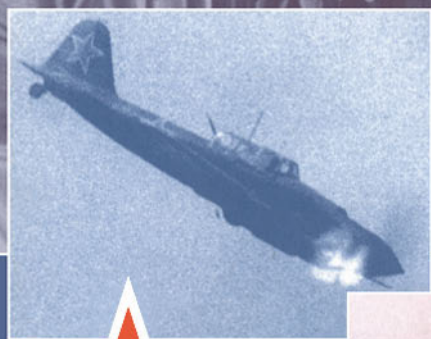
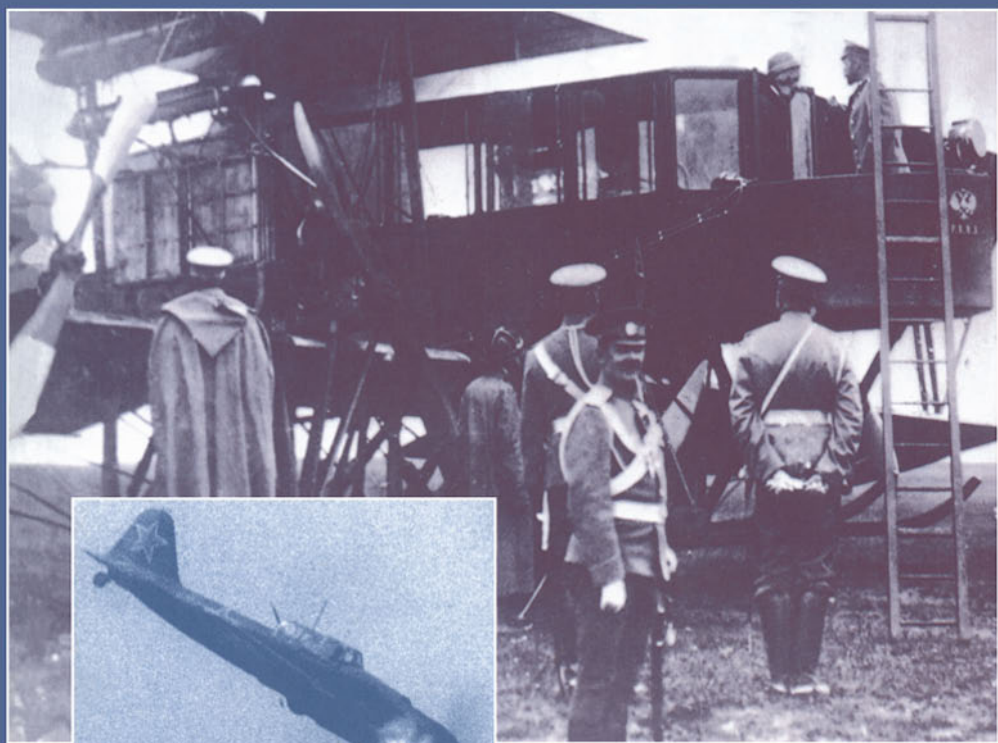


# Russian Aviation and Air Power in the Twentieth Century

Edited by  
**Robin Higham, John T. Greenwood  
and Von Hardesty**



CASS SERIES: STUDIES IN AIR POWER

(Series Editor: Sebastian Cox)

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IN THE TWENTIETH CENTURY

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## Series Editor's Preface

The startling collapse of the Soviet Union and the subsequent transformation in the political face of the former communist bloc have wrought changes in Russia which may yet prove as fundamental as those brought about by Lenin's seizure of power in 1917. As we move towards a new millennium, it is arguable that the rise of Soviet-style communism and the development of air power have been two of the most potent influences on the military and political history of the twentieth century. The extent to which the external relations of Soviet communism differed from those of the old-style Russian nationalism under the czars has been a source of fascination and debate for Western historians for many years, and the uncertain path that lies ahead seems likely to provide further opportunity to explore that theme.

The contributors to this book have profited from the partial lifting of the Iron Curtain and the subsequent increased access to original documents on the Soviet regime. The ending of the Cold War also allows us to view many of the events described here without the distorting prism of Cold War suspicion. However, many questions remain about the true nature of Russian power in the post-Cold War era. The Russian Air Force played a prominent, but far from universally successful, role in the recent fighting in Chechnya, and the potential for conflict along the southern periphery of the former Soviet empire remains high, while many of the purely military problems created for the Russian armed forces by changes in the geo-strategic situation remain unresolved.

The original intention of this work was to produce a revised and updated edition of *Soviet Aviation and Air Power* (1977), edited by Robin Higham and Jacob Kipp. However, as both the opening and the closing eras were Russian, and many of the contributors were new, it was decided to start afresh. The result is an entirely new book, which serves to expand on and to illuminate the scholarship of the 1977 volume. Chapters 6 and 7, on the aviation industry and the design bureaux respectively, draw to some extent on the chapter from

*Soviet Aviation* entitled 'Patterns in the Soviet Aircraft Industry', but contain much original material and bring the story up to date.

In examining the story of Russian air power from its beginnings in czarist Russia through to the last adventures of old-style Soviet communism in Afghanistan, this book makes an important contribution to our knowledge and understanding of the subject. At a time when former Warsaw Pact countries are entering NATO, and the future direction of Russia is uncertain, these scholarly essays bring a timely historical perspective that should help to illuminate current thinking.

SEBASTIAN COX

# Introduction

ROBIN HIGHAM, JOHN T. GREENWOOD  
AND VON HARDESTY

The story of Russian aviation, and by extension, aerospace, is nearly co-extensive with the twentieth century. Only the United States possesses an aeronautical tradition with such continuity and influence. Language, geography, and politics have conspired to make Russian achievements in this important sphere of technology remote and, until quite recently, inaccessible. Few books in English have been devoted to Russian and Soviet aviation.

Such a lacuna in English-language historical literature, of course, has prompted myth and distortion – often at the expense of the Russians. One enduring perception of Russian aviation has been to see the typical Russian airplane as simple, if rugged, in design; a species of technology nearly devoid of technological sophistication. For the more hostile observer such ‘primitivism’ mirrors a larger scientific and industrial backwardness. Co-existing with this stereotype is another perception, one fueled by the Cold War and Soviet triumphs in rocketry and space: a view of Russian aeronautical prowess as a threat, and something to fear in the nuclear age.

Stereotypes do possess a measure of reality. Russian approaches to aviation give substance to both perceptions. Russian-designed aircraft, especially in the mass production of military airplanes, have been simple and rugged, austerely equipped with instrumentation, and seemingly inattentive to creature comforts or pilot safety. Less apparent in these flying machines has been the Russian priority on effectiveness. For Russian designers this priority has meant the studied effort to design aircraft that perform well. These designers have fashioned aircraft that routinely fly in some of the most inhospitable environments in the world; accordingly, Russians would pioneer cold weather flying in the twentieth century.

Only with the collapse of the Soviet Union did Westerners acquire a context to understand more fully the historical weaknesses and strengths of Russian aviation. For the first time, both Russians and

Western historians could assess accurately Russian aeronautical achievements. It appeared that everything that had been said about Russian aviation was more or less true; Russia's aeronautical establishment embodied both the primitive and the most modern. Innovative engineering mixed with a traditional dependence on certain forms of Western technology. If viewed over the entire sweep of the century, Russians designed many modern aircraft, but for decades remained behind the West in the design of aero engines.

A new anthology on Russian aviation is timely, especially as we approach the end of the century and reflect on the impact of the airplane, civil and military. This story cannot be told without reference to the Russian/Soviet contributions. As an assessment, the present anthology represents a revised and augmented version of Robin Higham and Jacob Kipp, *Soviet Aviation and Air Power: A Historical View* (Boulder, CO: Westview Press, 1977). This original anthology provided extraordinary insights into Soviet aviation to English readers in 1977, at a time when little was known about the internal workings of the Soviet aeronautical establishment. Two decades passed. Now, in the post-Soviet period, the comprehensive coverage of the 1977 anthology has been revisited and updated in light of new archival materials. *Russian Aviation and Air Power* brings to the reader a comprehensive view of Russian aviation, from its genesis in the late czarist period to the present era. The approach is essentially chronological with a major emphasis on the evolution of military aviation. The contributions are diverse, however, with appropriate attention to civilian and institutional themes. When viewed in its entirety, Russian aviation possesses a certain continuity that transcends politics.

#### AN HISTORICAL OVERVIEW

Looking at Russian aviation and air power in the twentieth century provides an excellent opportunity to compare and contrast developments within both the geography of that vast Slavic state and the development of aviation elsewhere within and without a monolithic system.

Most people have probably forgotten that there were times when the Russians led the world. In the years immediately preceding the First World War Igor Sikorsky developed the largest heavier-than-air passenger plane and then converted it into a bomber. The latter's principal problem was that there were few suitable targets within range and so it was employed on reconnaissance. Later in the 1930s, when Stalin's Five-Year Plans were in place, the Soviets led the world in many classes of aircraft, only to fall out of the pattern during the

Spanish Civil War when the latest German models appeared. But the Soviets recovered during the Great Patriotic War of 1941–45, not so much in quality as in quantity and in the effective use of tactical air power.

Then the rules of the game changed again. The Soviet Union found itself naked and fearful of the might of United States grand-strategic nuclear air power. But the Slavs responded to the challenge and by the 1960s they had equipment and electronics equal to that of the West. The problem thereafter until the collapse of the USSR in 1991 was lack of combat experience. Equipment was tested vicariously in Eastern bloc satellites and especially in the air forces of clients and allies such as those in the Arab world. The West and its allies did not fully appreciate the sophistication of Soviet aircraft, electronics, and missiles until the Gorbachov era at the tail-end of Soviet power when invitations were extended to visit Soviet bases and fly aircraft such as the MiG-29.

The latter showed that one constant in Russia has been the relationship of aviation to the people combined with the demand that all aircraft be able to operate off unprepared grass strips. Thus the MiG-29 had doors over its engine intakes to keep out foreign matter until after the nosewheel left the ground and the engine could breathe full ram air instead of through louvers on top of the intakes.

Only after the Great Patriotic War of 1941–45 did the USSR begin really to develop Aeroflot (the umbrella civil aviation side) into a major airline system. Even so, the early jet airliners were variants of bombers rather than purpose-designed machines. But this was also less obviously so in the West, where the De Havilland Comet and the Douglas DC-8 broke new ground.

Russian design differed from that in the West in carrying the large turbo-prop to much greater extremes as a long-range reconnaissance bomber.

On the other hand, Russian aircraft design and manufacturing remained in the pre-Second World War mold of design bureaux with their own ability to produce prototypes separate from the factories which produced the separate models. And this system was not forced to change until 1997 when the perilous state of the Russian economy, now market-driven, forced Moscow to take drastic action to reduce the mix of bureaux and factories to perhaps two competitive establishments with which to face Boeing-McDonnell Douglas and Airbus-DASA-British Aerospace.

## IN THE BEGINNING

While the beginnings of aviation took place under the czarist regime, it was limited by finances, and natural and human resources in a country whose serious industrialization had only really accelerated after the Franco-Russian Alliance of 1894. During the 1914–17 war against Germany and Austria, the Russian military and naval air forces had been limited to what they could produce out of indigenous and imported designs as well as the small number of aircraft and engines that were imported through the White Sea ports of Murmansk and Archangel. Essentially, this meant that the Russian air forces were not as well equipped as those on the Western and Italian fronts where the stability of designs was constantly in flux as better aircraft, guns, and airmen were placed on an increasing number of airfields. The collapse of the czarist and then of the Kerensky regimes came at a time when in the West uniform fighting formations had been made possible by standardized machines, more reliable engines of higher horsepower, and better trained, disciplined and led front-line combat forces. Moreover, long-range bombing either by Zeppelins or by heavy bombers had become possible. But at the same time, the defenses had also reached wartime equilibrium after the long slope of rearmament instability had been ascended.

While on the Western and Italian fronts, and to a much lesser extent in the Middle East, the fighting had been concentrated over only a part of the trench lines, on the Eastern Front where the Russians faced both the Germans and the Austrians, the space was so vast that aircraft were spread in penny packets as the eyes of the armies, and little air-to-air combat developed. Thus by the time that the Red Armies took over for the Civil and Polish wars that followed Lenin's seizure of power, aviation was still a hope rather than an ancillary. And it remained so until 1922 and the end of the various campaigns for Soviet survival.

## THE INTERWAR YEARS

By contrast, in the West, the Treaty of Versailles blamed the Germans for starting the war in 1914 and their military activities were proscribed, forcing them to concentrate on the development of civil airlines and to refine their technology – to their ultimate advantage in 1935. Austria–Hungary disappeared as an empire and none of the successor states had the wherewithal to take even the parlous Austro-Hungarian industry's place. In Italy General Giulio Douhet and the new Fascist dictator Benito Mussolini made aviation independent and

in theory relied upon a deterrent bombing force to be launched from behind the bastion of the Alps. In Britain, the exigencies of wartime production had forced the amalgamation of the Royal Naval Air Service and the Royal Flying Corps into the Royal Air Force under an independent Air Ministry. In 1918 the RAF was the second largest air force in the world. Postwar it was shrunk to a colonial policing force by 1922, when the idea of a Home Defence grand-strategic deterrent bomber force emerged as a cheap way to avoid another killing ground on the continent of Europe. The number of private aircraft and engine firms declined rapidly to those in 'the Ring' to whom the very limited orders were passed out. No infrastructure was created to make grand strategy workable, for it was assumed that there would be no major war for at least ten years.

France emerged from the war with the largest air force in the world and a determination to keep Germany from ever being the aggressor again. Unfortunately, the great depression and eternal squabbles between the Army and the Navy on the one hand, the airmen seeking an independent force not tied in penny packets to the army for tactical purposes on the other, and the politicians in the middle who wanted, as always, to save money and who ultimately nationalized the aircraft industry, all combined to make the great French Air Force impotent by 1940.

And the United States, in spite of having been the home of the Wright brothers and controlled flight, had overconfidently assumed in 1917 that it would mass-produce aircraft at a time of fluid designs and trans-Atlantic time lags. Instead the nascent US Air Service in France flew foreign aircraft, which Billy Mitchell concentrated for tactical use at St Mihiel and the Meuse-Argonne. After the Great War the same patterns as in France and Britain pertained. The Army and the Air Service were split over grand-strategic and tactical uses of air power, while Mitchell's sinking of anchored battleships aroused the US Navy, whose William A. Moffett created the carrier-borne naval aviation that would prove so effective, unlike the RAF-shackled Fleet Air Arm, in the Great Pacific War of 1941-45.

In the West, aircraft design and production was in private hands after the First World War, with the exception that the government retained control over experimental and test facilities such as the Royal Aircraft Establishment at Farnborough, UK, and the National Advisory Committee for Aeronautics facilities at Langley Field, Virginia, USA.

In sharp contrast, in the new Soviet Union, where aviation was seen as a symbol of modernization similar to the dynamo, a central design establishment was created in Moscow for aerodynamics (airframes) and one for engines. The TsAGI (*Tsentral'nyi Aero-*

*gidrodinamicheskii Institut*) and the TsIAM (*Tsentral'nyi nauchnoissledovatel'skii institut aviamotorstroeniya*) became both training grounds and technical think-tanks with enormous influence on the development of Soviet designs. Outside of these two central establishments were the limited number of factories with their own design teams such as Polikarpov and Tupolev. Tupolev doubled also under his initials as ANT.

Since Russia had almost no roads and a skeletal railway system, much damaged by the civil wars of 1918–22, aviation quickly came into its own, and Aeroflot, when it came into being in 1932 was not only a unified airline, but controlled all non-military air activities from crop-spraying to mail-carrying. Moreover, unemployment in the cities was anathema to Soviet doctrine, so that aircraft factories like any other approved by the State had to be kept in production, though in 1922–28 90 per cent of all Russian aircraft were imports or of foreign design. This meant that in contrast to the hand-to-mouth existence of aircraft constructors in the free world until rearmament began in the mid-1930s, Soviet aircraft design bureaux and factories were constantly employed. And they were ahead of the West because Stalin's Five-Year Plans from 1928, a sound management technique, were designed to rearm the USSR against the outside imperialist enemies which both doctrine and Stalin's paranoia took to be just waiting to crush the nascent state as they had attempted to do in 1918–22.

Great strides were made in Russian aircraft design and production from 1928 onwards. By then not only had the designers got on their feet technically, so to speak, but they had the means to turn their sketches into reality. Thus on the one hand there were the few great Antonov bomber-paratroop designs and on the other the very nimble biplane fighters such as the Polikarpov I-15 and the I-16. The latter were combat tested in the Spanish Civil War from 1936 to 1938, until the German Me-109s appeared, the next generation of high-speed monoplanes.

Ironically, both the Germans and the Russians had developed their equipment and doctrinal ideas at the illicit German base at Lipetsk, while Junkers manufactured at Fili, near Moscow. These arrangements were canceled for anti-semitic reasons in 1933 after Hitler came to power. In the meantime, the cross-fertilization, which included Soviet officers visiting Germany, led to the development of sound doctrines for the employment of tactical air forces, having little influence in a country which could trade space for time and which could generally not reach any worthwhile grand-strategic targets. The Germans, on the other hand, sought to avoid another stalemate of the 1914–18 type and so opted for blitzkrieg, in which tactical aviation would play a very important part.

## THE ROAD TO WAR

Thus by the turning point of 1934, the beginning in most countries of rearmament instability, the Soviet Union was already launched on the second Five-Year Plan and was approaching the third.

Most developments in Russian aviation were now tied into diplomatic, military, political, economic, scientific and technological, medical, social and ideological patterns. Moreover, these tended both to reflect Soviet attitudes and to mirror the Russian background. Very large armed forces were being prepared as a hedge against the activities of Nazi Germany, not to mention France and Britain – Stalin was suspicious of many entities. At the same time domestically there was the purge of the higher leadership of the armed forces including the air force, an action which was also seen in other countries' retiring of superannuated senior officers.

In addition to the war in Spain, from which the lessons were being absorbed throughout 1939–42, the armed forces of the USSR were engaged in the Nomohan and Khalkin Gol incidental wars (1937–38) with Japan in the Far East, in which the latter were defeated, and the Winter War with Finland (1939–40). In the Far East the Soviets dominated in spirit, technique, and equipment. But in the war against Finland, the Russians were held up by much smaller Finnish forces, in part because the purges had placed new commanders in the field who did not yet have the necessary doctrine, experience, or trained troops to win a quick victory in bitter weather. Success came both from sheer numbers and from the fact that the Finns were cut off from the West. Ironically, the Finns later allied with the Germans as they both had a common enemy to the east.

In the meantime the Soviets had watched the events at Munich in September 1938 with interest and alarm. France and Britain, which might have called Hitler's bluff if they had combined their strength with that of the Czechs, forced the latter to give way owing to Britain's weakness in the air and the aversion to another great war on the part of both themselves and their Gallic allies, not to mention the adhesion of Italy to the Axis.

Hitler's non-aggression pact of the summer of 1939 gave Stalin breathing room, and shortly part of Poland once more. The brief September 1939 campaign in Poland made it very clear that the Germans had perfected the blitzkrieg they had been contemplating in Russia in the 1920s. Stalin barely had time to seize his share of Poland as the *Luftwaffe* demonstrated its use as advanced scouts and mobile field artillery as well as showing how to destroy an enemy air force on the ground.

And if Stalin needed to have the handwriting on the wall pointed

out more clearly, the blitzkrieg which overwhelmed the Low Countries and France between 10 May and 20 June 1940 illuminated it clearly.

#### THE GREAT PATRIOTIC WAR, 1941-45

Stalin was no fool, but his innately suspicious nature was almost his undoing. In spite of warnings from the British delivered by their socialist Labour ambassador in Moscow as to the German D-Day for Barbarossa, the assault on the Soviet Union, the Russian dictator refused to believe this intelligence. Thus just before dawn on 22 June 1941 Soviet forces were surprised by the German assault which very quickly wiped out some 1,500 aircraft on Russian airfields in Poland and the western USSR. These losses, considered staggering for many years, compare not unfavourably with the roughly 1,000 RAF aircraft lost in the month of the 1940 campaign in France and to the complete destruction at the same time of the French Air Force. Moreover, the French lost their entire aircraft industry in the German bloodsucking which followed.

What saved the USSR were a number of important developments. First, much of the equipment destroyed was older while the aircrews generally survived to fight another day. Second, the new commanders, blooded in Spain, Finland, and the Far East survived to form the backbone of the new high command and the leadership of the massive air armies which the USSR would soon field. Third, a massive effort was already underway when the war started to move all Soviet aircraft and other munitions factories from the Ukraine and the other areas in the west, to east of the Urals, where they would be safe from almost anything but very long-range German air attacks or from a panzer breakthrough. Britain had had a funk line from the Wash to Bristol, but placing factories west of this was vitiated when the Germans conquered Norway and Denmark in April 1940, as well as France and the Low Countries shortly thereafter. Moreover, the British had a sophisticated air-defence system which repelled the daylight assault in the summer of 1940 and was relieved from the nighttime blitz by Hitler's mobilization of all forces for the attack upon Russia. The United States was beyond all but U-boat range and that was limited to the Atlantic and the Caribbean coasts. Thus, as had been done in 1812 in response to Napoleon's invasion, the Russians once again heeded their history and traded space for time. By the winter of 1941-42 the weather was once more upon their side.

In contrast with the Western Desert, the North African and Italian campaigns, and the invasions of France in 1944, the war on the steppes

was fought by massive armies across vast spaces. Whereas the Western Desert was over 1,200 miles in length, geography limited the armies to a narrow coastal strip. In contrast, on the Eastern Front it was some 1,350 miles broad from Leningrad to the Caucasus and the armies were engaged face-to-face all along that line.

At first the Red Air Force was at a disadvantage in terms of equipment and experience. But quite soon that changed as the Germans found themselves in the same position as the Russians in Spain – the opponent had newer and more up-to-date equipment and plenty of resources. Moreover, the Soviets were fighting over their own land and they knew well that Russia was still very much a workers' and peasants' society. The Red Air Force was, therefore, a tactical air force there to support the infantry, armor and artillery. There was never the dichotomy of doctrine or purpose that plagued the British and American air forces, divided as they were in Europe between round-the-clock bombing of Germany, tactical support of the ground forces, and the Battle of the Atlantic with all its ramifications. (The Soviet naval air force was limited to minor activities over the Black Sea, the Sea of Azov and the White Sea, which hurt it postwar.)

This singleness of purpose on the Eastern Front meant that the Russians were able to concentrate small aircrews in single and twin-engined tactical air armies flying simple, easily producible aircraft such as the prime ground-attack machine, the Shturmovik, which squadrons had made into a two-seater. In these short-range support missions, the Red airmen and women rarely flew above 3,000 feet.

And where in the West wings were the standard large formation of perhaps at the most 200 aircraft, over the steppes air armies of 4,000 frontline aircraft were committed against the increasingly decimated *Luftwaffe*, especially after its transport fleet was ruined in supporting von Paulus' army trapped in shattered Stalingrad (now Volgograd) in the winter of 1942–43. Yet the Red Air Force never went after enemy airfields and aircraft on the ground for the doctrine of air superiority was not an absolute, the space being so great that that ultimate objective could not have been held for more than a few minutes. Nor was air superiority a legacy of the Eastern Front in the previous war.

By the time that wartime equilibrium was reached for the Red Air Force late in 1942, it had become the dominant flying weapon over the Eastern Front at the same time as the RAF and the USAAF attacks in the West were just beginning to demolish German cities such as Hamburg, well within their range.

The massive Soviet air armies also contrasted sharply with the forces deployed in the concurrent Great Pacific War. There, however, the space was mostly water and so the key points were islands and the offensive forces of the American judo blitzkrieg were carriers and

amphibious forces striking at the pinpoint fortresses and airfields held by the Japanese.

#### THE TECHNICAL REVOLUTION

In the meantime, the Soviet Union had been much less affected than the West by the multiple revolutions in aviation of the years 1934–45 which had such a great impact on the invisible infrastructure.

The Soviets did adopt the technical revolution, for they read Western literature, and that compelled them also to go over to all-metal construction. But they were far behind in electronics, airfields, jet aircraft, atomic bombs and computers. An early impact of this in Russia was the licensed production of the Douglas DC-3 transport which started just before the war, the arrival of Lend-Lease aircraft from the United States and Britain; and the landing in the USSR in 1944 of several new American B-29 Superfortresses, which were interned in the Far East and copied. On the other hand, at the end of the war in 1945 when the *Luftwaffe* and the RAF had operational jet fighters and the Italians and USAF (United States Air Force) were testing their first ones, the Russians had none. However, they made rapid progress through a combination of capturing German scientists and designers of both aeroplanes and rockets, together with (as an ally) obtaining new Rolls-Royce engines from Britain. Thus the Russians were able to make up lost ground very rapidly, so that by the time of the Korean War five years later they were able to test the new MiG-15 in combat and shortly thereafter to supply the Arabs with MiGs and Sukhois for their battles against the Israeli Air Force.

More significant was the way in which air transport had emerged from the 1939–45 War. It had come of age. The twin-engined DC-3s and Lockheed 14s and 18s had been replaced with four-engined, primarily US-built transports such as the Douglas DC-4 Skymaster and the Lockheed 049 Constellation, both capable of spanning the oceans and making use of the many airports which had been built as wartime air bases. Both the recivilianized airlines and rival newcomers entered a boom phase thanks on the one hand to wartime navigational developments from sextant to Loran, the long-range radar-fixing system, and on the other to the masses of well-trained and experienced aircrew from which they could choose the best.

In contrast to the United States, the Soviet Union did not use air transport lavishly during the war. It was limited to the DC-3 (Li-2) and C-47s. It was not until 1944 that the Ilyushin design team began work on the Il-12, which first flew in 1946 and soon went into mass production for Aeroflot, which had to have aircraft that could land on

grass. The Il-12 was the first Soviet aircraft with a tricycle undercarriage and the first with full-feathering propellers. Rugged structure and simplicity of manufacture were qualities demanded in contrast to the West's need for a lighter more efficient aircraft. The Russians who had neglected four-engined heavy bomber design during the war had a piece of luck in 1944 when three USAF B-29s landed out of fuel near Vladivostok. Accustomed to studying foreign examples, the Soviets at once took the planes apart and analysed them acutely. From this came the Tupolev copy, the Tu-4 and its passenger counterpart, the Tu-70, which did not emerge as the twin of the Boeing B-29 derivative Stratocruiser.

Russian design bureaux and their attached factories for the next quarter-century followed the Western practice also of developing both bombers and transports from the same basic design work. Thus, just as the Boeing prototype Model 367-80 became the basis for both the 707 airliners and the KC-135 tankers, and the Vickers Valiant and the unfinished V-1000 transport followed the same pattern, so a string of Tupolev and Ilyushin designs had commonalities. This was especially evident in the 1950s when the transport versions still carried the glassed bomber nose compartment as in the Tu-16 and its civilian counterpart, the Tu-104, which first appeared in the West at London's Heathrow in 1956. Contemporaneously, when Bristol in the UK was developing the Britannia four-engined turbo-prop airliner, which was eventually produced in a maritime reconnaissance version for the Canadians, the Russians went ahead to the very long-range turbo-prop Bear (Tu-20) of 1955 with its civil counterpart the Tu-114, and to the all-jet Tu-16 derived from the Tu-104, which appeared in the maritime role. It would take the Royal Air Force into the 1960s to derive the Nimrod from the Comet airliner.

Compared with the 9,000 MiG-17 jet fighters produced, the number of Tu-104s was a modest 200. However, it was estimated that some 2,000 Tu-16s were built, but only 300 Tu-20s. These figures compare very favourably with 760 B-52s, 1,832 Boeing 727s and something over 5,000 F-4s manufactured in the USA.

Soviet civil aircraft development reached a plateau with the 17 Tu-144s of the 1960s (one of which crashed at the Paris Air Show in 1973), which bore a close resemblance to the 13 Anglo-French Concorde supersonic transports (SST), conceived in 1955 and operational in 1976. In the meantime plateau theory hit the United States. Variable geometry SST had been canceled by 1969 owing to political, economic, and social-ideological forces. Whereas the Concorde has been in visible North Atlantic service with Air France and British Airways since 1976, Aeroflot operated the Tu-144s only on freight service within the USSR and all had been withdrawn by the 1990s. Ironically,

one was taken out of mothballs in 1996 to serve as a test bed for joint Russo-American tests for a next-generation SST.

Supersonic military aircraft, of course, continued to be evolved in competition with the West during the Cold War, but the development times lengthened as did time in production and service.

#### THE COLD WAR

Immediately after the war the Soviets made rapid progress in jet fighters and were able to deploy the MiG-15 and later the MiG-17 in combat over North Korea from 1950 to 1953, against USAF F-86 and then F-100 sweptwing fighters. Soviet fighters proved to be rugged, but they were outfought by better trained and more experienced American pilots. Thereafter, the Russians gained their combat experience vicariously against the Israeli Air Force thanks to the efforts of their Arab allies, but with serious losses which had to be replaced. Nevertheless, this foreign aid helped factories in the Soviet Union dispose of the quotas of aircraft which they produced. India became another client who tested MiGs and Sukhois against Pakistan's American and British-built machines, both sides finding that older aircraft were more reliable and useful because they could be kept serviceable. At the same time, China, always lacking an aircraft industry, was a market for both finished and license-built machines. Overall, the pattern was very similar to that in the free world where some aircraft were sold from home-manufactured stocks and others were licensed for off-shore manufacture or for shares in the work.

The influence of the Cold War on Soviet aviation has to be seen against the background of Russian suspicions of outsiders that went back at least to the struggles over Russification or Westernization started by Peter the Great at the end of the seventeenth century. This was compounded by the Communist ideology that expressed itself in the Comintern fear of imperialist powers after 1917, in itself simply a wider-world view of the Great Game that had been perceived all along the southern frontier from the Black Sea east. Then, too, there was the experience of the Second World War in which Leningrad, Moscow, Stalingrad, and Sevastopol had been besieged and the economy devastated with great loss of life, while leaving many surviving veterans of both sexes. Moreover, many of these in the victorious armies which had reached Berlin had seen the destruction wrought by the Allied Combined Bomber Offensive. All of these factors made the Kremlin very apprehensive, especially when the man who made the Iron curtain speech in Fulton, Missouri, was the same British leader, Winston Churchill, who had urged on the attack on the Reds in 1918 in alliance with the White armies.

Thus it should not have been at all surprising that the Russians put great effort into various forms of home defense from accelerated development of the German V-2 rocket into a ballistic missile system, beefed up air defenses from guns and radar to fighters, and a civil defense organization with more shelters than had been built in the Great Patriotic War. Western instigation of the North Atlantic Treaty Organization (NATO), public pronouncements and display of weapons and doctrines aimed solely at the USSR simply spurred efforts rather than leading to peaceful co-existence. The doctrine of containment of the USSR and its Warsaw Pact allies simply revived the Russian desire for warm-water adventures. At first these were limited to contact in the Atlantic and the Mediterranean, but eventually reached the Indian Ocean.

The later 1950s saw the Soviets making rapid strides in many fields. The Navy was accepted, after its dismal showing in the Great Patriotic War. Thus it was modernized in a long process that brought it VTOL (vertical takeoff and landing) aircraft-carriers in the 1970s and ocean-going full carriers just in time for the collapse of the nation. Sputnik, the first satellite, was put in orbit in 1957, and thereafter the Soviets made great progress with IRBMs (intermediate range ballistic missiles) and then ICBMs (intercontinental ballistic missiles) causing the USA and its allies to counter first with Thor IRBMs in Britain and Turkey and then with Polaris submarine-launched IRBMs, and finally with the major ICBMs culminating in the demonstration of American scientific and technical prowess with the landing of a man on the moon in 1969. While the Russians had been the first into space and would continue to place people in orbit, they never achieved a moon flight. In the end, of course, after the collapse of the Soviet Union and the destruction of nuclear missiles, the former enemies joined together to man Soyuz space stations.

In the meantime, the nuclear deterrent strategy had proved to be the unusable weapon because of mutually assured destruction (MAD) capabilities and a lessening interest in war as mutual fears were eroded by better communications and tourism, as well as by the achievement of a balance of power by the opening of relations between China and the USA in 1972 in the wake of long Sino-Russian hostilities that stretched back into the nineteenth century.

The weakening of Soviet suspicions became evident not only in the permission for Western airlines such as PanAm and BEA to fly to Moscow, but the 1960s opening up of the air routes across Russia to BOAC and Japan Air Lines, as the new longer-ranged four-engined jets allowed the airlines to make non-stop Moscow-Tokyo and Moscow-New York flights.

## RUSSIAN AVIATION IN MAHANIAN TERMS

Another way of assessing Russian air power is to look at the country in Mahanic terms – geographic position, physical conformation, extent of territory, number of population, national character, and character of the government.

Positioned across the top of the Eurasian continent, Russia is a vast country that in the twentieth century has stretched from the middle of Poland eastward to Alaska, a distance of roughly 3,850 miles. Except for the great rivers in western Russia beyond the Urals, transportation for heavy commodities and raw materials was almost non-existent outside of the thin rail network. Yet the country was well supplied with raw materials, even having large oil-fields with which to fuel aviation, while there was hydroelectricity for power grids, factories, and for smelting aluminum. Much of the land, moreover, was very suitable for aviation; only in the few mountainous areas and in the forest was it necessary to carve out airfields. All aircraft were fitted either to land on water or to operate off grass, so the continual shortage of concreting equipment was not a disadvantage. Equally importantly, the vast distances within the country made aviation very time-effective, the miles from Moscow being such that very long-range flights could be undertaken without leaving the USSR, and climatic variations meant that aircraft, equipment, and crews could be tested in everything from hot and high, to sea level in sub-zero conditions. Only the United States enjoyed a similar advantage.

As time passed and pilots were no longer either first-class navigators or certified maintenance personnel, then aircraft had to be tested under all conditions and not be expected to be modified by pilots *en route*. For the British, then, this meant taking aircraft to Canada for winter trials in Manitoba and to Kenya for hot and high trials. Moreover, even in the limited competition between British and foreign-built aircraft, the race was primarily with the United States until the 1970s when the French challenges from the Dassault Mirage and the Airbus Industries airliners came to the fore. And even after 1945 when the British were able to operate the internal airline in Germany, and British European Airways was pushing out the range of its services as newer aircraft such as the Comet IV became available to it, the opportunities for airlines in Europe was limited. Though as the speed of airliners rose, their time-savings over the excellent railway network grew. However, in the 1980s that began to be reversed with the coming of the French TGV (high-speed train) and the following development of a high-speed rail network in Europe (and in Japan). In the Soviet Union and Russia, however, the advantage lay with the air services because trains in Russia have never been known for their high

speed, nor, with so much capital being expended on defense, were funds available for the construction of high-speed rail lines, all hope for which flew out the window with the collapse of the USSR in 1991.

As to people, Russia had a growing population which made plenty of labour available, though the lateness of the industrialization, the costs of the Great War and of the subsequent Bolshevik activities, meant that it was a long time before recovery to 1913 levels was achieved. The Five-Year Plans did mobilize and train labour, and the Great Patriotic War demonstrated that peasants could be trained along with urban workers to produce large numbers of effective aircraft, and that men and women could be mobilized to man them. The legacies of war and the philosophy of full employment meant that there was a sufficient workforce which was probably more capable than anti-Soviet Western sources wished to admit, in part also because the known working conditions were not those in Western countries. Certainly, the average Russian or Soviet urban or peasant worker was patriotic, as demonstrated by their will and determination to fight for the Motherland throughout 1941–45, and their traditional fear of unknown outsiders.

The tourism made possible by aviation, in much of the rest of the world, which saw a million passengers a year crossing the North Atlantic in the early 1960s and climbing upward ever since, was not evident in the Soviet Union. Breaking down mental blocks by tourism has been a relatively recent development. On the other hand, for the internal development of aviation, the general mechanization of Russia, especially in the Second World War, created a sufficient supply of mechanics. How efficient they have been has been shrouded in some mystery since unlike in the West, accident reports have not been readily accessible. It can also be noted that the West for its own reasons has tended constantly to ignore or discredit Russian technical prowess as can be seen in the surprise with which close-up examination of the MiG-29 revealed the excellence of its systems as well as its superior flying ability.

Perhaps the critical question in such a Mahanian examination has to be the nature of the government.

At the time of the Wright brothers' flight, Russia was an autocracy upon which the Revolution of 1905 forced a measure of middle-class democracy through the newly elected Duma or parliament. However, the problems to be tackled were so great even without a war, that it was not surprising that the system collapsed in 1917 and had to be rebuilt by the urban-minded Soviets as a nineteenth-century industrial entity. In spite of purges after 1917 and in the late 1930s, as well as emigration, the Soviets made the economic engine run.

The Soviet government was a monolith imposed upon many

different nationalities speaking a host of different languages. Power and decision making resided in Moscow, with decisions influenced by the Communist Party members from various regions. Very like the Roman Catholic Church, it was essentially a top-down hierarchy. Thus, until the collapse after the unsuccessful Afghan War (1979–90), the military, especially the Army and its affiliate the Red Air Force, exercised a great deal of control over the budget and kept a very large force off the labor market, while also providing a solid consumer for aircraft production. After the collapse, and the split into the Commonwealth of Independent States (the CIS), as Oliver Wendell Holmes would say, the wonderful one-horse shay fell apart.

As a result, the armed forces have been starved of money, have had to discharge millions, and are still faced with the near impossibility of continuing any defense projects let alone procuring new types. The Su-37 variable-thrust fighter may have stolen the show at Farnborough in 1996, but the likelihood of orders is slight. In addition, an old trend has re-emerged. The civilian side of the Russian aircraft industry has turned to the West for engines and electronics in the hope not only of making their much cheaper aircraft saleable, but to make them also maintainable by the standards of world airlines.

At the same time, the privatization move that has been driving other governments to divest themselves of their state-run enterprises so as to make them self-supporting, has also hit the CIS. Aeroflot was broken up and privatized, and by sometime in 1997 it was expected that the main Moscow airport, Domodedovo, would also be run by a civilian corporation, perhaps even a Western one.

#### CONCLUSION

Although Russia and then the Soviet Union were by choice isolated societies with great suspicions of Westerners, the patterns of aviation development within the country have mirrored those outside. In part this was inevitable not only because in tackling common problems in the air a certain similarity of solutions was bound to occur, but also because the Russians both read foreign technical journals, saw foreign products at air shows and elsewhere, and received periodic injections of Western developments from the 1914 war through the Great Patriotic War and its aftermath, especially in jet technology. Moreover, periodically immigrants, willing or otherwise, have been attracted to Russia to supply expertise, as has been happening again after the collapse of the USSR.

Given the experience of France after 1944, it would be a mistake to believe that the Russians will not once again become important players

challenging the Europeans, the Americans, the Japanese, the Chinese, and perhaps even the Indonesians in aviation.

#### THE CHAPTERS

The pieces that follow vary in length for a reason. The chapters on the early days by Von Hardesty, on the interwar years by Reina Pennington, on aviation and the transformation of combined-arms warfare 1941–45, by Tom Allison and Von Hardesty, on naval aviation by Christopher C. Lovett, on the defense of Russian aerospace by Dennis J. Marshall-Hasdell, and on air combat on the periphery by Mark A. O'Neill all conform to the original lengths suggested. But in the course of the development of the work, it became clear that four subjects required more space.

These lengthier chapters did not lend themselves to being divided easily into chronological sections. Thus John T. Greenwood's chapter on the Great Patriotic War (Chapter 3), and his piece on the aviation industry (Chapter 6), and on the designers (Chapter 7), together with David R. Jones' coverage of Aeroflot (Chapter 10) are of a greater length.

Apart from that irregularity, we hope the reader will find this work both informative and useful, offering as it does a look at one of the world's most potent air forces as well as the life history of an establishment.

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# Early Flight in Russia

VON HARDESTY

For Russia, with its 11 time zones, aviation has been a dynamic instrument to provide for national defense and to forge social cohesion. Under the Soviets, the airplane occupied an exalted place at the very center of public life, as a metaphor for progress and an enduring measure of national achievement. Whether flying over the North Pole in the 1930s or building Aeroflot, the largest airline in the world, Russians have endeavored to be at the cutting edge of aeronautics. Once human flight acquired a trajectory into outer space, the Soviet Union again allocated enormous human energy and economic resources in the ceaseless quest to maintain parity with the West.

One of the most striking features of Russian aviation in the twentieth century has been its separateness, its evolution for decades as a parallel universe in the realm of aeronautics. The fateful intersection of war and revolution between 1914 and 1917 assured that Russia, for most of the century, would exist as a garrison state. Aviation, as with other critical sectors of the economy, embraced a goal of self-sufficiency. Ideological commitments only reinforced this estrangement from the outside world. Over time, the Russian approach to aviation acquired a peculiar style of its own, a blend of Western technology and indigenous engineering.

At the very dawn of the air age, however, Russia enjoyed close ties with the wider European aeronautical world, then experiencing rapid and dramatic growth. This first incarnation of Russia's aviation community in the late czarist period, if small, possessed great vitality. Russian air enthusiasts were an ubiquitous presence in Europe. They flew in international air races, made substantial theoretical contributions to the new field of aerodynamics, pioneered new aircraft designs, and even leaped into the high-risk world of capital investment to build a Russian aviation industry. Aviation proponents enjoyed easy access to the highest echelons of the Russian government. The czarist regime, despite subsequent distortions by Soviet propagandists, actively supported the development of aeronautics in the period 1909-14. Aero

clubs spread rapidly across Russia, reflecting a blend of active government patronage and public volunteerism. Aviation plants quickly emerged in major cities such as St Petersburg and Moscow to supply a growing market for aircraft and spare parts. Many Russians traveled to western Europe to train as pilots and to purchase aircraft. Military links were established as early as 1910, when the Imperial Russian Navy purchased an Antoinette airplane for testing at Sevastopol. The following year the Russian Army purchased a French Bleriot monoplane to inaugurate army aviation training at Gatchina, near St Petersburg.

This pattern of natural growth for Russian aviation was abruptly shattered with the advent of the Great War in 1914. For a brief interlude, Russia sustained the established ties with French military aviation; as long as Russia remained active in the war effort there was a steady, if uneven stream of logistical support for the tiny Imperial Russian Air Force. But the war brought military defeat and social upheaval. The year 1917 unleashed two revolutions – the first in March toppled the Romanov dynasty, and the second in November saw the Bolsheviks seize power. With the Bolshevik triumph in the long struggle for control of Russia's destiny, Russian aviation found itself in a profoundly altered context – one of technological isolation and strict party control.

#### AVIATION VIEWED THROUGH THE SOVIET PRISM

Any historical reconstruction of early flight in Russia must begin with a consideration of Soviet historiography. For over seven decades the Soviet Union embraced an official history of aviation that became normative for both the public and historians. Accordingly, Soviet histories viewed the year 1917 as more than a political faultline; it represented a technological watershed, the borderland between the primitive and the modern. The czarist era, by definition, reflected a backward stage of history, an era that stood in sharp contrast to the future embodied in the Bolshevik revolution. All that preceded 1917 – even the most impressive Russian national achievements in aviation – fell victim to this script of history.

Accordingly, Igor Sikorsky, a Russian aviation pioneer of world stature, slipped into a memory hole, his name being expunged from many history texts for decades and his creative work as an aircraft designer studiously ignored. Sikorsky had made the fateful decision to reject Bolshevism and emigrate to the West where he promptly inaugurated a second illustrious career. By contrast, Nicholas Ye. Zhukovskiy, the famed Russian aerodynamicist, cast his lot with the

Bolsheviks in 1918, a decision that in the near term earned him the active patronage of Lenin and ultimately the title of 'Father of Soviet Aviation'.

Once in power, the Soviets engaged in a deliberate campaign to downplay the pre-1917 Russian aeronautical accomplishments. The process of subordinating the history of aviation technology to the ideological imperatives of the Soviet state meant more than seeking out those who were sympathetic to the revolutionary cause. The Soviets soon engaged in a systematic program of distortion, to fashion for political purposes a sequence of mythic technical achievements. Under Stalin the quest to identify the Soviet regime with modern technology, in particular aviation, meant legitimacy at home and respect abroad.

When the Soviets sought out the useful past, they took a special interest in Alexander Mozhaiskiy, an obscure Russian naval officer who had experimented with a steam-powered flying machine in the 1880s. Mozhaiskiy became a convenient rival in Soviet historical literature to the Wrights, a way to demonstrate that Russia had been the birthplace of one of the most important inventions in modern times. Few details of Mozhaiskiy's life survive to allow for a nuanced retelling of his life and career. The outline of his career as an engineer and aircraft designer, however, is known. Mozhaiskiy first built a series of flying models, to study how a flying machine might be designed. He then constructed a full-scale monoplane, which he equipped with a steam engine. Mozhaiskiy's attempts to fly the monoplane proved unworkable: he catapulted his machine down a ramp in the expectation that his steam powerplant would be sufficient to propel it skyward. The excessive weight of the engine precluded any sustained powered flight. While Mozhaiskiy's design did not lack sophistication, he fell short, as many others had, in the effort to fashion a flying machine that could be self-propelled and possess a workable system of flight controls.

Mozhaiskiy's experiments were largely unknown in pre-revolutionary Russia, even among air enthusiasts. However, during the Soviet era official history texts rescued Mozhaiskiy from the ash heap of history and heralded him as a precursor of the Wrights, a claim which amazed westerners and only reinforced the sense of separation between Russian aviation and the outside world. Sadly for Mozhaiskiy, his true accomplishments were obscured by the excesses of Soviet propaganda. It would take decades before his contribution to aviation would receive proper coverage. One can note that the residual strength of this Soviet-era myth endured even into the late Soviet period: the Central House of Aviation (*Tsentrálny dom aviatsii*) in Moscow showcased Mozhaiskiy as the 'designer of the world's first airplane' as late as the 1980s, although the aviation community as a

whole ignored this embarrassing episode in Soviet historiography under Stalin.

By 1989, however, the Russian aeronautical community displayed a new appreciation for the Russian aeronautical accomplishments in the late czarist period. That year a special exhibition was held in Moscow to celebrate the centennial of Igor Sikorsky's birth. This extraordinary exhibition, based in part on resources from the Smithsonian Institution's National Air and Space Museum, provided the first complete historical portrayal in Russia of Sikorsky's life and contributions. Russian historians openly embraced Sikorsky as a national hero, as part of a concerted effort to rehabilitate Sikorsky and, by extension, recast Russian aviation history anew.

#### THE GOLDEN AGE OF RUSSIAN AVIATION

The late czarist era constitutes a distinct phase in Russian aviation history, indeed a golden age, a reminder that the story of aviation in Russia is not co-extensive with the Soviet era. Russian participation in the saga of human flight goes back to the eighteenth century when Mikhail V. Lomonosov, the founder of the Imperial Russian Academy of Sciences, speculated on aeronautical theory and flying machines. Lomonosov became Russia's Leonardo da Vinci, a visionary for a field of technology yet to be born. A century later, another Russian scientist named Dmitri I. Mendeleev became a well-known balloonist. Mendeleev is best known today as the compiler of the periodic table of atomic weights, but his public persona as an aeronaut in the nineteenth century did much to promote airmindedness in Russia. One can trace the institutional basis for Russian aeronautics to Dmitri A. Miliutin, who, as War Minister under Alexander II (ruled 1856–81), took a keen interest in the military uses of balloons. Miliutin's foresight bore fruit with the establishment in 1885 of a special army 'flying school' for balloonists at Volkov Field near St Petersburg. By the time of the Russo-Japanese War (1904–05), the Russian Army fielded its own balloon battalion to conduct aerial reconnaissance. A decade later, Russia's lighter-than-air contingent included a total of 13 dirigibles.

The Wright brothers obtained a Russian patent for their flying machine in 1909. The Wright patent coincided with a burgeoning Russian interest in the new heavier-than-air technology. The first public demonstration of a Wright airplane took place in St Petersburg that same year, an event which included an inspection of the Wright flying machine by Sergei Witte, the famed builder of the Trans-Siberian railroad. Two of Russia's best known aviators – N. Ye. Popov

and M. N. Yefimov – subsequently flew Wright aircraft in a series of air shows in 1910.

Russian interest in the Wrights, if intense, proved to be shortlived. Between 1910 and 1914 Russian aviation enthusiasts, civil and military, shifted their attention to France, then the epicenter of aviation in Europe. The names Farman, Bleriot, and Voisin quickly became the exemplars of modern aviation in the minds of most Russians. M. N. Yefimov became the first Russian to fly a Bleriot. In 1910, citizens of St Petersburg looked up in awe as G. Piotrovskiy in a Bleriot circled the Winter Palace and St Isaac's Cathedral, ending his trek over the imperial capital with a direct flight to the island naval base at Kronstadt. Ye. V. Rudnev, another prominent Russian aviator, made one breathtaking non-stop flight from St Petersburg to Gatchina – at the time a dramatic long-distance flight of 25 miles. The hub for flying was Komendantskiy field, located in the forest district north of St Petersburg.

At the core of early Russian aviation was the Imperial All-Russian Aero Club (IRAC). Founded in January 1908, the IRAC provided a powerful vehicle to organize and promote airmindedness in Russia. Being new and linked to western European aviation centers, the IRAC displayed a keen interest in heavier-than-air technology. As the IRAC set up a national network of flying clubs across the Russian Empire the airplane became the major focus. This new emphasis ran counter to the traditional Russian interest in balloons and more recently dirigibles. For a short period of time there was an intense rivalry between these two camps, based in part on the fact that the lighter-than-air proponents possessed strong institutional resources.

Russia's firm footing in aviation in the early years rested in part on a highly sophisticated scientific research program that pre-dated the Wright brothers flight at Kitty Hawk. Russia had established an experimental lab at Kuchino in 1901, a facility which would place Russia at the cutting edge of aerodynamics. Here Russia built a modern wind tunnel in 1904 (Russia's first wind tunnel had been constructed at Moscow University in 1902). Located near Moscow, Kuchino drew to its modern labs a cluster of talented scientists. As early as 1904, Nicholas Ye. Zhukovskiy – Russia's famed aerodynamicist – worked at Kuchino, taking full advantage of Kuchino's new and sophisticated wind tunnel, spacious workshops, and library. Zhukovskiy went on to contribute a sequence of theoretical works on aerodynamics in the years before the First World War. Kuchino drew other specialists such as D. P. Riabouchinskiy (the director of Kuchino facility), K. Ye. Tsiolkovskiy, the famed rocket and space flight visionary, and S. A. Chaplygin, an authority on high-speed aerodynamics.