transport aircraft units, excepting those stationed in the Far East, were put under a unified command called the Long-Range Air Force. It was given specially qualified personnel who, however, were still not sufficiently trained. But even this newly organized command was employed for operations in conjunction with the ground forces, and not for strategic missions.

Bombing attacks at points of main effort were usually well coordinated with the infantry, artillery, and armor so that, despite certain deficiencies, they were fairly successful. These successes, however, were not in proportion to the effort made.

In the conduct of operations the crews' behavior was often passive, either a result of their lacking the essential mental ability, or an indication that the intricacies of navigational training could not be absorbed in so short a time.

Modern bombing aircraft were in short supply, the available models being, on the average, too slow and generally inferior to German aircraft. The bombs and bomb sights were similarly deficient.

Thus, the progress of the Russian bomber forces was hesitant and limited. Whether, and to what extent the expectation of Allied Lend-Lease shipments of bombers might have contributed to these deficiencies is difficult to say. The development and commitment of Russian long-range bomber aircraft give this idea some plausibility. Despite the slowness of their progress, Russian bomber forces were

capable of playing an important part during the Battle of Stalingrad, both by their bombing operations against the German airlift bases and by their relentless air supply sorties during which they moved up a constant flow of rations, ammunition, and equipment to the beleaguered city, before it was taken by the Germans. In 1943 they rendered similar services near Orel and Leningrad. There Russian bombers flew not only daytime missions, but also launched strong and well executed night raids with considerable success.

Even though the opinion⁸⁶ that Russian bombardment aviation was lagging behind the ground-attack and fighter arms during 1942-43 may be generally justified, the considerable progress made by this air arm after mid-1943 cannot be ignored.

According to Colonel von Beust,⁸⁷ Russian bomber units remained relatively weak and ineffective through 1942-43, despite certain improvements in training, equipment, and tactics. Their operations were almost exclusively directed against nearby targets in support of the ground forces and only rarely against long-range objectives, although German rear area logistical installations would have been excellent targets for systematic bombing operations. At Stalingrad, for instance, where the Russians completely stopped German airlift operations, they could also have inflicted a decisive defeat on German bombing and transport aviation. But the Russian bombers were not capable of carrying out such tasks. German Army officers generally agree with this description.⁸⁸

B. Organizational Structure, Chain of Command, Strength Figures, and Methods of Assembly

According to the available, somewhat sketchy sources,⁸⁹ there was a distinction between close-support bombing units that were usually subordinate to air armies, and the long-range bombing and transport aviation units that had been unified under the Long-Range Air Force since the beginning of 1942. This command was subordinate to the Peoples' Commissariat for Defense and Central Headquarters. The units were controlled by the Long-Range Air Force headquarters, even though they occasionally flew ground-support missions, such as at Stalingrad.

Most of the bombardment divisions subordinate to the air army headquarters were composed of three regiments with two to three squadrons each; each squadron had ten aircraft; the ideal regiment

was composed of three squadrons. The aircraft were PE-2's, PE-3's, DB-3's, DB-3F's (IL-4), and occasionally even SB's; for night missions, the Russians used U-2's, R-5's, R-Zet's,* TB-3's, and TB-7's. The relatively small number of aircraft made it difficult to equip bomber regiments uniformly, in contrast to fighter or ground-attack regiments. A few dive-bomber regiments were equipped exclusively with PE-2's--a very effective dive bomber--but even these regiments lacked all other specialized equipment. The personnel strength of the bomber regiments depended on the aircraft models issued to them, with variations in numbers being shown only in the strength of flying personnel. In contrast to fighter and ground-attack units, bomber regiments had one additional aircraft mechanic per plane.

The Long-Range Air Force had divisions with two to three regiments each, a regiment being composed of three squadrons; guard regiments had four squadrons. Corps headquarters were being organized to assist the Command headquarters as tactical staffs. Apparently, future plans called for corps with two divisions composed of two regiments each, with each regiment consisting of two squadrons. By summer of 1943 there were seventeen long-range bombing divisions and one transport aircraft division under the Long-Range Command. The order of battle, however, varied constantly.

Each squadron had fifteen aircraft; regimental headquarters also had three command airplanes: one bomber, one transport aircraft (model PS-84), and one liaison aircraft (model U-2). The authorized strength of a regiment was therefore 46 bomber, one transport, and one liaison aircraft.

The personnel strength of a squadron consisted of 15 pilots, 15 observers, 15 radiomen, 15 gunners, and 90 men serving as technical ground personnel. Each regiment had 190 flying personnel, 291 technicians, and 27 other personnel, thus altogether 508 men. The flying personnel consisted of 8 field grade officers, 41 officers of other grades, and 141 NCO's. The corresponding

* Editor's Note: The R-Zet, R-Z, or R-5 as it was sometimes called, was a single-engine reconnaissance biplane which was also employed as a ground-attack, transport, liaison or night bomber aircraft, depending on the circumstances.

figures for technical personnel were 1 - 85 - 205, and for the other personnel 2 - 12 - 8. There were also four enlisted drivers and one female secretary.

The principal aircraft model used by the long-range bomber divisions was the DB-3F (IL-4). One division, composed of three regiments with two squadrons each, had American B-25's.

The Long-Range Air Force had its own ground organization, replacement regiments, and pilot schools, and was generally concentrated on airfields around Moscow. In case of necessity, the units could be shifted to airfields in the vicinity of the operational centers--the Stalingrad area in the winter of 1942-43, for instance--or they could be moved up to advance air bases.

C. Bomber Operations

1) Personal Conduct. Opinions on this subject are at variance,⁹⁰ but it is generally emphasized that the close-support bomber pilots--similar to the ground-attack pilots--were aggressive and that they carried out their missions with remarkable courage and occasionally also with exemplary aggressiveness, so long as the fire from fighters or flak was not too intense. The rear gunner was still considered the best man in the crew, even though he opened fire from too great a distance. But he aimed well, fired relentlessly, and was usually the last to jump from a burning aircraft.

The general opinion on long-range bomber pilots was less favorable. They were more rigid, and their aggressiveness and conduct were below that of the average Russian pilot. Bomber crews employed for night sorties were especially noted for their lack of enthusiasm. When picked up by searchlights they would immediately jettison their bombs because of their fear of night fighters. Thus, the Germans often had the impression that the bomber crews were less interested in hitting their targets than in dropping their bombs as quickly as possible. Any generalization drawn from this statement would be unfair to the Russian bomber crews. But it cannot be denied that close-range bombers committed near the front in support of ground operations performed better and were more aggressive than the long-range bombers.

2) General Principles of Commitment. These were almost the same as during the first year of warfare in Russia. According

to German opinion, they showed the following characteristics: a) the bulk of the bomber units were committed as close-support aircraft, assisting the ground forces by hitting targets in the combat zone; b) units belonging to the Long-Range Air Force also flew most of their sorties against targets close to the front or in direct support zones, rarely striking rear area objectives, and only exceptionally attacking strategic targets; c) daytime bombing raids were carried out with fighter escorts, and, in the course of time, units grew in size and operated in conjunction with ground-attack aircraft; d) individual aircraft carried out night attacks as nuisance or bombing missions; after the summer of 1943, however, night attacks were conducted by major units.

The general principles, organization, and characteristics of Russian bombardment aviation underwent only minor changes during 1942-43.⁹¹ The Russian conduct of operations resembled more and more that of the German. The principal mission was to attack nearby targets in support of the ground forces, so that Russian bombardment aviation acted really as reinforcement of the artillery and ground-attack aviation. The targets were either integrated into the artillery fire plan or they extended the artillery gun range beyond the capability of the ground weapons. Rarely did bombers attack rear area targets, such as railroad stations, supply installations, or airfields. Close-range bombers were used to overcome stubborn resistance or to accelerate an advance or a thrust in the direction of the main effort. Bombing raids in the contact zone were a sure indication of imminent ground offensives.

In accordance with Russian military doctrine and air army concepts, the bombardment regiments subordinate to an air army headquarters had only close-support functions and were therefore also designated as close-support bomber regiments. They operated generally in daytime, did not penetrate far beyond the main line of resistance, and flew in formations of from 12 to 20 aircraft. Smaller formations were exceptional, larger units were observed only at points of main effort or during operations launched in conjunction with ground-attack planes. Large units, such as those employed by the British or Americans, were not encountered in Russia.

Bombing raids were preferably staged in the early morning or at noon; they were often executed by attack waves and usually ended before dusk, the last raid of the day often being the most intense. Organic aircraft frequently carried out reconnaissance

missions before the attack was launched. Along stationary frontlines attacks were often repeated against the same target, at the same time of day, along the same approach route, and in the same attack formation. Heavy Russian losses were the result of such repetitiousness. Bombs were dropped from horizontal flight, and were generally of medium size, while--on rare occasions--large numbers of small fragmentation bombs were used.

Long-range aircraft were employed, by preference, at points of main effort until the end of 1943 (for instance at Stalingrad, Orel, and Bryansk). These aircraft, operating in conjunction with mobile forces and spearhead armies, were supposed to prevent the moving up of German Army reserves and to disrupt the German supply services. Important rear area installations, such as communications centers and air force ground services, were preferred targets. Strategic bombing raids on the German zone of interior were limited in 1943 to isolated raids on East Prussian targets.

Night raids were mainly directed at targets in the combat zone; during these raids German airfields were bombed or nuisance attacks were launched by individual aircraft. After mid-1943 night-bombing operations were undertaken by larger-size units, and as the nights grew longer the Germans expected more extensive raids.

3) Flying Technique. In this field the Russian bomber pilots learned from wartime experience, by imitating their German adversaries, and by receiving instructions from Allied training teams.⁹² Even though they were far from being as accomplished as their Western Allies--there were a few exceptions--the Russian bomber pilots progressed considerably in comparison to their 1941 methods.

Normally, the approach, attack, and return formation remained unchanged. The preferred unit formation became the V formation, with one V formation following the other at recognizable, at times even long, distances, sometimes echeloned in altitude. At first formations were made up of from 3 to 12 aircraft, but their strength soon averaged from 12 to 30 planes, sometimes even more. On occasion, entire units formed one V, but only if they did not exceed regimental strength. The handicaps of the V formation--inflexibility, difficulties of control, the need for superior flying ability--greatly inhibited the performance of the Russian bombing crews whose training was none too modern and whose ability was not very keen. Divisional formations--at that time very rare--

flew with regiments abreast, under heavy fighter escort.

Altitudes of flight and attack varied greatly according to the situation, the weather, and other circumstances. They varied from 1,000 to 26,500 feet, with both extremes being unusual. Targets near the main line of resistance were generally attacked from altitudes of 3,300 to 8,250 feet, objectives farther to the rear from 10,000 to 16,500 feet.

When attacking frontline targets the bombers flew straight toward the objective in fairly close formation; approaches from the side or rear were rare. The attacks were made by waves in regimental strength following one another at short intervals. At the end of the straight approach flight, apparently upon a signal given by the unit commander, the bombs--usually small and medium size--were dropped; attacks being repeated until the bombers had emptied their entire load. Hits became more frequent. After the mission was accomplished, the aircraft immediately changed course, turned about, and flew straight back to their own lines. The same procedure was followed in attacking rear area targets; if these targets were difficult to find, the course was charted by reference points.

The Russian bomber pilots were about equal to their German counterparts in formation flying. On the other hand, their insufficient training in other spheres, such as their inability to take advantage of favorable weather conditions and their slow reaction to flak fire and above all to fighter attacks, proved a serious handicap. PE-2 units that were faced by German fighters often tried to keep their opponents away by firing rockets at them and dropping bombs into their approach route, tactics which were generally unsuccessful.

The conduct of night raids, which will be dealt with separately, was mainly left to individual aircraft flying at 5 to 15 minute intervals without bomb sights, radio direction or target finding devices. These aircraft flew at medium altitudes, following the same route on the approach and return flights during moonlit or at least starry nights, raids usually taking place from the beginning of dusk to shortly after midnight. Night attacks by major units flying in closed formation, in the fashion of Russia's Western Allies, began in mid-1943.

4) Bombing Operations in Support of Army and Naval Operations.
The reports of Army officers⁹³ clearly indicate that strong Russian

bombing forces continued to support the ground forces in 1942-43. Whatever the difference between individual Russian bombing attacks and however varied the experiences of German Army officers may have been, it can be stated that, in general, the cooperation between bombers and ground forces was very close and that bombers were usually committed at points of main effort. This explains why certain German Army officers had no contact with Russian bombers from the spring of 1942 to the autumn of 1943, while others report that they were subjected to continuous bombing raids. Also, at certain times some sectors of the front were not attacked by any bombers whereas at other times Russian bombers predominated in the air. This indicates that the Russians concentrated their bombers for crucial operations more than ever before. During the Battle of Stalingrad Russian bomber activity increased from the end of August 1942; this intensification was steady, even though interrupted occasionally, until complete supremacy was achieved during the last weeks of the battle of encirclement. The Russian bombers usually attacked in squadron strength; they were so effective that the Germans occasionally rated their performance more highly than that of the ground-attack aviation. Other Russian bombing operations near Sevastopol, Kerch, at the Kuban Bridgehead, in the Caucasus and near Kharkov, Orel, and Leningrad (that is to say, everywhere that decisive battles were taking place) were executed with determination and in increasing strength in support of the ground forces.

Whereas sometimes the bombers attacked targets in the rear of the combat zone while the ground-attack aircraft concentrated on frontline objectives, at other times both the bomber and ground-attack aircraft would raid the same objectives. Quite frequently bomber units composed of some 30 aircraft would strike important objectives on or near the battlefield with flight altitudes varying according to the over-all situation and air and weather conditions. There was, however, a general tendency to attack from medium, and sometimes from high, altitudes.

The German losses suffered from such attacks continued to be low during this period, with the possible exception of the Battle of Stalingrad. Although personnel and materiel losses were higher than in 1941, they remained within acceptable limits; the effect produced on morale, however, was far more serious, although, in general, the German troops were not as greatly impressed by Russian bombing attacks as by the raids of ground-attack aircraft.

After the beginning of 1943, Russian bombing operations against German naval installations and operations multiplied.⁹⁴ High altitude raids, for instance, were directed by units of 20 to 30 bombers against harbor installations at Kerch and Feodosiya and at the ports of Anapa, Yalta, and Taman as well as against the German torpedo boat harbor at Ali Baba* west of Feodosiya. The effect of the bombings was generally minor because well placed flak fire often induced the Soviet bombers to drop their bombs prematurely. On the other hand, the Russian bombers succeeded in inflicting heavy losses on the German naval transports supplying the troops in the Caucasus. During the withdrawal of the German forces in the Caucasus the bombers again hampered the flow of supplies by repeated attacks on Kerch and Taman and partly destroyed the preparations for transferring the troops to the Crimea.

At the same time, Russian aircraft attacked German naval convoys between Constanta and Sevastopol, usually by dispatching torpedo bombers from Tuapse, which were generally loaded with normal aircraft torpedoes, occasionally also with parachute torpedoes. Although these operations were usually unsuccessful because the torpedoes were launched from too great a distance, the Russians did force the German Air Force commander to divert fighters to escorting the convoys, and these fighters were thus not available for other missions. A torpedo raid staged in the autumn of 1943 by a squadron of Douglas Bostons against the port of Constanta was totally ineffective. Whereas there was some bomber activity against the German Navy in the Black Sea area, according to available information the Russians did not undertake bomber operations in the Baltic or North Sea.

5) Russian Bombing Operations in Rear Areas. In 1942-43 Russian bombing operations in rear areas were mainly directed against tactical objectives. Supply, service, and transportation installations as well as billets and troop movements deep in the rear areas were among the chief targets, while missions aimed at Luftwaffe ground organization units focused mainly on airfields. Attacks on strategic objectives in the German zone of interior were

* Editor's Note: This must be a nickname for Ivan Baba, a small port located on a peninsula about a mile south of Feodosiya.

rare exceptions.

Opinions on the procedures used and effect produced by these bombing attacks vary. All Luftwaffe commanders agree, however, that gradually the planning improved, the attacks grew more intensive and became more successful. The Russian bomber attacks against the German airlift at Stalingrad⁹⁵ offer the best example of this. At first, the Russians did not launch any planned attacks by major units against those German loading airfields outside of the Stalingrad pocket. Instead, individual twin-engine aircraft made day and night attacks at irregular intervals, but their attempts to disrupt the flying activity failed. By mid-December 1942 bomber units in squadron strength appeared more frequently, and sometimes even larger units were employed. They attempted to disturb the airlift by dropping bombs from an altitude of 13,200 to 20,000 feet, flying in squadron V formation. Such attacks were almost continuous, and inflicted heavy losses of German aircraft, materiel, and irreplaceable personnel. Finally, the losses went as high as 50 percent of all the operational aircraft.

Simultaneous attacks against airfields situated in the pocket had a very detrimental effect on the landing and take-off of the transport aircraft, on the unloading of supplies, and on the evacuation of the wounded. Because of damage to the airstrips and uninterrupted attacks, take-offs and landings often had to be cancelled and airfields had to be temporarily closed down. The constant bombing attacks added to other causes finally led, in January 1943, to the complete stoppage of operations at the airfields in the Stalingrad pocket.

According to German Army and Air Force officers,⁹⁶ Russian bombing attacks in rear areas were still insignificant in 1942. When opposed by German fighters, the Soviet bomber units often suffered devastating losses. Although they carried out their missions without deviating, the bombers failed because they dropped their bombs indiscriminately, scoring few hits on the targets and producing little effect. A major attack⁹⁷ carried out by three waves of bombers against German billets along the Black Sea coast also produced little effect, except for some damages to buildings. By contrast, in the steppes along the Don River, German anti-aircraft batteries that were repeatedly attacked, from an altitude of 5,000 to 10,000 feet, by Russian bombers during the summer of 1942 suffered considerable losses until the German troops were able to dig in, no cover or concealment being readily available.

During 1943 the situation changed profoundly.⁹⁸ Even then, Russian bombers scored little or no success if German Air Force units opposed them in strength. During Operation Citadel, for instance, the Russian bombers approaching German airfields were caught in time by German fighter aircraft and badly mauled. This did not stop the remaining bombers from stubbornly continuing their mission. Some elements reached the target and dropped their bombs despite continual fighter resistance; few hit the target, however, and the damage was slight.

During another attack of closed bomber formations flying under heavy fighter escort the targets were the airfields of the German 4th Bomber Wing in the Orel-Bryansk area. A major Russian success was prevented by well placed flak fire which impeded the aiming of Soviet bombardiers. During its return flight, this Russian unit was caught by German fighters which then shot down some 90 Soviet aircraft.

But the Russian Air Force was able to compensate for such losses by a continuous flow of materiel and personnel replacements. Russian bombing attacks spread to German rear area airfields and logistical facilities. Thus, the railheads at Orel and Bryansk were badly hit almost day after day with very noticeable effect. In Orel a train loaded with one million rations and part of an Army ration dump were bombed out, while at Bryansk the Germans lost 1,200 tons of ammunition. The Germans, as a result, were forced to disperse their supply and service facilities even wider, which again required more guard personnel, more supplies, and more POL, quite apart from the fact that the dispersed installations had no access to the railroad. This, in turn, affected the entire supply system.

The gradually improving performances of Russian bombers during attacks on rear area facilities of the Germans during 1943 are recognized by various German Air Force commanders.⁹⁹ According to them, the bombing operations were well prepared, based on good intelligence, reasonably planned from a tactical point of view, and carried out by surprise and at times when the German unit under attack was particularly vulnerable--immediately after landing, for example. Although German flak and fighters often succeeded in preventing the Russians from precision bombing, German personnel and materiel losses increased considerably because of the existing Russian numerical superiority, the growing strength of the units committed, and the Russians' steadily improving

performance in dropping bombs and employing aircraft weapons. PE-2 units, up to 80 aircraft in strength, attacking in a steep dive, under direct and indirect protection of fighter escorts, were no longer exceptional.

A well executed Soviet bombing attack on the Stalino airfield in 1943, when no German fighters were present, was rather ineffective only because the German bomber group based on this field was away on a mission. When the Russians repeated the attack, their bombers were intercepted by German fighters that had been redeployed to this vicinity. The Russian bombers were dispersed before reaching their target and were almost completely annihilated.

A particularly instructive example of the improved Russian bomber operations was the raid on Kotly airfield, which was situated on the Bay of Finland and could be kept under observation by the Russian garrison in Leningrad. A few hours after the arrival of a German bomber group (1st Bomber Group, 1st Bomber Wing), the airfield was subjected to a classical bomber strike by 15 to 20 Russian aircraft approaching at low level from the sea. The antiaircraft fire by 4 four-barreled 20-mm machine guns was completely inadequate. German fighters were busy elsewhere at quite a distance, which was probably known to the Russians through intelligence channels. The small and medium bombs hit precisely between the parked aircraft and the billeting areas. After the bombardment the planes returned for low-level strafing attacks. Aside from considerable personnel losses, the Germans lost 10 Ju-88's that were either destroyed or heavily damaged. The same afternoon another attack was launched against the same airfield by 17 Russian bombers, and on the following day 24 bombers renewed the assault so that the operational readiness of the German bomber group was reduced to four aircraft. As a result, the entire unit had to be transferred to East Prussia for rehabilitation and replacement of losses. This was an irreplaceable loss because the unit had been an experienced bomber group. Even though no similar Russian successes have been registered, this event proves the capability of Soviet bomber units in 1943 under favorable circumstances.

In summary, during 1942 Russian bombing operations against German rear areas were primarily tactical. Aimed at supply installations and airfields, they were executed with far too few aircraft flown by poorly trained, inexperienced crews. As a result,

losses were high and results were poor. By 1943, however, such attacks gained in power and were executed more skillfully because of the increased experience of the crews. Finally, although Russian losses to German fighter and anti-aircraft defenses remained heavy, the Russians, in contrast to the Germans, were able to replace their losses within a short time. Thus, German defenses gradually weakened and Russian bombing operations improved.

6) Night Bombing Operations. Russian night bombing operations in 1942-43 were similar to those in 1941. They were either nuisance raids or attacks on tactical objectives near the main line of resistance, staged during the hours of darkness.

The methods of launching night nuisance raids changed little,¹⁰⁰ and the raids were still executed mainly by U-2 aircraft. The almost uninterrupted commitment of individual airplanes flying at low or intermediate levels during moonlit or starry nights was characterized by the aimless and nonselective dropping of small-caliber bombs on any identified target or ray of light. As a result, the bombers scored accidental hits, kept the frontline area under constant pressure, and disturbed the German troops' rest at night. As of 1943 they also dropped propaganda material and passes for potential deserters. For well-known reasons counteraction by German night fighters was hardly possible. The combination of 600-mm searchlights and light and medium flak had a deterrent effect and constituted a strong defense, but the existing shortage of equipment restricted its use to a few centers of ground fighting. Thus, the Russians could generally carry out their nuisance raids without being disturbed, scoring many successes, especially against service and supply installations. These night raids also affected the morale of the overextended German ground forces. Both Luftwaffe and Army officers agree that organizational improvements, proper training in dropping bombs, more adroit commitment, and the use of modern bombs and bombsights could have made these raids far more effective.

One author¹⁰¹ very ably characterizes the nightly nuisance raids by stating that the nuisance bombing units were constantly being reinforced and reorganized. They appeared everywhere at night without any system, being used against any target of opportunity such as troop assemblies, occupied villages, rail or road traffic, airfields, and German night flying operations. Even though they did not score decisive successes--these were perhaps not sought--they

produced a quite considerable and constant nuisance effect.

The Russian command issued detailed directives governing air-ground cooperation by night.¹⁰² Very close contact between the appropriate Army and Air Force agencies, the attaching of Air Force liaison officers to Army staffs, the security of signal communications, the commitment of aircraft from advanced airfields, the installation of direction centers along the main line of resistance to orient and guide aircraft by flares, tracer ammunition, and searchlights, the marking of the main line of resistance by optical aids--all were spelled out in minute detail.

Whereas there were only a few changes in the execution of night nuisance raids in comparison to 1941, the bombing attacks on tactical objectives under cover of darkness increased considerably in intensity and importance both in the combat zone and in rear areas.¹⁰³ They were primarily directed against supply facilities and service installations as well as against German airfields and night air activity. The attacks were launched during clear, moonlit or starlit nights, primarily by individual aircraft--some obsolete four-engine planes, but mostly twin-engine PE-2's or DB's--that followed each other at short, regular intervals. They dropped their medium bombs and fired their guns from altitudes varying from 6,600 to 10,000 feet, often repeating their attacks on consecutive nights. During dark nights they lit up the target area with flares prior to dropping the bombs, but this was done so inaccurately and prematurely and without properly considering the wind that the bombs usually missed their target. The German ground defenses were occasionally deceived by Russian aircraft giving the proper German recognition signal before dropping their bombs.

The success achieved by these attacks varied greatly. For instance, during the period 16 to 26 June 1943 twin-engine aircraft flying individual missions attacked the East Zaporozhe* airfield during four nights for periods of two to two-and-a-half hours each time. A maximum number of 20 aircraft was employed; they attacked

* Editor's Note: Zaporozhe was important because of its location on the east bank of the Dnieper River bend, a natural barrier which figured importantly in the southern sector of the Russian campaign. Captured by the Germans in 1941, Zaporozhe remained in their possession until 14 October 1943. See Tippelskirch, pp. 342-43.

from about 6,600 feet altitude during clear nights, dropping a moderate number of bombs, many of which were duds. They did not cause any fires on the ground, but they damaged four aircraft and destroyed a small ammunition dump. In another instance, ¹⁰⁴ IL-2's first attacked at dusk, followed by PE-2's, TB-3's, and DB-3's launching continuous raids, which completely immobilized the runway and the taxiway for half a day. Only because the wrong fuses had been used for the heavier-type bombs--producing deep bomb craters instead of fragmentation or splinter effects--did the damages resulting from the raids not turn out to be heavier.

Such night raids on German transport aircraft engaged in airlift operations near Stalingrad were, at first, rare and unsuccessful. But by December 1942 such raids grew in size and frequency, causing personnel and materiel losses that the Germans could ill afford.

Russian night raids on tactical objectives increased in intensity during 1943. In the northern sector of the Russian theater, for example, the main line of communications was severely disrupted by repeated attacks on the Dno railroad station. Such raids were particularly disruptive during Operation Citadel. Increasing night bombing attacks on the principal railroad stations and lines of communication led to long delays. Supplies had to be unloaded outside the stations or they had to be diverted to some other rail line, which then promptly became the main center of attraction for the Russian bombers. These continuous attacks finally forced the Germans to stop their supply trains as early as Roslavl and to transship the supplies via army group truck regiments or move them up by horse-drawn vehicles. Serious disadvantages of all kinds arose from this situation and were aggravated by the coordination and interaction of bombing attacks and partisan activities, the latter becoming more and more effective.

The Russians were hesitant to launch night attacks by major bombing units. By spring of 1943, however, such operations were observed by the Germans; during the summer of 1943, repeated night attacks by bombing formations took place in the Leningrad area. There, one or two squadrons would attack a single target from low altitudes with medium and heavy bombs. Before the start of the attack, the target area was illuminated by numerous flares. The attacks impressed the Germans by their vehemence, even though they did not achieve any results worth mentioning.

Since the Germans were short of anti-aircraft guns, searchlights and (above all) night fighters, an effective defense against night attacks was difficult. Whenever the Germans were able to improvise night fighting operations by a combination of searchlights and night fighter aircraft, as for instance near Kerch, they shot down quite a number of Russian planes. The Russians contributed to these successes because their night attacks took place only during clear or moonlit nights, their aircraft used the same route for approach and return flights, and their twin- and four-engine bombers were easy to locate by their exhaust flame, which was clearly visible. Thus, the Russians stopped their night attacks near Kerch after repeating them for eight times and losing about twelve aircraft.

No Russian bomber raids at night on German naval targets were reported during the 1942-43 period, except for raids on German harbor installations in the Crimea, which were never too successful.

7) Operations under Special Weather Conditions. For the 1942-43 period there is very little information on Russian bombing operations under special weather conditions.¹⁰⁵ The conclusion that the training of most Russian bomber crews had not sufficiently advanced to permit carrying out missions under really bad weather conditions is based on the following facts: first, the Russians did not conduct strategic bombing operations and were therefore unable to obtain experience in flying under unfavorable weather conditions over long distances; second, night attacks were carried out only during spells of good weather; and finally, the bombing aircraft lacked adequate instruments and navigational aids to fly bad weather sorties.

Only for operations in the immediate combat zone could the weather be left out of consideration. There, the Russian bombing missions were adroitly and persistently executed under even the worst weather conditions and in the most severe cold. The same applied to the nuisance raids conducted by U-2's, which were practically unaffected by the weather. One report mentions, for instance, that a Russian nuisance raider attacked the Orsha airfield during weather that virtually excluded flying. The aircraft dropped small-caliber bombs, through a momentary opening in the clouds that covered the night sky, and hit a hangar, whereupon all aircraft inside the hangar burned to ashes.

Thus, during the period 1942-43 Russian bomber crews

were still generally incapable of carrying out flights over long distances in really bad weather; the night nuisance raids conducted by U-2's in all types of weather constituted the sole exception.

8) Bomber Operations in Conjunction with Other Air Arms.

As stated earlier in this study, Russian combined operations of bombers and fighters were still inadequate until mid-1942. They led to high losses that could have been avoided and that were caused by the fighter escorts' inability to fulfill their mission and the bomber units' lack of cohesion. But after fighter and bomber crews had learned their lessons, cooperation improved considerably until, by the end of 1943, it reached a satisfactory level. Bombing operations without fighter escorts became a thing of the past.

D. Types, Armament, and Equipment of Russian Bomber Aircraft

There were few changes in the types of Russian bomber aircraft employed in 1942-43.¹⁰⁶ The antiquated SB and TB models were no longer used during daytime, and only occasionally used during the hours of darkness. The Russian daylight bomber units were therefore almost exclusively equipped with twin-engine DB-3's, DB-3F's (IL-4's), and PE-2's. In their performance these aircraft corresponded approximately to the Heinkel 111's with regard, for instance, to speed, maximum altitude, and bombload. They were therefore not up to modern standards. During these years the PE-2 remained the best Russian bomber: its armament consisted of two to three rigid and one to three mobile machine guns, it carried a bombload of 1,320 lbs., had a speed of 250 miles, a normal range of 250 miles, and carried a crew of three men. A great number of these aircraft were to be found in the immediate combat zone. Their powerful rear defenses of machine guns and rockets prevented German fighter attacks except from the side to the rear--in the blind spot caused by the tail assembly--or from above and to the side. Attacks directly from the rear were impossible. German fighters could score successes only by first eliminating the rear gunner and then setting one motor on fire, the rest of the aircraft being extremely fire resistant. It was known that the Russian Air Force command was trying to commit more modern bombers manufactured in the Soviet Union and in the United States. No such aircraft were encountered by the Germans during this period, however.

Russian medium and heavy caliber bombs, the Germans observed,¹⁰⁷ contained a disproportionately high percentage of duds. Thus, during an attack on the East Zaporozhe airfield in 1943, 8 out of 60 bombs were duds, during another raid as many as 30 out of 130. The light fragmentation bombs, however, detonated almost without exception and were quite effective. The Russians had a predilection for using captured German fragmentation bombs, with good effect.

No special information is available on the equipment of Russian bomber units in 1942-43. It seems improbable, however, that the backwardness in accessories and equipment--in comparison to Western standards--had been modified to any extent.

E. Summary and Conclusions

Russian bombardment aviation during 1942-43 can, on the basis of available source material, be evaluated as follows:

- 1) Despite some progress Russian bombardment aviation continued to be the weakest and intentionally neglected arm of the Russian Air Force.
- 2) The personal conduct of the Russian bomber crews, particularly in combat, was worthy of recognition.
- 3) In accordance with the general Russian doctrine on the conduct of operations, bombers continued to be employed exclusively for tactical and not for strategic missions. The creation, in 1942, of the Long-Range Air Force did not change this. Bomber operations, however, gave evidence of increasing adherence to the principle of concentration of forces.
- 4) Bombing attacks in the combat zone against tactical objectives in support of the ground forces constituted the main mission of Russian bombardment aviation. Cooperation with the Army was generally well organized and gradually produced results, particularly in the southern part of the theater.
- 5) Bombing operations in rear areas were also mainly tactical, being directed, for the most part, against service facilities, supply installations, and airfields. The effectiveness of these raids

grew considerably in the course of time, even though the successes often involved heavy losses.

6) Russian bombing operations against German naval targets took place only in the Black Sea area; there the results were negligible.

7) Night nuisance raids became more numerous; because of the continuous disturbance they created, they weakened the resilience of the German ground forces. Night attacks on tactical objectives were successful despite the Russian crews' deficiencies in training and experience.

8) The tactics and flying technique of Russian bomber crews had improved, even though there were still many weaknesses in the control of operations, as well as in technical ability and training. The size of the attacking units grew steadily, and operations were always conducted with fighter protection. Night operations were still predominantly conducted by individual aircraft.

9) Types, armament, and equipment of bombing aircraft showed little progress. The neglect of bombardment aviation in these fields manifested itself very clearly, affecting both operations and effectiveness.

10) The performances of Russian bombardment aviation in cooperation with ground-attack and fighter aircraft during combined operations improved in proportion to increasing experience.

Section VI: Other Flying Operations

A. General

There is little information on the use of Russian aircraft for other flying operations in 1942-43. The available data indicate, however, that considerable progress was made in air transport and courier flights and above all in airlift operations to and from partisan areas in the central and northern parts of the Russian theater. The successes achieved in transport and courier aviation were not as spectacular and perhaps less significant. But the rapidly growing partisan activity, which proved so harmful to the German troops,

would have been altogether impossible without the continuous re-supply and support by airlift.

B. Transport Aviation

Russian military transport aviation¹⁰⁸ was at first expanded by the employment of large civil aviation elements. They were used for carrying light express goods in rear areas, wounded personnel, and supplies to partisan-infested areas. For these missions the Russians often still employed the antiquated TB-model aircraft. In supplying the Russian ground forces at Stalingrad, Russian transport aviation also played an important and successful part. By contrast, the Soviet transport aircraft did not succeed in flying adequate supplies to the Russian bridgehead south of Kerch in November 1943. The supply containers they dropped often landed within the German lines, some of the aircraft were shot down, and finally the Russians were forced to abandon the bridgehead.

By summer of 1943 the Germans had identified one long-distance transport division with three regiments operating within the framework of the so-called Long-Range Air Force. This division was also occasionally committed for bombing missions. It was equipped with PS-84* model aircraft, and its crews had been transferred from civil aviation. Aside from carrying out supply functions, especially for the long-range bomber units, these transport aircraft were used for dropping leaflets and propaganda material, as for instance in January 1943 near Orel and Bryansk.

C. Courier, Liaison, and Command Missions

Russian courier and liaison missions increased in importance because of the vast expanses of the theater and the long distances to be covered in the combat zone as well as in the zone of interior. This type of aviation was therefore correspondingly enlarged.¹⁰⁹ Its principal objectives were the rapid transmission of information, the delivery of courier mail, the transporting of light loads and passengers, and to a minor degree the maintenance of liaison with the partisans or the setting down of agents behind the Germans lines. These courier,

* Editor's Note: A twin-engined transport, the PS-84 was the Russian version of the American C-47.

liaison, and command missions were unified within the framework of the Russian Air Force and subordinated to the Intelligence and Liaison Branches within the Soviet High Command staff of the Air Force. Beginning in 1943, each air army was given a courier aircraft regiment as well as a varying number of separate courier squadrons and flights. The latter were attached to army staffs in accordance with the over-all situation. Supply and personnel matters for those units were handled by the air armies in the combat zone, whereas, in the zone of interior, air force staffs in the military districts had this responsibility. The models used were mainly U-2's, with a few R-5's, UT-1's, and UT-2's. Captured German Fieseler Storch aircraft were observed occasionally. During the last few weeks of the period under review a new type of aircraft was identified by the Germans, the JA-6.* It was built of lumber, had twin-engines, a crew of two or three, and could carry a payload of 1,100-1,320 lbs.

Russian courier and liaison aircraft were often encountered by German reconnaissance planes during 1943, usually along railroad tracks. The dirty gray-green camouflage paint of these aircraft made them difficult to observe in bad weather when the sky was overcast. In sunshine they could be identified by their sharp silhouette. The Russians flew skillfully, taking advantage of favorable terrain features. On these aircraft, the rear seat was often equipped with a machine gun mounted on a rotating gun ring for defensive protection against attacks from the rear and above. If they recognized an attacker in time, the Soviet courier pilots would change course abruptly as soon as the opponent opened fire and disappear behind groups of trees, villages or in forest fire-breaks. The Germans shot them down only if they could catch them by surprise in a low-level attack from the rear by suddenly reducing altitude and speed.

D. Airlifting Supplies to Partisan Units

In 1942-43 the cooperation between the Russian Air Force and partisan units expanded gradually, especially in the extensive areas of the central and northern parts of the Russian theater, which were infested by partisans. This cooperation resulted in extremely heavy

* Editor's Note: English designation may be YA-6. No additional data available.

losses and damages to the Germans.¹¹⁰ Continuous airlift supported the partisans with rations, weapons, medical supplies, and many other supply items, and at the same time provided them with key personnel and important orders and information. The methods of executing these operations had remained essentially unchanged, i. e. aircraft and cargo gliders landed by night on emergency airfields--during the winter on the ice of frozen lakes--which were also used for airdrops. This support enabled the partisans to carry out successful attacks on railroads, roads, airfields, bridges, convoys, march columns, rear area command agencies, and even troop units. As a result, the Germans suffered heavy losses of personnel and materiel. In addition, they had to devote considerable forces to countermeasures. These extensive, time-consuming operations resulted in an attrition of forces. For instance, security troops had to be committed more extensively and vehicles had to move in guarded convoys. The Germans flew reconnaissance missions to discover airdrop and landing fields in partisan-held areas, attacked airlift operations wherever they had been identified, used deception by setting up dummy airfields and giving fake signals, and finally activated a special anti-partisan wing of 100 Arado-66's. The results achieved--especially in the central part of the theater--remained unsatisfactory. In the final analysis, this use of airlift by the Russian Air Force must be considered a success, for the relentless night airlift operations enabled the partisans to carry out their tasks.

Section VII: Air Force Ground Organization, Technological Development, and Supply Services

A. General

There is relatively little information on the ground organization, technological development, and supply services of the Soviet Air Force during 1942-43. The available data indicate that with considerable simplicity in these spheres the Russians demonstrated remarkable adaptability and an admirable capacity for improvisation. To an increasing degree, their methods were tailored to fit the requirements of the Russian theater of war in general and the Soviet Air Force in particular.

B. Air Force Ground Organization

1) General. The Soviet Air Force ground organization recovered fairly quickly from the reverses of 1941. It was realistically organized, adjusted to constantly changing circumstances, and it perfected itself on the basis of practical experience.¹¹¹ In establishing airfields, the Russians often disregarded the lack of railroad sidings and in many instances even the absence of improved roads leading to the facility. Instead, they preferred more and more to build airfields close to the frontline. The increasing number of flying units, the necessary decentralization in assembling air force units, and the absence of a great number of large peacetime airfields that had fallen into German hands, gradually led the Russians to use almost exclusively advance airfields for Air Force operations. Thus, in the summer of 1943, there were only two fixed installations among the sixteen Russian airfields in the area south of Orel.

2) Operational Principles, Organization, and Chain of Command. German officers had no insight into these matters during 1942-43. They did know, however, that the chief of rear area services at an air army headquarters directed his entire ground organization, including supply, in accordance with regulations prepared by the Central Administration of Rear Area Services in the Central Administration of Red Army Air Force Units. Each chief of rear area services had a subordinate branch for ground organization.¹¹²

3) The Airfields and Their Facilities. In describing the conditions which prevailed in 1941, we noted that the unpretentiousness of the Russian ground organization had many advantages and that the Russians had demonstrated particular ability and talent for improvisation in this sphere. These observations are equally valid for the period 1942-43.¹¹³ Advance airfields were literally roughed out with complete disregard of the prevailing season. On a flat surface having the required dimensions--about 1,100-1,320 yards in length and 176-220 yards in width--heavy rollers were used to establish a runway in an east-west direction which was the predominant direction of winds in Russia. These airstrips could be used even in bad weather; they also proved effective when covered by snow. The dispersal areas were well camouflaged; in winter they were under a cover of snow. The troops usually lived in dugouts, not in fixed or barrack-type billets. Some advance airfields were completely integrated into the surrounding countryside. Wherever splinterproof shelters were available for aircraft, the opening

passages were shifted from time to time to confuse reconnaissance pilots. In the course of time, however, the Russians almost completely stopped building revetments for aircraft. Ammunition, bomb, and POL dumps were dug into the ground away from the airstrips. The airfields were usually protected by one or two anti-aircraft batteries.

Air Force ground personnel operated efficiently. The flight operations, particularly take-offs, took place rapidly and without incidents. Bomb damages were repaired within a short time. Thus, for instance, the last airfield near Sevastopol was repaired again and again despite repeated German air attacks. While the airfield was thus kept operational, the planes were distributed among the covered shelters and were moved at frequent intervals.

The Russians were also very skilled in installing dummy airfields. As an example, the Germans made several saturation bombing attacks on an airfield near Kerch until they discovered, during a low-level attack, that this was a dummy installation on which Russian ground crews were continuously moving well imitated dummy aircraft from one end to the other. On another advance airfield the Russians intermingled real and dummy aircraft so skillfully that they could not be distinguished from one another.

C. Air Force Technological Development.

We have already discussed the individual types of aircraft and the related technological development for 1942-43 in another section of this chapter. From an organizational point of view, ¹¹⁴ technical matters were controlled by the Central Administration of the Aviation Engineer Service within the Central Administration of Red Army Air Force Units. It was from this agency, then, that a chief engineer at an air army headquarters would receive his directives. The fixed aircraft repair shop within his jurisdictional area dispatched a maintenance and a repair battalion to satisfy all immediate requirements up front. The testing and introduction of technical innovations and improvements and the execution of repairs were particularly stressed. Subordinate specialized inspectors were responsible for constant technical supervision.

D. The Supply Services.

Despite many difficulties, Russian supply services generally

fulfilled their functions, even though they had to improvise constantly.¹¹⁵ The replacement of aircraft was well organized since, despite heavy losses, no decrease in operational strength of fighter aircraft was felt in the field. Aircraft replacements were flown in great numbers directly from the factory to airfields in the combat zone to fill existing gaps. Thus, in the summer of 1943, entire groups of aircraft arrived at airfields in the Orel area, even though they had not yet received their coat of camouflage paint.

Materiel was, by preference, transported by truck. The availability of railroad connections, therefore, was relatively unimportant. Personnel replacements were made through air force replacement regiments. During the very tenuous situation in the spring of 1942, for example, the reconnaissance replacement regiment had sufficient personnel for five to six reconnaissance regiments. Up until the autumn of 1942, however, these regiments could only be activated very slowly, one at a time, because the necessary aircraft were lacking. By 1943 this bottleneck had been overcome.

The Central Administration for Rear Area Services--a part of the Central Administration of Red Army Air Force Units--controlled the entire supply system as well as the ground organization. A chief of rear area services at each air army headquarters directed all supply services at the lower echelons.

Section VIII: Air Force Signal Communications¹¹⁶

Russian Air Force signal communications, during this period, shared in the general progress achieved by the Russian Air Force; this was particularly noticeable in radio communications and organization, and in the operational principles followed. The signal traffic was smoother since detailed directives on signal communications within the Air Force had been issued. Allied materiel assistance might also have been of importance. In comparison to German Air Force signal communications, the Russians were still considerably retarded; no step had been taken to form separate air force signal units as an arm of the service.

In the organizational field the remarkable feature was that signal communications included not only radio, radar, telephone, teletype, and other means of communicating, but also all media of

transmission such as liaison, courier, and command aircraft. There was therefore no differentiation between the transmittal of a message, an item or a person, all these services being accomplished by signal communications. The Signal Communications Service Branch in the Central Administration of Red Army Air Force Units, was the control agency for these operations. A chief of signal communications and liaison service acting as the chief of the signal communications and liaison branch at each air army headquarters, directed, according to the regulations and orders issued by the central control agency, all radio, telephone, teletype, courier, and liaison services within the air army. The cryptographic service, an exception, formed a separate branch.

The most obvious progress had been made in the transmission of radio messages.¹¹⁷ In radio traffic among aircraft in flight and, above all, in air-ground communications, there had been considerable improvement since 1941. In May 1943, for instance, at the Kuban Bridgehead all Russian fighters were equipped with radio sets. Russian fighter and ground-attack aircraft were systematically and consistently directed by radio control stations established along advance positions at the points of main effort. These radio control stations assisted the Russian fighters in locating German formations in flight, informed Soviet ground-attack and close-range bombers of worth-while targets along the German main line of resistance, provided information on the air and ground battle, and warned Russian ground-attack and bomber aircraft of the approach of German fighters. The radio control stations supervised the operations of Russian aircraft in flight and were even authorized to reprimand or punish crews while they were still in the air, if they had made a mistake or their failure to carry out a mission had been established. In addition, the radio control stations attempted to enter German radio traffic circuits, threatening or misleading the German crews. But despite all these measures, the radio discipline of the Russian Air Force units was still far from perfect. This enabled the German radio intercept service not only to establish the assembly preparations of Russian Air Force units in many instances, but also to direct the German fighters toward the approaching Soviet units or to warn German headquarters and troops of the impending danger.

The existence of a Russian Air Force radio intercept service was known to the Germans who, however, had no knowledge of details because of the strictly imposed secrecy. But the Germans had reason to assume that the Russian radio monitoring service was inferior to

their own and that it did not produce any significant results or information on the situation in the air. ¹¹⁸

Even though the Russian Air Force organized its own organic telecommunications units on a major scale in 1943--a development that affected the German reconnaissance and bombing aircraft, often very disagreeably--this sphere of activity was still retarded. The same can be said about the radar service. Radar instruments were available and mass production of new sets was apparently underway for sets that could detect the appearance and number of enemy aircraft apparently within 70 to 90 miles' distance. To judge by the operations of the Russian Air Force and especially by the performance of the night fighter aviation, Soviet radar development must still have been at a very elementary stage. ¹¹⁹

Section IX: Training ¹²⁰

As already stated, German officers had little insight into Russian training methods. The deficiencies which obtained in this field during 1942-43 were certainly caused by lack of sufficient time to thoroughly train personnel before sending them into combat. This was not surprising after the losses and reverses of the first year of the Russian campaign, quite apart from the fact that the Soviet Air Force had to base its training on gradually obtained experience in combat.

The much abbreviated training course consisted as a rule of the following: after premilitary training in flying clubs and associations, suitable personnel were sent to pilots' schools, and from there to the specialized schools of the different air arms. The personnel that had completed these training courses were assigned to air replacement or training regiments from which they were transferred to combat units. There were no specialized training courses for observers.

The flying and ground personnel were concentrated in air replacement regiments, where they were either subjected to further training or retrained by special instructors. Then they were used to activate new units, to rehabilitate units that had suffered heavy losses or to serve as individual replacements of crews with combat units.

There were two air academies: the Command, Staff, and Navigational Academy of the Red Army Air Force at Chkalov trained staff officers, regimental and divisional commanders, air attaches, navigation officers and field-grade officers (in the supply services and ground organization) in command, staff, and operational principles, whereas the Air War Academy Zhukovski at Sverdlovsk--previously located in Moscow--trained primarily members of the higher technical staffs.

There was no detailed information on training by Allied instructors. But the Germans had established the fact that at Kostroma Russian pilots were retrained by British instructors to fly British aircraft.

From these relatively scarce data it can be gathered, however, that the Russian Air Force's efforts to bridge the existing gap in the training of its personnel were gradually proving successful.

Section X: Paratroops and Airborne Forces

In 1942-43 there were no basic changes in the organization and employment of Russian paratroops and airborne forces. They remained directly subordinate to Red Army headquarters, i. e. to the Peoples' Commissar for Defense.

By the end of February 1942 the activation of 10 airborne corps--ordered in the autumn 1941--had been completed. Almost all of these units were assembled in the area east of Moscow; during the following months, particularly in January and May 1942, they were committed on a small scale at various sectors of the front. These operations had a very detrimental effect on the flow of German supplies, since they were directed against the German lines of communication, traffic centers, and other man-made facilities, thus disrupting the few railroads and highways that were available. In August 1942, under the effect of the German advance on Stalingrad, the airborne corps were reorganized into seven guards rifle divisions, one guards artillery division, and one guards armored corps, all under the command of the First Guards Rifle Army, which was immediately sent into combat near Stalingrad. At the same time the Russians resumed the activation of airborne corps which in turn were employed in ground combat near Demyansk and at Staraya Russa in February 1943. Further activations taking place after April 1943 had generally

been concluded by the end of 1943. ¹²¹

The units activated after April 1943 were no longer organized as airborne corps; the new units were airborne brigades with about 3,500 men each. By autumn of 1943, 7 out of 20 airborne brigades, which the Germans assumed were then in existence, were ready for commitment. An airborne brigade was composed of four airborne battalions of 700 men each, one engineer company, one signal, one machine-gun anti-aircraft, and one bicycle-reconnaissance company as well as one anti-tank battalion. Each airborne battalion had three rifle companies as well as one machine-gun, one mortar, and one bazooka company and one reconnaissance, one engineer, and one signal platoon. At that time all airborne forces were paratroops.

The Flying Units of the Red Army Airborne Forces had probably also been considerably reduced by the spring of 1943, being essentially limited to two training glider regiments and the glider school at Saratov. The mission of the glider regiments was: to carry airborne forces, cargo, ammunition, medical supplies, and rations; to evacuate the wounded from partisan-held areas; and to airlift supplies of all types to the partisans during the hours of darkness. They also attempted to undertake surprise night-bombing attacks, after having been towed to high altitudes.

The airborne forces had no organic transport aircraft capable of carrying troops for major operations. For this reason, transport units of the Long-Range Air Force, occasionally augmented by Red Army Air Force transports or civilian aircraft, had to be employed for large-scale operations. Obviously, this led to major complications and resulted in failures, like the operation in the Kanev area during the night of 24-25 September 1943. During that operation the Russian paratroopers jumped too far east of the Dnieper from too high an altitude (5,000 feet). When they landed, they were so dispersed that the Russian commander was unable to concentrate his forces within a short enough time and commit them at the decisive point on the battlefield.

Whereas personnel selection, training status, and above all the high priority enjoyed by the airborne forces ought to have produced a powerful instrument of war, these forces were greatly hampered in their usefulness because of inadequate leadership, defective cooperation between the air and ground forces, and improperly coordinated commitment both with regard to time and space. The

result was piecemeal employment. 122

Section XI: Aircraft Production, Armament Industry, and Communications Network

Information in these areas remained scant during 1942-43. German officers, however, provide the following general indications: 123

Russian aircraft production reached its lowest point in the autumn of 1942. The Soviet production figures that became known to the Germans at that time indicated that for many months the number of aircraft shot down exceeded the number being produced. The Germans arrived at the somewhat hasty conclusion that the number of aircraft in the Soviet Air Force was gradually shrinking. But the contrary was actually the case. The total production of fighters in 1942, for instance, numbered--quite apart from 2,200 imported Allied aircraft--9,300 planes as against about 4,600 German fighters produced during the same period. As to the number of frontline aircraft, the Russians had some 10,000 to 12,000 planes by the summer of 1943, so that they were practically independent of aircraft imported from the United States or Great Britain.

The Russian armament industry was generally capable of fulfilling the wartime requirements. Several armament plants in the Volga area, in the Urals, and in Siberia, which had hitherto remained unknown to the Germans, proved that the armament production capacity was far greater than they had assumed. Another surprise was that, despite having lost 60 percent of its iron and steel capacity by the end of 1941, the Russian armament industry was able to continue production without reduction because of the extensive quantities of iron and steel it had stockpiled. German leaders, however, hoped that the continuation of hostilities and the loss of the Caucasus area would lead to a breakdown of the Russian armament industry because of insuperable difficulties in the production of iron, steel, fuel, and food.

As part of the transportation network, the Russian railroads continued to fulfill their functions despite technical and mechanical difficulties. Whereas damage to tracks could usually be repaired within a few hours, air attacks on railroad stations and yards, especially when signal facilities had been hit, proved often of very lasting effect. The Vyazma railroad station, for instance, was out of

order for 14 days after one such attack.

Civilian air traffic was fully geared to military requirements.¹²⁴ The Civil Air Fleet, which, at the beginning of hostilities, had already been subordinated to the Central Administration of Red Army Air Force Units, was more completely integrated into that organization. The mission of the Civil Air Fleet was essentially military, consisting mainly of courier and transport services. More and more of its groups were transformed into air regiments, redesignated, and integrated into air armies. Even though personnel replacements and supply were still the responsibility of the central administration of the Civil Air Fleet, all other matters, including ground organization, were taken care of by the military agencies. The completion of the Civil Air Fleet's integration into the Red Army Air Force, it was thought, would be achieved in a short time.

One author¹²⁵ succinctly summarizes the situation as follows:

The German hopes of severing the enemy from his principal resources or of destroying his production facilities were buried at Stalingrad and along the edge of the Caucasus. Russia's aircraft production plants and armament industry operated almost without disturbance, well supported by Allied deliveries of raw materials and of other types of products.

Section XII: Allied Assistance

Even though German officers did not know the details of Allied assistance to the Russian Air Force, the effect of this assistance made itself felt at the front. They agree that Allied assistance became increasingly noticeable after the spring of 1942.¹²⁶ Most of the British and American aircraft were in action near Leningrad and at the Kuban Bridgehead. This could probably be explained by the fact that Leningrad was favorably situated near the termini of the northern entry routes which passed through Murmansk and Archangel, while the Kuban Bridgehead was easily accessible from the southern entry route that began at the Persian Gulf and passed through Baku. Along the Kuban Bridgehead, British and American aircraft models--Airacobra-type fighters and Boston and Mitchell type bombers--were at times more numerous than Russian planes.

The northern routes, via Alaska to Eastern Russia or via Great Britain to Murmansk, carried the greater share of aircraft imports into the Soviet Union. Losses on the Murmansk route from submarines and air attacks on convoys were at times quite considerable.* The southern ferrying route led via Miami, Natal, Ascension, Cairo to Abadan on the Persian Gulf, where the Americans had built large installations. From there, shipments passed via Baku into southern Russia. Along this southern route, 1,702 aircraft were transported by ship, while 602 were transferred by air up to 1 September 1943. Of the total number of American aircraft delivered up to that date 20 percent were P-40's (Curtiss Tomahawk), 25 percent were P-39's (Bell Airacobra), 49 percent A-20's (Boston III), 5 percent B-25's (Mitchell), and 1 percent AT-6's.¹²⁷

Because of the great number of British and American aircraft appearing in the Russian theater, Luftwaffe officers felt sure that the delivery of aircraft and flying equipment was probably the most important Allied assistance to the Soviet Union. It contributed very considerably to the growth of the Russian Air Force during 1942-43, even if the quota of aircraft required according to the Lend-Lease agreements was not fulfilled.

Section XIII: Conclusions

German officers' evaluation of the Russian Air Force in 1942-43 can be summarized as follows:

1) The recovery of the Russian Air Force--a process that had begun already in the autumn of 1941 after the devastating blows of the German offensive--continued, at first slowly then gaining momentum during the following years. Whereas in 1942 this development did not seriously affect the existing German air superiority, by the end of 1943 the situation had changed significantly. By then the Russians, benefiting from a considerable numerical superiority, were able to dominate the air space at certain times and in certain places under

* Editor's Note: The most successful German attack on an allied convoy in this region occurred in July 1942 against convoy P.Q. 17, which lost 23 of its 37 ships. See Denis Richards and Hilary St. G. Saunders, Royal Air Force, 1939-1945, Vol. II, The Fight Avails, Her Majesty's Stationery Office (London, 1954), p. 81.

certain conditions. The growth of Russian air power extended over all spheres, showing particular progress in command and staff procedures, technology, and the conduct of air operations; this was quite apart from the steadily increasing number of aircraft. Less progress was made in such fields as education and training or personnel, and in the evaluation of combat experience. As a result, the Luftwaffe--though numerically inferior--was still capable of holding its own in aerial combat at points of main effort and even of achieving temporary air superiority at specific intervals during 1943.

2) In 1942-43 Russian air operations continued to emphasize direct support of the ground forces. The growing intensity of Russian air attacks and their concentration at the decisive points of the ground battle, impressed the Germans and, in addition, gave the Russian ground forces moral and material support. The general trend characterizing Russian air operations was the gradual change from defensive operations--forced upon the Soviet Air Force in 1941--to offensive operations in all spheres.

3) The combat behavior of Russian flying crews continued to be determined by inherent Russian character traits. The increasing number of successes and the growing confidence in their new aircraft models strengthened their self-assurance and promoted their aggressiveness. The Soviet airman thus developed into an opponent who could no longer be disdained.

4) Reconnaissance aviation was employed essentially in support of the ground forces, becoming more and more effective in close and battlefield reconnaissance operations, whereas strategic reconnaissance was relatively retarded by comparison. Despite much progress since 1941, however, the over-all performance of reconnaissance aviation was still not satisfactory, mainly because of personnel deficiencies. Training of crews remained inadequate.

5) Fighter aviation dropped its fundamentally defensive attitude and switched everywhere to the offensive. In their operations against German fighters, reconnaissance aircraft, dive-bombers, bombers, and transport planes, the Russian fighter crews benefited from such factors as more modern types of aircraft, proper command and staff procedures, and growing experience in combat. These factors, in turn, improved the crews' performances and gave them more and more self-assurance, with the result that

they scored more successes. These developments, together with the great numerical superiority of Russian fighters, were the primary causes for the German loss of undisputed air superiority in 1943.

6) Ground-attack aviation, being the top-priority arm of the Soviet Air Force, was further developed and formed the principal attack weapon from the air during the execution of ground operations. Ground-attack aircraft were concentrated at the points of main effort and employed tactically in support of the ground forces, both for offensive and defensive purposes. Their ability to influence the course of the ground battle was gaining. But, while they scored successes, they did not achieve decisive results.

7) In 1942-43 bombers continued to play a role secondary to that of fighter and ground-attack aviation; this was exactly what Russian military leaders intended. Bombardment aviation was used almost exclusively for tactical purposes in support of the ground forces and frequently in conjunction with ground-attack aviation. While the conduct of day and night bombing attacks improved steadily, the effectiveness of these attacks was limited by the restrictions imposed on Soviet bombardment aviation.

8) Combined operations of fighter, ground-attack, and bomber aircraft and their joint operations with ground forces developed gradually, until they reached satisfactory and in some instances even remarkably high standards.

9) The use of aircraft for other flying operations, such as transport, courier, and liaison missions, was expanded on a large scale according to plan. The major successes scored by the partisan units in the extensive areas they dominated would not have been possible without large-scale assistance from the Soviet Air Force, particularly in airlifting supplies.

10) Air Force ground organization, technological development, and supply services, although steadily improving, remained relatively primitive by West European standards. They did satisfy the requirements of the Soviet Air Force, however.

11) Air Force signal communications, particularly in the field of radio communications, participated in the general progress of the Soviet Air Force. Nevertheless, the difference between Russian and German or Allied Air Force signal communications remained

considerable.

12) Although German military experts had no way of evaluating the Russian training system in its step-by-step procedures, they did not doubt that the over-all status of training had improved.

13) Paratroops and airborne forces continued as elite units, but they were primarily employed during critical situations in the ground fighting so that they were dissipated and decimated. No major parachute operations took place during the period under review.

14) Aircraft production, the armament industry, and the transportation network overcame the difficulties of the first year of German-Russian hostilities rather quickly and fulfilled their requirements, insofar as German military experts could judge.

15) Allied assistance, consisting of aircraft and flying equipment, increased steadily after the spring of 1942, and made itself felt on German forces in combat.

In summary, the Russian Air Force in 1942-43 can be characterized as follows: During this period it was almost exclusively employed as a tactical instrument of ground warfare and as such scored an increasing number of successes. It recovered progressively from the disastrous events of 1941, switched to the offensive in all spheres, and achieved equality in the air during 1943, primarily because of its great numerical superiority. It was only because of the wider combat experience and the better performances of the German crews that the Luftwaffe, despite its numerical inferiority, was still capable of holding the initiative at the operational points of main effort.

Chapter 4

THE RUSSIAN AIR FORCE ACHIEVES AIR SUPERIORITY

Section I: The Course of the Air War in 1944-45¹

As in the previous years of the war, Russian air operations remained contingent upon the operations of the ground forces. Throughout the war the Soviet Command adhered to its basic point of view: that air power be employed primarily and almost exclusively to support the Army. Even during the last phase of the war the Soviets made only very occasional use of their air forces for quasi-strategic* missions. It might be added here that the same applied to German air power in the Eastern Theater, the only difference being that the scope of Soviet air operations was intentionally restricted, whereas that of the Luftwaffe was restricted, in the last two years of the campaign, by the exigencies of the situation. †

To understand Russia's use of her air force it is thus important to review the decisive battles on the ground during this last year and a half of the war. In chronological order, they were:

1944

January - March	Severe German defensive battles all along the line, particularly in zones of Army Groups South and North
April - May	German evacuation of the Crimea and Sevastopol
20 June	Opening of major Soviet offensive in Center; annihilation of German Army Group Center

* See note below, p. 348.

† Editor's Note: For an opposing opinion and a brief account of the Luftwaffe's attempts at strategic bombing in Russia see, Richard Suchenwirth, Historical Turning Points in the German Air Force War Effort, USAF Historical Studies: No. 189, USAF Historical Division (Maxwell AFB, 1959), pp. 76-90.

17 July	Opening of major Soviet offensive in the South; evacuation of Rumania, Bulgaria, and parts of Hungary by German troops
August	German defensive battles and delaying actions all along the line
September	Establishment of German main line of resistance in Poland at the San and Vistula Rivers
October	Soviet forces isolate the Baltic and open their drive into East Prussia
<u>1945</u>	
12 January	Soviet forces break through Vistula line and advance against Oder River
February	German defense of Oder River line
March	Soviet drive into Pomerania and Hungary; German loss of East Prussia
April - May	Soviets break through Oder line; capture of Berlin

Whereas the main emphasis in ground operations in 1942-43 was in the southern part of the Eastern Theater, calling for a corresponding shift of emphasis in air warfare to that part of the front, the picture changed in early 1944 and more pronouncedly so from the middle of the year on. In accordance with the day to day development of the tactical situation, main emphasis in ground operations from then on shifted back and forth from area to area, until, as Soviet superiority mounted, decisively important battles were in progress in various areas at the same time.

The Soviet air forces were required to adapt their activities to the requirements of these circumstances, and their mounting strength enabled them to do so. Thus, apart from a few exceptions, air warfare was almost exclusively restricted to those areas in which decisive ground operations were in progress, while elsewhere air

activities came to an almost complete standstill.

The growth of Soviet air power in 1942-43, which had already led to a gradual balance of power in the air--as described in the previous chapter--, increased in the months which followed. The Soviets were favored here by the growing need for German air power in other theaters of operations. At the same time the operable strength of the Luftwaffe in front line units was decreasing because of diminishing aircraft production, the growing German shortage of fuel, and the concomitant rapidly mounting strength of the Soviet air forces.

According to Luftwaffe commanders,² by the end of 1943 the Soviets already had achieved a large numerical superiority in air power, and this superiority increased considerably up to the end of the war. Their almost unlimited resources in manpower, materiel, and fuel enabled the Soviets to isolate the areas of main effort from the air by large concentrations of bombers and ground-attack aircraft, with fighter escorts. While the Soviet air forces were becoming increasingly aggressive, the Luftwaffe, conversely, was forced onto the defensive: the picture had changed radically since 1941. Nevertheless, right up to the end of the war the Soviets failed to achieve absolute air superiority because the individual Soviet fighter pilot remained inferior to his German counterpart in air combat and was unable to prevent completely German bomber and dive-bomber units from executing their assigned missions. Still, the continuing decrease of German ground-to-air and air-to-air defensive power resulted in a considerable Soviet air superiority in the last phase of the war.

Luftwaffe commanders agree that up to the end of the war the primary mission of the Soviet air forces was that of supporting the ground forces. Concurrently with a step up in attacks against targets in the German near-front areas, went an increase--although only on an appreciable scale from the summer of 1944 on--in missions against traffic targets, supply installations, Luftwaffe ground installations, and similar objectives in the German rear. At no time did the Soviets engage in strategic air warfare of the type waged by the Western Allies.

The ceaseless commitment of heavily massed air power in the areas of main effort, to achieve which the Soviet Command practically stripped secondary tactical areas of air support, constituted extremely effective support for all operations on the ground and

contributed heavily to the success achieved by the Soviets in their offensives. In this connection the Soviets made a steadily increasing use of fighters in fighter-bomber missions, a use which proved highly effective.

In actions in which the Soviet Command sought to force a major decision, it deliberately withheld its air power during the initial stages of the operation in order then to throw its strength into the battle in a sudden heavy concentration, always in closed formations. When the attack on the ground began to make good progress, air power was again withheld, to be committed later only when German resistance stiffened.

According to Luftwaffe commanders, from 1944 on the Soviets, in addition to the effort they spent on their fighter and ground-attack arms, began to pay more attention to the development of their bomber and reconnaissance arms. Through the commitment of an overwhelming numerical superiority of highly developed types of aircraft, the Soviets in 1944 achieved equality in the air with their German opponent. In the last phase of the war they even sometimes achieved a slight technical superiority, but were unable to take advantage of this because of personnel inadequacies.

Finally, commanders state that in the last phases of the war the training and fighting qualities of flying personnel remained the weak points in Soviet air power. Although training standards, morale, and aggressiveness of aircraft crews improved with the change-over to offensive warfare, they failed to keep pace with the increasing numerical strength and modernization of the Soviet air force's equipment. Thus, Soviet airmen up to the end of the war frequently displayed a reluctance, which occasionally assumed critical proportions, when they encountered German defenses of any considerable strength.

The above consolidated opinions of Luftwaffe officers are supplemented and confirmed by excerpts from descriptive accounts by two Luftwaffe commanders. Captain von Reschke describes the behavior of Soviet air forces in the northern area from early 1944 to the end of the war approximately as follows:³

The quality of Soviet air forces' materiel in the spring and summer of 1944 almost equalled that of their German opponents.

In numbers, the Russians had such a pronounced superiority that they could afford to develop clearly defined power concentrations. Nonetheless, German air units were still able to execute their missions successfully.

In the summer and autumn of 1944 the heavily massed Soviet fighter-interceptors in Courland* and East Prussia seriously hampered German air activities and inflicted heavy losses on the German air forces besides enabling the Soviets to secure periodical air superiority over the general battle areas.

After the close of the Soviet autumn offensive the air situation returned to normal and remained unchanged up to the opening of the Soviet drive into East Prussia which, in January 1945, ushered in a period of major battle that lasted right up to the end of the war. Soviet air activities increased steadily, with massed units committed to isolate the individual zones of attack. At the same time ceaseless attacks were flown against the German troops on the line and in the near front areas, while the German ground organization was kept under such close and constant observation by day and night that German air operations were hampered seriously and, by the spring of 1945, the Soviets succeeded in achieving air superiority in East Prussia.

Reschke's opinion is that the Soviets' success was due to their steady increase in strength, plus the exemplary cooperation existing between the various arms of their air forces, their able development of areas of main effort, their illimitable replacements in materiel and personnel, their technological progress, Allied deliveries, and the steadily declining German defense capabilities. Superior German training and other advantages of German flying personnel, according to Reschke, were no longer important factors. He comes to the conclusion that, although committed exclusively in support of the ground forces and not in strategic missions, the Soviets, through their steadily mounting air superiority, achieved cumulative results

* Editor's Note: This is the historic name for the southwestern portion of Latvia. Courland was bordered on the west by the Baltic Sea and to the north and east by the Western Dvina River. German Army Group Courland held a bridgehead with an area of about 900 square miles in the western part of Courland until the end of the War.

equalling those of their western allies.

Major H. J. Jaehne, whose return to the Eastern Theater in January 1945--after a lengthy assignment in the Western Theater--afforded him a particularly good opportunity to draw comparisons between the Soviet and the western air forces, reaches similar conclusions.⁴ He states that in this period the Soviets were achieving air superiority in East Prussia but that there was a vast difference between air superiority in the East and air superiority as it existed in the West. For example, in the Western Theater supply routes were practically impassable for supply columns during daylight, whereas in East Prussia supply traffic proceeded almost undisturbed in the rear areas. In the West, German fighters as a rule found themselves engaged in combat almost as soon as they left the ground and consequently were unable to execute their assigned missions; in the East they generally still found it possible to execute their missions, although within limited areas and subject to limitations in time. Air units of the Western Allies were in evidence at all times of the day, in all combat areas and over Germany; the Soviets endeavored only to achieve and maintain air superiority at and near the front and to destroy the German front line Army units.

In spite of growing combat strengths, improved training standards and combat morale of personnel, increased output and better technical performances of aircraft, and refined tactics, Soviet airmen were still a bit cautious in combat. This was due primarily to the effective action of German fighters and German anti-aircraft artillery. Even during the battles around Berlin and in Mecklenburg in April 1945, the Soviet air forces restricted their operations to the front areas, but it must be admitted that in doing so they achieved the desired result--that of effectively supporting all operations of the Army.

In spite of their enormous numerical superiority, concludes Jaehne, the Soviets did not succeed in achieving absolute air supremacy until the last German aircraft had disappeared from the skies.

Jaehne's picture of the operations and effectiveness of the Soviet air forces is rounded out by field commanders of the German Army with similar experience.⁵ According to their reports, strength ratios in air power were more in favor of the Soviets in 1944, and particularly so in 1945, than they had been in 1943. With each successive major offensive, Soviet air attacks increased in

frequency and size and the concentration of air power in areas of main effort became more pronounced. Air power was massed in the areas where the command on the ground sought to force a decision. In Cherkassy,* for example, Soviet fighters were superior in strength and destroyed numerous German transport planes, while Soviet bombers seriously depleted the two enveloped German corps. Also, during the bitter battles fought for Sevastopol in the spring of 1944 Soviet air support was impressive. Another example was the large offensive against Army Group Center. Four Soviet armies attacked the German lines in succession, one each day from 20 to 23 June 1944. These attacks on the ground were supported by masses of air units, which operated with particularly effective results against the German artillery. Against this crushing superiority the German Sixth Air Fleet had only 40 operable fighters. Yet even prior to their 1945 offensive the Soviets had had a large enough numerical superiority to maintain air supremacy.

In quiet sectors of the front the Soviet air forces remained remarkably inactive, as was the case during the last German offensive in Hungary in February 1945, where Soviet resistance in the air was practically non-existent. This was in sharp contrast with focal points of combat, where, during the spring of 1945, the Soviets launched almost ceaseless day and night air attacks. By this time, the Soviets, in the areas of main effort, had begun committing larger numbers of fighter-bombers with which they frequently brought all traffic to a complete standstill to a depth of up to 12 miles in the German rear.

In spite of this change in the air situation in favor of the Soviets, field commanders of the German Army agree unanimously that air warfare in the West produced far more telling effects on the German troops. As one source puts it: ". . . Soviet air attacks were mere pinpricks compared with those by the Anglo-Americans"16

* Editor's Note: Towards the end of January 1944 the 11th and 42d Corps of the German 8th Army were surrounded in the Cherkassy, Korsun'-Shevchenkivskiy area, north of the Dnieper River bend. Air supply of the besieged corps was attempted, but had to be given up when they lost control of the last airfield in the pocket. Most of the two corps (about 30,000 men), minus their artillery and tanks, were able to break out during the night of 16-17 February. Cherkassy, according to von Tippelskirch and von Manstein, was another example of Hitler's ill-conceived and stubborn ground-holding tactics in the Russian campaign.

On the whole, the losses inflicted by Soviet air attacks remained within tolerable limits and the German troops were able to carry out their movements even during daylight without appreciable interference and at only a small cost in losses. Although the defending German fighters were weak in numbers, wherever they did put in an appearance they proved superior and swept the skies clear of Soviet air forces. The Luftwaffe not only held its own against the numerically far superior Soviet air forces, but was even able at this late stage to deal powerful blows. The opportunities for such action, however, became steadily rarer, both in respect to limits of time and space.

The above findings of the German ground forces apply primarily to 1944, but also can be applied conditionally to 1945.

Air operations in support of the Soviet Navy also increased in scope and importance in the last two years of the war, but on a scale not even approaching the operations in support of the Soviet Army. In spite of their great superiority in numbers and materiel, the results achieved by Soviet air forces in naval support operations were very modest.

German naval commanders⁷ consulted agree that Soviet air activities at sea intensified gradually, and that a certain degree of systematic planning for operations, together with the proper tactical cooperation between the Soviet air forces and the Soviet Navy, became evident. These latter features, however, were not achieved until the final phase of the war, at a time when German seaborne transportation in the Baltic, in the Black Sea, and at the German ports of embarkation and debarkation, were exposed--practically without defenses--to repeated heavy Soviet air attacks. Until then Soviet air activities at sea remained restricted primarily to reconnaissance, escort missions for Soviet seaborne transports, and occasional attacks against German seaborne transports, without any signs of organized integration between the Soviet air and naval units involved.

The 1944 operations against the Crimea were an exception. Here, the tactically well integrated action of the Soviet air forces contributed largely to the success achieved by the Soviet Army and Navy in their amphibious operations. The Soviet naval air arm, which considered itself an elite force, generally proved to be quite aggressive during these operations. This applied particularly to the

naval bomber and torpedo-bomber units, which gave a good account of themselves, even in critical situations.

The Soviets, in 1944-45, continued to develop their anti-aircraft artillery arm, with most of their heavy equipment patterned on foreign models. Although they at no time achieved the standards of performance of the German fire control equipment, the Soviet anti-aircraft artillery forces as a whole were not to be underestimated as an opponent. The characteristic features of Soviet anti-aircraft artillery operations were: 1) massed concentration close to the target defended; 2) action in defense of the concentration of ground and air forces prior to offensive operations; 3) action in defense of the foremost infantry and tank units spearheading an attack both during the initial attack and during the breakthrough operations; and 4) speedy and frequent displacement of units, particularly in areas near the front.

In their operations, as characterized above, Soviet anti-aircraft artillery forces often placed Luftwaffe units in difficult situations and in some areas inflicted losses which were by no means inconsiderable. Towards the end of the war, however, the effectiveness of anti-aircraft artillery defenses was less important when compared with the effectiveness of the Soviet defensive fighter forces.⁸

Section II: Command and Operations

In the last two years of the war the command and operations of the Soviet air forces continued to improve. German field commanders assess them broadly as follows:⁹

1) The Soviet Command continued to adhere to the doctrine of planned cooperation of the air forces with the Army. Air operations, including those of bomber forces, were governed by the principle that air power should be used exclusively to support the Army.

2) In line with the basic principle stated above, the Soviets committed their air power in accordance with the requirements of operations by the ground forces, and thus principally in tactically defined missions in the front areas, with a decided emphasis on the principle of power concentration. Measures to increase long-range

reconnaissance and fighter patrol activities, action against traffic and supply targets in the German rear, and offensive operations against German shipping and airfields, all served the same purpose: direct support of the Army.

3) The orders of higher command echelons improved in clarity and decisiveness, but they lacked flexibility. Commands at lower levels gave evidence, up to the end, of lacking the requisite versatility and the ability to take quick and independent action consonant with the requirements of current situations. These defects may have been largely due to the generally accepted military formalism, and to the intellectual level of the troops and their officers, which, at best, can only be described as average.

4) The offensive action taken by the Soviets in the battle for air supremacy differed widely from that taken in the West. It was in consonance with the basic Soviet doctrine of employing air power in the near front areas that the Soviet Command rejected the idea of operating against the German air armament industry or against the German ground service organization. Instead, the Soviet Command committed its fighters against the German front-line air forces and its ground-attack and bomber units against the German Army. For these reasons the battle for air supremacy in the Eastern Theater was restricted primarily to the front areas.

Section III: Organization and Chains of Command

No important changes have become known regarding the organization and chain of command of Soviet air forces during the last two years of the war.¹⁰ The Soviet Command continued to adhere to the system it had found suitable in the past. This meant that the air forces remained under the Army and the Navy, and that the Air Arm of the Red Army remained organized in air armies, corps, divisions, regiments, and squadrons. The same organization was retained for the air forces assigned to the Navy.

In 1945 it was estimated that the Soviets had 10 to 13 air armies, approximately 30 air corps, 130 to 150 air divisions, and roughly 650 air regiments.

Based primarily on smooth and close cooperation between the Army--or the Navy--and its assigned air forces, the flexible

command system, instead of rigid command controls, remained in force in 1944-45 and apparently was found suitable up to the end of the war.

The only major change planned was a reorganization of the air regiments. Still under question was whether the air regiments, with an authorized strength of forty aircraft each, should continue to be organized into three squadrons, each containing twelve aircraft, plus a headquarters flight of four aircraft, or be organized into four squadrons. It appears, however, that no final decision was reached on this point by the end of the war.

Available information on the organization and chains of command of the Soviet air forces, as they existed in 1944-45, is relatively sparse. In general, the description given in Chapter 3 can be considered equally valid for the last year of the war. No reports which would contradict this assumption have been received.

Section IV: Strength and Distribution

Little information is available on the strength of the Soviet air forces in 1944 and 1945. That which we have indicates that the numerical strength continued to gain.¹¹ Different estimates indicate that the Soviets had approximately 13,000 aircraft committed in the field at the beginning of 1944 and an average of about 20,000 at any given time from autumn 1944 to the end of the war. In April of 1945 the Luftwaffe High Command gives a total figure of 17,000 Soviet aircraft in the field, broken down as follows: 8,000 fighters, 3,900 ground-attack aircraft, 5,000 bombers, and 800 transport and other types. The overall number of combat aircraft in the Soviet Union was estimated at 39,700; thus, a very large combat reserve was apparently available.

The same source indicates Soviet aircraft losses of 2,700 per month during the last few months of the war, of which 1,500 were lost at the front and 1,200 in the Zone of Interior. New deliveries were estimated at 3,700 aircraft per month, meaning a monthly increase in aircraft strength of 1,000.

Strength ratios at the front developed steadily in favor of the Soviets. For example, in the northern area in February 1944 the ratio of Soviet aircraft to German aircraft was still only approximately 5 or 6 to 1; by summer it increased, in areas of main effort,

to 10 to 1 and even more. By February of 1945 the ratio was estimated at 50 to 1 in favor of the Soviets!

Few reports are available concerning the distribution of Soviet air power, which was just as difficult for German field commanders to estimate as were Soviet strengths. Those reports we do have agree that the disposition of air power reflected the areas of main effort in ground operations.¹² Prior to each major Soviet offensive all Soviet airfields near the front became crowded with aircraft. By this time, however, the Luftwaffe was too weak to launch heavy attacks against the crowded fields.

Soviet air units always displaced in accordance with the main direction of the attack on the ground. Nevertheless, the air units usually had difficulty keeping up with the army's advance, as was the case during the Soviet summer offensive of 1944 against German Army Group Center.

At the end of September 1944 the movement of strong air forces to the Bulgarian area, the westward transfer of units committed against Hungary, and the arrival of new units to reinforce the already heavy concentration of air power north of the Beskid Mountains served to indicate an imminent Soviet offensive directed at the southeastern area. In a similar manner the concentration of Soviet air forces in any area could always be taken as an unmistakable indication of what was to come. The last Soviet concentration of air power, at the end of April 1945 (involving the Fourth Air Army, with 1,600 aircraft in Pomerania, the Sixteenth Air Army, with 2,600 aircraft in the Mark [Brandenburg] area and in Western Prussia, the Second Air Army, with 2,100 aircraft in Silesia, and another air army presumably transferred from Eastern Prussia to Upper Silesia) was an immediate prelude to the all-out offensive across the Oder River directed at Berlin.

Section V: Aircraft Types, Weapons, Other Equipment

German field commanders and other authorities¹³ are of the opinion that the Soviets, in 1944-45, continued the further development of tested aircraft models, their weapons, ammunition, and other items of technical equipment. The types used included the Lagg and Yak fighters, the IL-2 ground-attack plane, and the DB-3, DB-3F, PE-2, and B-25 bomber and reconnaissance planes.

In line with Soviet air power doctrines, main emphasis was on the development of fighter aircraft, and in this field the latest La-9* and Yak-9 fighters in evidence at the front were not only high-performance aircraft but in some respects superior to the German Focke-Wulf and Messerschmitt fighters.

Over-all technological developments, particularly in the construction of aircraft, provided evidence of the importance the Soviet Command attached to tactical air power and also revealed that in 1945 Soviet planning still put main emphasis on the development and production of tactical types. There was no evidence of any intention to increase appreciably the strategic air arm.

The Soviet Command held its latest aircraft models in reserve, making only small use of them at the front, until the old types committed were depleted or until they could commit the new types simultaneously in large numbers. Because of this method, eventually only new types were in action at the front.

By the end of 1942 the output of the Soviet aircraft industry exceeded losses at the front and in the Zone of Interior. The steadily increasing number of aircraft available and their continued improvement, as compared with the models used by the Germans, were indisputable ingredients of the mounting Soviet air superiority.

The development of the Soviet air forces from early 1944 to the end of the war can be summarized broadly as follows:

- 1) Retaining their existing organization, chains of command, and command and tactical principles, the Soviet air forces were committed almost exclusively in support of the Army in pronounced concentration in the areas of main effort on the ground and thereby contributed largely to the Soviet successes and the German defeat. Heavy and effective air attacks against the immediate rear of the German front lines increased from mid-1944 on. The scope of air operations in support of the Soviet Navy increased considerably towards the end of the war, but remained relatively insignificant in the overall

* Editor's Note: The La-9 was a further development of the La-5 and La-7 series. A single-engine, low-wing monoplane, it was introduced very late in the war.

picture.

2) The air situation changed slowly but continuously in favor of the Soviets. The steady improvement in the numerical strength and performance of the Soviet air forces, together with the steady decline of German air power, resulted in a crushing Soviet air superiority. Although this was already noticeable in 1944, by 1945 it became the dominant feature of the air war in Russia.

3) The now-decisive factors which enabled the Soviets to achieve air superiority had been present in previous years. They were:

a) The modernization and accelerated expansion of the Soviet air forces.

b) The increased and undisturbed production of aircraft, and the consequent rapid increase in the numbers of aircraft in the field.

c) The aggressive, ruthless, and unremitting commitment of air units in massed operations--in which they possessed a crushing numerical superiority--to support the Army in consonance with logically developed principles of command.

d) The improved combat experience, mounting confidence, and growing aggressiveness of flight personnel. Weaknesses still remained noticeable, however, in respect to training, tactics, and the capabilities of the personnel.

e) The decrease in properly planned German counter-air action due to the rapid decline in German operable strengths and general German shortages in manpower and fuel.

4) Contrary to Anglo-American air superiority in the West, Soviet air superiority in the East was due solely to numbers and therefore was restricted in time and area. In the execution of their missions German fighters, reconnaissance units, bombers and dive-bombers were, right up to the end of the war, able to maintain their own. This was due primarily to the abilities and better performances of German crews. Owing to the small operable strength of German air units, however, the opportunities to contest local Soviet air

superiority became increasingly rare.

A German field commander¹⁴ ably describes the situation as it existed towards the end of the war, with the remark that German airmen had the knowledge that they were inferior but had no feeling of inferiority.

5) Even in 1944-45 the Soviets made practically no strategic use of their air power.

6) The Soviet antiaircraft artillery remained a source of grave concern to German air forces. Towards the end of the war, however, the results achieved by Soviet antiaircraft artillery forces were relatively small in comparison with the results obtained by their air forces.

Section VI: The Reconnaissance Arm¹⁵

The importance attached by the Soviet Command to air reconnaissance in 1943 continued to increase in 1944-45. This became particularly evident when combat shifted to non-Russian territory and a substitute had to be found for the declining intelligence activities of partisans and agents.

On the basis of sources presently available, Soviet air reconnaissance can be assessed in broad outline as follows:¹⁶

Once the Soviet Command had realized the importance of systematically conducted air reconnaissance, they not only directed such operations in accordance with proper planning, but also took appropriate measures to build up their air reconnaissance arm. It was quite evident that, with some modifications, they had adopted the German patterns of reconnaissance. This was true, for example, in operational principles and in the organization of the reconnaissance forces into strategic and tactical air reconnaissance regiments. Thus, the strategic regiments were in some respects similar to the German strategic reconnaissance groups and the tactical regiments to the German tactical reconnaissance groups. A point in which the Soviet system differed from the German, however, was that the Soviets made liberal use of fighter and ground-attack air regiments for tactical and battle reconnaissance. This may have been the outcome

of the Soviet principle that every plane over the battlefield had a reconnaissance function in addition to its combat function.

Just as was the case in the overall conduct of air operations, the Soviets employed their air reconnaissance forces in concentration in support of the Army, and thus in the areas of main effort in ground operations. Whereas reconnaissance units in general remained relatively inactive, reconnaissance activities increased suddenly just prior to each major offensive. These took the form of thorough tactical and battle reconnaissance missions, with a gradual increase in the effort spent on large area reconnaissance against road, rail and airfield targets. Reconnaissance activities continued during the actual offensive and lessened only when the situation became relatively quiet in the sector involved. During the last months of the war, when large area reconnaissance continued, inferences usually could be drawn as to the direction of future Soviet attacks. The fact that Soviet air reconnaissance produced no exceptionally noticeable results for the German Army or Luftwaffe cannot be considered as proof that it was inadequate or unsuitably conducted. It can be assumed, nevertheless, that a very systematic program of air photo and target reconnaissance and of air artillery fire directing would have produced more noticeable effects.

It was difficult to obtain a clear picture of Soviet reconnaissance activities because of the lack of German superiority in fighters in the front areas and the impossibility of intercepting Soviet reconnaissance planes in the German rear owing to fuel shortages. One can, perhaps, assume that Soviet reconnaissance planes towards the end of the war found conditions in the German rear approximating those conditions which German reconnaissance units had found in the Soviet rear at the beginning of the campaign, so that the Soviet Command had a general knowledge of the measures taken by the Germans on land and at sea.

In the meanwhile, Soviet reconnaissance airmen had improved considerably in training, although they at no time achieved the high performances of German units in actual reconnaissance operations and frequently failed in air combat because of their poor gunnery.¹⁷ The ratio of newly trained to seasoned reconnaissance aircraft crews was approximately 1 to 1. Late in the war the replacements arriving at the front were adequately trained and were employed systematically in progressively difficult missions. The practice of giving air

reconnaissance personnel preferential treatment in the form of better pay, better rations, more leave and more decorations was maintained.

A. Organization, Chains of Command, Strengths

According to sources available at writing,¹⁸ the organization, chains of command, and strengths of the Soviet air reconnaissance forces in former years remained in force with only relatively unimportant changes.

The highest command authority within the reconnaissance forces was the Commander of Reconnaissance of the Soviet Army within the Central Administration of the Air Forces of the Soviet Army. He was also Chief, Reconnaissance Division, Main Administration of the Air Forces of the Soviet Army. This meant also that he was Chief Intelligence Officer, in which position he was able to exert an important influence on the employment of the air reconnaissance forces, something which his counterpart in the Luftwaffe was unable to do.

The organization into separate long-range and tactical regiments was retained, with composite air regiments becoming less frequent. Only long-range air reconnaissance regiments of the Central Administration of the Air Forces of the Soviet Army were employed in missions extending farther into the operational field. The original intention had been to employ one such long-range air reconnaissance regiment in the zone of each air army, but up to the end of the war one of these regiments had to cover the zone of each two air armies. This probably was due, at least in part, to two factors: 1) adequate intelligence coverage was secured from the widely ramified network of agents in Soviet territories and from partisan activities; 2) the Soviet methods of air warfare did not require strategic target data.

The organization of long-range air reconnaissance regiments was not based on a uniform wartime table of organization. As a rule these regiments contained three squadrons each, a squadron consisting of two flights of three planes and one flight of four planes. In addition, the regiment usually had two U-2 liaison planes. Some regiments, however, had an entirely different organization. Thus, it was known that the 47th Guards Long-Range Air Reconnaissance

Regiment, acknowledged as the best reconnaissance unit of the Air Forces of the Soviet Army, was organized as follows:

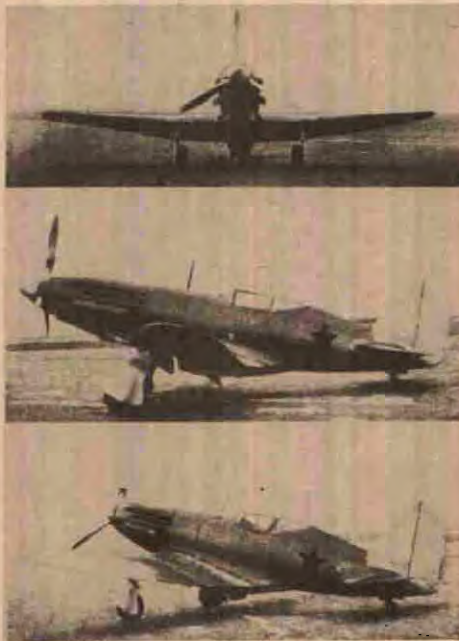
	Aircraft Types	Missions
1st Squadron	PE-2	Intermediate-range reconnaissance up to 210 miles.
2d Squadron	IL-4*	Night reconnaissance up to a range of 450 miles.
3d Squadron	PE-3 & TU-2	Long-range reconnaissance.
4th Squadron	PE-2	Reserve and training squadron.
5th Squadron	Li-2 ^f	Transportation and partisan supply missions.
6th Squadron	unknown	unknown

Some long-range air reconnaissance regiments were also identified organized into five squadrons (for example: two PE-2, two Boston III, and one Yak-9 squadrons) and others into four squadrons.

A long-range air reconnaissance regiment of three squadrons had a personnel strength of approximately 300 men, of whom 100 were flight personnel. Each squadron had ten 3-man crews. With the exception of radio-operator gunners all flight personnel were commissioned officers. The regiment had 110 technical, 35 weapons, 25 photographic, and 30 general purpose personnel. Actual strengths in 1944 as a rule were approximately 20 percent below authorized strengths, but in this respect a gradual improvement was noticeable.

* Editor's Note: This was an improved version of the DB-3F. See note above, p.189.

^f Editor's Note: This was an armed version of the PS-84 (DC-3).



The Russian Mig-3,
one-place fighter



A Soviet Li-2 transport