From Red Wings to Red Stars

Bombers, Intercontinental Ballistic Missiles and the Evolution of the Soviet Strategic Arsenal in the Early Cold War

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Acronyms

ABM – Anti-Ballistic Missile
CAS – Combat Air Support
C2 – Command and Control
DA – Long-range aviation wing of the Soviet Air Force (from Russian dal’naya aviation)
GCI – Ground-Controlled Intercept
GKN-VVS – Red Banner State Research institute of the Air Force (from Russian Gosudarstvenny krasnoznamenny nauchno-issledovatel’skiy institut Voenno-vozdushnykh sil’)
ICBM – Intercontinental Ballistic Missile
L-II – Flight Research Institute (from Russian Lyotno-issledovatel’skiy institut)
lb – standard abbreviation for pounds static thrust
NACA – National Advisory Committee for Aeronautics
NKAP – People’s Commissariat of the Aviation Industry
NKVD – People’s Commissariat of Internal Affairs, forerunner to the KGB (from Russian Narodnyy komissariat vnitrennykh del)
PVO – Air Defense Forces (from Russian Protivo-vozdushnaya oborona)
OKB – Experimental Design Bureau (from Russian Opytnoe konstruktorskoe byuro)
SAC – Strategic Air Command, the branch of the United States Air Force responsible for the long-range bomber program
SAM – Surface-to-Air Missile
SRF – Strategic Rocket Forces
TsAGI – Central Aero-Hydrodynamic Institute (from Russian Tsentral’nyy aero-gidrodinamicheskii institut)
USAF – United States Air Force
VVS – Soviet Air Force (from Russian Voenno-vozdushnye sily)
**Doctrine, Technology and Military History**

The history of the Cold War is distinctive within military history. More popular forms of military history, such as analyses of the Normandy Landings of World War II or the Gettysburg campaign of the American Civil War, typically have a narrow scope. Their focus lies at the tactical and operational levels: the average reader of popular military history wants stories of weapons, men, and maneuvers on the field of battle.\(^1\) When military historians take this approach to an entire conflict, they string together a narrative of campaigns and battles. This provides a wealth of examples of warfare at the operational and tactical levels. However, many of these works lack a view of warfare that transcends stories of men, equipment, and maneuvers. Though they may briefly mention how operations fit into a larger strategy, these analyses typically fail to assess elements of the tactical, operational, strategic, and grand-strategic levels of warfare. This yields an over-simplified narrative of battles and campaigns.

Cold War military historians have a more difficult task in limiting the scope of their analyses. While it is possible to analyze individual conflicts within the larger scope of the Cold War (i.e. Korea, Vietnam, Afghanistan), it is unproductive to string these tactical and operations-level analyses into a larger narrative of the Cold War. This is the case for four major reasons. First, the Cold War lasted over four decades, much longer than most previous wars. Second, there was no single theater of operations for the Cold War. Instead, the Cold War spanned the entire globe. Third, with possibility of a global nuclear exchange resulting from the advent of the nuclear weapons in the 1940s, military leaders had to plan for a conflict dissimilar to any earlier conflicts. Finally, the Cold War was not a continuous period of open military hostilities between the United States, the Soviet Union, and their allies. Those who would string together

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\(^1\) As an example, see Edwin B. Coddington’s *The Gettysburg Campaign*
the analyses of the open hostilities of the Cold War would end up with an incomplete narrative, dotted with periods of calm. In order to fill in these gaps, it is important to address questions of doctrine and technology with its corresponding countermeasures. By discussing these themes, the Cold War military historians’ analyses can be more expansive, including relevant details from all four levels of military operations: tactical, operational, strategic and grand-strategic.*

This inclusion of doctrine and technology is especially important when analyzing the potential of global nuclear war between the US and the Soviet Union. Since the Cold War never turned into an intercontinental nuclear exchange, historians must approach this topic of in a distinctive fashion. They must first assess the evolution of technologies available to each side. These include not only the nuclear bombs and warheads, but also the means for delivery, whether aircraft or intercontinental ballistic missile (ICBM). This assessment should also include anti-nuclear defenses and countermeasures, whether anti-ballistic missile systems (ABM), anti-submarine countermeasures, surface-to-air missile (SAM) anti-aircraft defenses or interceptor aircraft with air-to-air missiles. By understanding the strengths and weaknesses of the technologies available to each of the Cold War superpowers, it is easier to understand the limitations on the use of nuclear weapons. It also helps the reader imagine how a global nuclear conflict in any decade of the war might have turned out.

It is not enough, however, to discuss only technologies. There are numerous examples in military history of warring states that had similar technologies but utilized and developed them in disparate ways. Military doctrine can help to explain such incongruities at the strategic level.

* The tactical level of warfare pertains to the conduct of battles and engagements for the achievement of combat objectives. The operational level of warfare deals with campaigns and major operations which are conducted for the achievement of strategic goals. The strategic level of warfare describes how a state uses its armed forces to meet national military objectives. The grand-strategic level of warfare describes how a nation utilizes all of its assets, both military and non-military, to attain the political objectives underscoring all armed conflicts and to maintain them after the conclusion of hostilities.
Technology provides military leaders with possible strategic courses of action; it does not dictate them. Doctrine explains how the military conceives of warfare. Doctrine, arising from the experiences of previous armed conflicts, clarifies how a state believes war will begin, be conducted, and come to a conclusion. While no doctrinal document can provide a perfect solution for the myriad strategic choices facing a commander, doctrine can provide commanders with guidance, especially in the preparatory and early stages of a conflict.

During the Cold War, military doctrine in both the United States and the USSR helped answer critical questions about the likely start, character, conduct, and end of a global nuclear war. At different points throughout the Cold War, military theorists on both sides of the Iron Curtain revised their own concepts and definitions of nuclear warfare. These revisions were nothing new in the Soviet Union, where in the four decades preceding 1945, doctrine had transitioned through three stages: early Soviet doctrine, Stalinist doctrine, and post-Stalinist doctrine. Each phase defined the character and goals of warfare in ways which corresponded to the experiences of the Soviet Union in earlier conflicts. Simply stating that the Soviet Union was preparing to destroy its adversaries through the use of nuclear weapons understates the complexity of military affairs during the Cold War. Understanding both the technological capabilities and the military doctrines of the USSR throughout the Cold War is essential for understanding the conflict as a whole.

**Soviet Strategic Bombers: A More Specific Issue**

Analyzing all aspects of Cold War military technology and doctrine is far beyond the scope of this paper, which instead focuses instead on a single issue. It examines the role of the Soviet long-range strategic bomber program in preparation for a global nuclear conflict during the first two decades of the Cold War.
The main question addressed by this paper is posed in an excerpt from a 15 February 1963 article in the Red Army newspaper, Красная звезда, or Red Star. In this article, General Lieutenant of Aviation N.A. Sbitov discussed the basic precepts of the Soviet conduct of intercontinental nuclear warfare during the first two decades of the Cold War, henceforth the "early Cold War". One excerpt from the article stated: “The infliction on the aggressor of retaliatory mass nuclear rocket strikes by strategic means, or to speak more frankly, by the Strategic Rocket Troops, is considered by us to be the main aspect of strategic operations.”

Sbitov, speaking authoritatively for the Soviet Air Force (and presumably for the Soviet military because of the periodical in which he was writing), revealed that the Soviet military leadership of the 1960s saw the ballistic missile as its primary strategic weapon. Statistics from years later in the decade confirmed this. Raymond Garthoff notes that in 1969, the Soviet Union had a combined ICBM and submarine-launched ballistic missile (SLBM) force of 985 missiles, compared to a US force of 1,710. At the same time, the Soviet Union had a long-range bomber force of only 155 bombers, compared to the US 565. Though the overall difference between American and Soviet long-range strategic bombers was only 410, the proportions of bombers to missiles were significant: a bomber/missile ratio of .3304 in the US and .1574 in the Soviet Union. Under the assumption that the Soviet Union and the US each had resources that they were willing to invest towards strategic advantage, these bomber/missile ratios made it appear that the US assigned a larger role to long-range strategic bombers for the delivery of nuclear weapons than did the Soviet Union. The Soviet Union seems to have assigned its long-range bomber program a much smaller role in its strategy for global nuclear conflict, relying more on ballistic missiles as the primary delivery systems.

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This paper will analyze the assertion that long-range aviation (дальняя авиация or DA) in the Soviet Air Force (Военно-воздушные силы, henceforth VVS) was less important than the Soviet Strategic Rocket Forces (SRF) for the Soviet global nuclear strategy of the early Cold War. This paper also has a wider significance, insofar as explaining the Soviet choice of ICBMs will call for an indirect reexamination of Soviet leaders’ interpretation of strategic parity and advantage during the early Cold War. In order to clarify the Soviet choice of ICBMs, this paper will examine doctrinal, technological and bureaucratic evolution within the Soviet military from 1920 to 1968.

**A Brief Outline**

In order to show that the small number of Soviet long-range bombers was more than an arbitrary choice by the Soviet political and military leadership which did not receive much consideration, this paper will examine three primary dimensions. The first chapter will trace the evolution of Soviet military doctrine from the earliest debates in the immediate post-civil war era through the Great Patriotic War and the reforms of the 1960s. This effort entails an examination of several majors players in the evolution of Soviet doctrine, including Vladimir Ilyich Lenin, Mikhail Vasilievich Frunze, Vasily Danilovich Sokolovsky, and others. The contributions of each author will be analyzed to explain why the Soviet Union preferred to rely more heavily its Strategic Rocket Forces rather than DA. Then this work will look at the acquisition and evolution of Soviet military technology beginning in 1945. It will examine the impact of German, British and American rocket technology, jet-engine technology, and operational concepts on the early Cold War Soviet military. Finally, other elements, such as the Space Race, institutional competition within the Soviet military, the leadership styles of individual Soviet
leaders, and the experience of Soviet pilots in the Korean War, will be explored in order to
further explain the comparatively limited size of the Soviet long-range bomber program.

The Limitations of this Analysis

The most difficult part of this analysis has been dealing with a restricted primary source
base. The author did not have access to a full range of early Cold War Soviet military
documents. The available primary source materials used in this paper, from the original
doctrinal documents to the memoirs of those who were involved in the production of aviation
and rocket technology in the 1940s and 1950s, sufficed for conclusions regarding the origins of
the Soviet preference for ICBMs. However, access to a wider range of Soviet government
documents could further reinforce many of the conclusions. Ultimately, this lack of Soviet
documents from the late 1940s and 1950s has left this analysis dependent on other historians’
concrete technical knowledge and the opinions of contemporary United States Air Force
analysts.

The author fully recognizes the limitations of this source base. While an attempt was
made to include all factors that contributed to the choice of the ICBM, he cannot ascertain if this
analysis covers all such factors. Furthermore, with this limited base of Soviet documents, this
author cannot determine each contributing factor’s importance. The dual-use nature of ICBMs
may have factored more into the decision than the CAS-only precedent set for Soviet aviation in
World War II; however, until one can look at a much larger source base of Soviet government
documents and determine the frequency at which certain themes appeared, one cannot determine
the relative importance of the topics mentioned in this discussion.
Chapter I: The Evolution of Soviet Military Doctrine

Early Concepts: Lenin, Frunze and Lapchinsky

Previous military experience writes military doctrine; theoretically, one could dig endlessly into the past to analyze the origins of all aspects of a given doctrine. The analysis of Soviet airpower begins best at the close of the Russian Civil War. The end of the Civil War marked the end of a decade-long period of war and political instability in Russia. If one were to try to speak coherently about the way Russians approached warfare in the years leading up to the end of the Russian Civil War, one would have to consider the way a multiplicity of factions waged war. Even within certain factions of the Russian Civil War, one would have to consider major ideological dissenters, such as famed Soviet commander Leon Trotsky. With the end of the Russian Civil War came a political and ideological narrowing of the Russian war machine; the Russian military came under the control of a government with a clear ideology. As this analysis seeks to talk about the evolution of Russian military doctrine over several decades, it is simpler to address only doctrinal discussion which occurred after this narrowing.

Though they were not military theorists, some members of the early Soviet leadership affected doctrine. In particular, Vladimir Ilyich Lenin’s writings in political theory influenced some of the most fundamental Soviet conceptions of warfare. Lenin did not write about or participate in discussions of military doctrine. Indeed, in the 1920s, he and Trotsky discouraged military theorists, such as Mikhail Vasilievich Frunze and Mikhail Nikolaevich Tukhachevsky, from formulating a doctrine for the Soviet military. At the 11th Party Congress, Trotsky told Frunze that, “it is too early to make generalizations on military doctrine—that should wait fifteen
or twenty years.” Lenin suggested to Frunze at the same time that it was too soon after the Russian Revolution and Civil War to know anything about the way in which the military of a proletarian state should function.

Despite the tendency of the early Soviet leadership to dismiss doctrinal discussion, some of Lenin’s writings shaped the development of Soviet military doctrine. However, one should not interpret the appearance of Lenin’s quotes in later Soviet military publications to mean that Lenin was the most important figure of all Soviet military thought. Many seemingly out-of-place references to Lenin were added to Cold War doctrinal publications simply as a formality, not as substantive contributions to the doctrine.

Nevertheless, Lenin’s writings were important, insofar as they provided a basic Weltanschauung about the nature of warfare. Much of this paradigm was confirmed by the early experiences of the Soviet Union. One of the more influential aspects of Lenin’s worldview was its heavy reliance on Marxist materialism. In his famous article, “War and Revolution,” Lenin wrote: “It seems to me that the most important thing that is usually overlooked in the question of the war. . . is the question of the class character of the war: historical and historico-economic conditions gave rise to it.” From Lenin’s belief in the power of productive forces followed the assertion that military affairs should not only focus on the army of the enemy, but also his economy. The overriding importance of a state’s productive forces had been confirmed in the world’s first experience with total war, so Lenin’s belief about warfare and a nation’s productive capacity did not differ greatly from conclusions reached by other European states after World

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5 Ibid.
War I. Nevertheless, the influence of this materialist worldview on future Soviet doctrine was profound.

Marxist-Leninist materialism answers fundamental questions about the origins of warfare in a meaningful, albeit vague way. Dialectic materialism implied that the world would inevitably face a global conflict between the capital-owning bourgeoisie and the alienated proletariat:

Our aim is to achieve a socialist system of society. . . . But in that war to win that socialist system of society we are bound to encounter conditions under which the class struggle within each given nation may come up against a war between different nations, a war conditioned by this very class struggle.7

This proposition defined the root cause of war as fighting among bourgeois capitalist states for resources and labor in the colonized world.8 This opened an array of specific possibilities for the worldwide struggle between the proletarian and bourgeois classes. Despite all of this, however, the idea that a showdown between the communist and capitalist states was inevitable later factored heavily into the Soviet Union’s preparations for war.

From the idea of inevitable conflict with capitalism followed the Soviet Union’s obsessive suspicion of the West, even in its early years. This suspicion continued throughout the Cold War. However, not all of the Soviet Union’s anti-Western suspicions during the Cold War were due to the writings of Lenin. As influential were the interventions of American and British military forces during the Russian Civil War and the Nazi invasion of the Soviet Union during World War II. Nevertheless, this distrust of the West had been codified in intellectual discourse long before the start of the Cold War and remained a central tenet of Cold War doctrines of

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7 Ibid.
nuclear war. Beyond these basic concepts of international relations and warfare, the early Lenin’s influence in the development of military doctrine was negligible.

As a result of the stability in the post-Civil War Soviet Union, theorists from outside the Soviet political leadership began to examine how the newly formed state might wage war. Though discouraged by the Soviet political leadership, who thought that the Soviet military was too new to have an officially established doctrine, authors such as Ioakim I. Vatsetis and Tukhachevsky analyzed the causes, character and conduct of future wars. However, the theorist who most influenced the development of Soviet military doctrine was Mikhail Vasilievich Frunze.

Frunze, born in 1885 in Turkestan to a Moldovan father, received his introduction to revolutionary groups during his education at the Petersburg Polytechnical Institute. This brought him into direct participation in the 1905 Revolution. Frunze continued his political activism throughout the next two decades. Though sentenced to death twice for his political activities, his commitment to the revolutionary cause never faltered and he played a major part during the Russian Revolution. During the February Revolution, he led the overthrow of Tsarist forces in Minsk, becoming the head of the city’s militia and primary organizer of the Minsk Soviet of Workers’ Deputies. Having left Minsk in August, Frunze organized and led nearly 2,000 Red Army soldiers and workers to Moscow from the Shuiskii-Ivanskii oblast. In December 1918, he was appointed to his first official command: the 4th Army on the Eastern Front. During the Russian Civil War Frunze gained the bulk of his military experience, commanding the 4th Army, the Turkestan Army, and eventually the entire Eastern front of the Red Army. By the close of Civil War, Frunze had both the experience and the fame to make an influential contribution to a
budding Soviet military doctrine. He was named Chief of Staff for the Red Army in 1924, but died mysteriously in surgery the next year; many suspect that Stalin ordered his death.

One of Frunze’s most long-lasting contributions to Soviet military thought was the basic idea of a single, unified doctrine. Having witnessed both World War I and the Russian Civil War, he concluded that wars were increasing in both geographic and demographic scale. Wars were no longer fought by professional armies that were completely separate from the civilian populace. Instead, Frunze believed that, “today whole nations, almost to the man, participate in wars. . . . Today, the theaters of military operations are not narrowly restricted spaces, they are huge territories with tens and hundreds of millions of residents.” War, in Frunze’s view, was also becoming more complex, because of the technology. Frunze noted that, “Technical combat resources are endlessly developing and becoming more complex, creating more and more new specializations, types of weapons.” He argued that the increased scale and complexity of modern warfare endangered the integrity of large-scale planning for wars. Thus, he advocated:

The state must define the nature of overall and, in particular, military policy beforehand, designate the possible objects of its military intentions in accordance with this policy, and develop and institute a definitive plan of action for the state as a whole, one that would take account of future confrontations and ensure their success by making prudent use of the nation’s energy before they take place.

Given modern manifestations of military doctrine, this almost seems to be a forgone conclusion. However, given the growing complexity of warfare and the disorganized state of

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11 Ibid.
12 Ibid.
13 Ibid.
Red Army operations during the Russian Civil War, Frunze’s concerns were well founded. Without a unified approach to doctrine, the individual parts of the Soviet military machine could not understand their role in the larger whole. No matter how well each branch achieved its goals in such a conflict, the achievements of the combined military establishment would fall far short of the sum of each branch’s operational and strategic achievements. Without a common “big picture”, the parts of the military establishment could hinder or counteract the efforts of others. Therefore, doctrine had to provide a common interpretation of warfare. Unified military doctrine could provide the military establishment with a common understanding of warfare, ensuring, in Frunze’s own words, “the integrity of the overall plan and strict coordination when it is carried out.”

Frunze’s contribution to Soviet military thought was to introduce the idea of unified doctrine, which may seem by today’s standards to be a foregone conclusion. By the time of the Cold War, this idea became critical. As technology progressed in the first decade and a half after World War II, the Soviet military establishment became more bureaucratically partitioned, growing from land and naval forces to the Soviet Army, Navy, Air Defense Forces [Protivovozdushnaya Obrona, henceforth PVO], Strategic Missile Forces, and the VVS. The Soviet military of the early Cold War was not only more bureaucratically complex than ever, but it also possessed a greater array of technologies: multi-stage ballistic missiles, jet aircraft, surface-to-air missiles and other technologies. What is most important about the idea of a unified military doctrine for this analysis is that it allows the military historian of the Cold War to assume that there were fundamental writings that officers and enlisted men in all five branches of the Soviet armed forces were reading. Thus, when this paper begins to analyze doctrine during the Cold

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14 Ibid.
War, one does not have to continually assess whether or not each part of the Soviet military adhered to similar operational and strategic concepts.

Frunze was the father of Soviet military doctrine, but other military theorists from the pre-World War II period made contributions to Soviet military thought that were more applicable to aviation. Aleksandr N. Lapchinsky wrote about the military potential of aviation. He produced five major works on the topic, the first of which received the Frunze Prize (a prestigious award for the best book in military thought in a given year) in 1931. Like many of his counterparts, Lapchinsky did not survive the purges of the officer corps in 1937-8. However, the last of his works were published after his execution, indicating that the post-purge military authorities considered his writings to be of value. In this way, Lapchinsky’s writings influenced the Soviet understanding of military aviation long after his death.16

One of Lapchinsky’s important arguments had to do with air superiority. In his work, Воздушные силы в бою и операции [Air Forces in Battle and Operation], Lapchinsky asserted that, “Absolute air supremacy is generally unattainable. But temporary, local superiority is possible. However, it would be prejudice to think that air supremacy is achieved through the efforts of aviation alone. Both air and land forces participate in achieving this supremacy.”17 He reasoned that even if one won great victories against enemy air forces, the speed at which aircraft could be produced was such that enemy aircraft could not be kept out of the skies, unless all launched enemy airplanes and their airfields were destroyed. This achievement would require a joint effort between forces on the ground and in the air. The fact that Lapchinsky conceived of

17 Ibid.
air superiority as a temporary, localized phenomenon, which required joint service cooperation, reflected the fact that early discussions of airpower in the Soviet Union assigned the airplane to the tactical and operations level. Lachinsky’s view of the airplane as solely an operational-level tool was widely shared. The Soviet military theorist and observation pilot Artur K. Mednis also argued in his book, Тактика IIIтуровой Авиации [Tactics of Ground-Attack Aviation], that military aviation’s primary function was the support of operations on the ground.18

The 1920s and 1930s were clearly a time of vigorous intellectual discourse concerning the Soviet military. Lenin provided Soviet military thought with a materialist foundation and the belief that the forces of capitalism would one day attack the Soviet Union, a view which was reinforced heavily by both Western intervention in the Russian Civil War and the Nazi invasion of 1941. Lachinsky offered a more concrete discussion of aviation in warfare, laying the foundations of military aviation in the Soviet Union. Frunze’s concept of unified doctrine added clarity and simplicity the Soviet military as it grew more complex. Without unified doctrine, analyzing Soviet Cold War military thought would be much more difficult, as one could never fully assume that all parts of the military establishment held the same views on the character of war, the proper strategic role of each branch during the war, and the overarching grand-strategic goal of a conflict. The aforementioned ideas from the thinkers in this section do not represent the entirety of the military discourse of the 1920s and 1930s in the Soviet Union. These are simply the ideas which this author considers to have had the greatest influence on the way that the Soviet Union chose to prepare for strategic nuclear warfare in the first decades of the Cold War.

18 Ibid.
Purges and Permanent Operating Factors: 1937-1953

The discussions of military theory in the 1920s and 1930s came to a halt in 1937, when Stalin began to purge the military. Fabricating a “traitorous, counterrevolutionary military fascist organization”, Stalin killed off a large portion of the Soviet officer corps, including many of the prominent military theorists such as Aleksandr Svechin, Iyeronim Uborevich, and Tukhachevsky.\(^\text{19}\) The only high-ranking officers who survived this purge were those who groveled before Stalin’s purported genius in military affairs, such as Marshal of the Soviet Union Kliment Voroshilov.\(^\text{20}\) Until his death in 1953, Stalin controlled the way in which the Soviet Union waged war. This section of analysis addresses Stalin’s concept of warfare. However, the ideas of Lenin, Frunze, and Lapchinsky were not banned (despite the death of the last two at Stalin’s hands), so they continued to influence military affairs in the Soviet Union well beyond the 1930s.

Stalin, a self-proclaimed genius in military matters, grossly oversimplified the doctrinal discussions of decades past. He announced in a speech on 23 February 1942 his five “permanently operating factors” of warfare. These were aspects of warfare that Stalin believed would determine the outcome of a war. They provided a narrow framework for all discussions of military theory until 1953. As paraphrased by Harriet and William Scott, these factors were: the stability of the rear, morale, quantity and quality of divisions, armaments of the army, and the organizational skills of the military command.\(^\text{21}\) They were acclaimed by the Soviet high command; however, Stalin had just picked five broad, obvious principles of military art, and tied them together in a radio address which proclaimed the superiority of the Red Army over the

\(^{19}\) Ibid.

\(^{20}\) See Kliment Voroshilov, *Stalin and the Armed Forces of the USSR*, 86 for an example of this.

German invaders during a desperate time for the Soviet Union.\textsuperscript{22} The five factors were Stalin’s pseudo-intellectual attempt to hide the mistake he had made by eliminating the brilliant military minds in the Soviet Union four years before the German invasion. As evidenced by their neglect during renewed discussion of doctrinal discussions after his death in 1953, Stalin’s contributions to military thought in the Soviet Union were inconsequential.

**Post-Stalin Soviet Military Doctrine: 1953-1969**

As doctrinal discussions reopened in the post-Stalin years, military theoreticians faced the difficult task of formulating a doctrine for a type of war that had never occurred, a global nuclear conflict. During the mid-1950s, as Soviet generals gradually distanced themselves from Stalin’s operating factors, they began to reassess the potential causes, character and result of such a war. By examining the answers to these questions, one can understand the doctrinal logic which underpinned the Soviet preference for one nuclear delivery system or the other.

The Soviet Union obtained its first nuclear device in 1949.\textsuperscript{23} In August 1957, the Soviet Union launched an unarmed R-7 ICBM over the Pacific Ocean, demonstrating the USSR’s ability to strike the United States with multi-stage rockets.\textsuperscript{24} By the late 1950s, both the US and the USSR possessed the technology to engage each other in a global nuclear conflict. This was a frightening prospect once coupled with a doctrine which asserted the inevitability of a large-scale, global war between capitalism and communism. Also frightening for the Soviet high command was the fact that the Soviet nuclear arsenal was smaller than that of the United States at the time; the Cold War had not yet entered a phase where mutually assured destruction existed

\textsuperscript{22} Voroshilov, *Stalin and the Armed Forces of the USSR*, 89.
\textsuperscript{24} Ibid.
as a possibility. If the USSR entered a nuclear war with the United States, the chances of achieving the much-prophesized Marxist victory of communism over capitalism were very slim. The Soviet Union could not have a military doctrine that contradicted the logical outcome of Marxist dialectic thinking. Thus, one of the first major changes in Soviet military doctrine after the death of Stalin was the elimination of the inevitability of this global showdown between communism and capitalism. Speaking at the Twentieth Party Congress in October 1956, Nikita Khrushchev stated: “War is not fatalistically inevitable. Today, there are mighty social and political forces possessing formidable means to prevent imperialists from unleashing war, and if they do try to start it, to give a smashing rebuff to the aggressors and frustrate their adventurist plans.” Khrushchev did not portray this change in the Soviet worldview as a lessening of hostilities with the capitalist world. The capitalist world was theoretically just as hostile to the Soviet Union as ever. However, the Soviet Union possessed nuclear weapons, which could serve as a deterrent against capitalist aggression, so capitalists would exercise caution in their plans to bring down the Soviet Union. War was probable but not inevitable.

Khrushchev’s speeches cannot cover the entire depth and complexity of the post-Stalin Soviet view of warfare. To fully understand the way the Soviet Union conceived of warfare in the early Cold War it is necessary to return once again to the authors of military doctrine. The best summary of Soviet military doctrine in this period is in Marshal of the Soviet Union Vasily Danilovich Sokolovsky’s famous work, *Soviet Military Strategy*. Historian Harriet F. Scott has called this book the single most authoritative doctrinal work of the Soviet Union during the early Cold War. The work, published first in 1962, was an attempt to rewrite older theories of military

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27 Ibid.
strategy which had become outdated with the advent of nuclear weapons. To Sokolovsky, military strategy in the Cold War was inextricably tied to nuclear weapons:

Military strategy under conditions of modern war becomes the strategy of deep nuclear rocket strikes in conjunction with the operations of all services of the armed forces in order to effect a simultaneous defeat and destruction of the economic potential and armed forces throughout the enemy territory, thus accomplishing the war aims within a short period. 28

From this proposition followed important features of Soviet military doctrine in the Cold War. First, Sokolovsky confirmed that nuclear rockets would be the primary Soviet strategic weapon in a nuclear war. Second, by stressing the destruction of the enemy’s economic potential, Sokolovsky reaffirmed the original Marxist production-centered paradigm, which had been espoused in the writings of Lenin. Third, Sokolovsky’s emphasis on deep strikes and a short conflict revealed that Soviet strategy did not conceive of a global nuclear war as a protracted affair, fought along a single, immobile front. Some earlier Soviet military theorists had anticipated drawn-out conflicts with a clear distinction between front and rear. Frunze wrote, “the need to prepare for a long and difficult war is still obligatory for us. Insofar as we’re discussing the class of two different worlds, this means the fight will be to the death. The worker-peasant republic has many enemies, and therefore the struggle will under any conditions be a long one.”29 Presumably, the fast pace of the war arose because of the immense destructive power of nuclear weapons. The idea of a war which reached into an enemy’s rear to strike at the center of gravity and induce systemic failure came from earlier Soviet doctrine. The Soviet concept of nuclear war in the early Cold War represented the idea of deep operations taken to the


29 “Фронт и тыл в войне будущего,” [“Front and Rear in Future War”] in Na novykh putiakh, 1925, as reprinted in M. V. Frunze, Izbrannye proizvedenija (Moscow, 1940), trans. David R. Stone, http://www-personal.ksu.edu/~stone/FrunzeFront.
extreme. Before his death in the purges of 1937, Tukhachevsky had written about the use of
tanks in such fast-paced, deep operations: “But modern means of combat permit us to organize
the attack in such a way that the enemy is simultaneously hit to the full depth, and his reserves
can be contained or their approach to the threatened sector. . . . long-range tanks supported by
artillery fire should pass through the enemy front and capture his routes of withdrawal.” 30
Sokolovsky and his contemporaries understood that the range of nuclear weapons made it
possible to reach deep behind an enemy’s borders and to destroy both the military forces and the
productive capacity of the state. Sokolovsky realized, however, that a successful nuclear strike
did not guarantee complete victory. In the same way that Lapchinsky had tied the success of air
forces to the joint efforts of ground forces, Sokolovsky tied the strategic success of the Strategic
Rocket Forces to the joint efforts of the VVS, PVO, Army and Navy. 31

One other dimension of Sokolovsky’s view of warfare is of particular significance.
Sokolovsky hypothesized that a global nuclear conflict likely would begin with a surprise
nuclear attack from the West. In the second chapter of Soviet Military Strategy, Sokolovsky
discussed at length the military policies of the United States. Sokolovsky wrote that, “The
phrases ‘massive retaliation’ and ‘massive retribution’ served to mask the aggressive essence of
American strategy. The imperialists of the United States, hiding behind similar phrases and
terms, are in reality preparing for a surprise nuclear attack against the Soviet Union and the other
countries of the socialist camp.” 32 This assumption, coupled with the speed and destructive
power of missiles with nuclear warheads, implied that the initial phases of a global nuclear
conflict would be critical. In this mindset, preparedness for global nuclear war meant a high
degree of readiness to respond to a nuclear attack.

30 Aleksandr Lapchinsky, The Air Forces in Battle and Operations, 60.
31 Vasily Danilovich Sokolovsky, Soviet Military Strategy, 10.
32 Ibid, 56.
By the time of publication of the third edition of *Soviet Military Strategy* in 1968, Sokolovsky conceded that warfare with the United States could take on a more limited, conventional character.\(^{33}\) This conclusion was due to the replacement of “massive retaliation” by “flexible response” in NATO rhetoric beginning in 1961.\(^{34}\) Sokolovsky accepted the idea of “limited warfare”. However, limited wars were not, by definition, short, small or conventional. They could easily turn into large, lengthy conflicts which involved the use of tactical nuclear weapons. The phrase “limited wars” referred to all forms of conflict between the US and USSR that fell short of using strategic nuclear missile strikes against the enemy. Sokolovsky believed that such warfare usually would escalate into a global nuclear war.\(^{35}\) Therefore, he held that the primary focus of the Soviet military should be preparation for a large-scale nuclear exchange with the United States.

In sum, Soviet military doctrine of the early Cold War conceived of global nuclear war as a possibility, but not an inevitability. This war would have a large scale and would reach deep into enemy territory to destroy both the productive capacity and the strategic nuclear assets of the enemy state. It would probably start either with a surprise nuclear attack from the United States or as the escalation of a limited war; the opening phases of the war would be critical. Despite the fact that the Strategic Rocket Forces would be the primary strategic asset, total victory over the enemy in the later phases of the war would require joint efforts with the other four branches of the Soviet military.

\(^{33}\) Ibid, 66.
\(^{34}\) Ibid.
\(^{35}\) Ibid, 58.
Perceptions of War and the Long-Range Strategic Bomber

How did these doctrinal ideas affect the Soviet choice to make missiles the primary weapon of a global nuclear war? Given the above analysis of Soviet doctrine, it is possible to conjecture with reasonable accuracy about the doctrine’s effect on choice of missiles over long-range bombers. The answer requires an important assumption. Thanks to Frunze’s idea of a unified military doctrine for the Soviet Union, all branches of the Soviet military establishment conceived of warfare in the same way and had the same strategic goals. Therefore, the predominance of the Strategic Missile Force was not just the outcome of bureaucratic competition; the heads of the VVS, PVO, Army, Navy and Strategic Rocket Forces all had the same goal and jointly determined which branch would best accomplish it. Having made this assumption, one can begin to look at each of the fundamental characteristics of Sokolovsky’s concept of nuclear war and attempt to explain why missiles were chosen over long-range strategic bombers as the primary weapon of Soviet strategy for global nuclear war.

The Soviet strategy for nuclear war predicted a surprise nuclear attack from the United States and stated that the very early stages of the war would be the most critical ones. It also noted that the initial phase of the war would be fast-paced. Missile technology was better suited for this pace of warfare, if only because Soviet ICBMs could fly faster than any bomber. One of the Soviet Union’s first ICBMs, the R-7, could move a 5.3-5.5 ton warhead at 6,385 meters per second (or 14,282.84 miles per hour) during its second stage. The United States’ fastest strategic bomber of the early Cold War, the B-58 Hustler, could barely reach one seventh of this speed. Because of this speed difference, a long-range bomber would take much longer than an

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37 N.A. Lomov, The Revolution in Military Affairs, 49.
ICBM to reach a target. In a strategy which placed a high priority on speed and decisiveness in the early stages of the conflict, such delays were unacceptable.

Furthermore, the probability of a surprise nuclear attack meant that the main delivery vehicles for a nuclear counterstrike had to maintain a constant state of readiness. This was more difficult for a squadron of long-range bombers to do. Airplanes had to be fueled, armed and deiced; pilots and crews had to be briefed. It therefore took longer to put a flight of long-range bombers into the air than it did to launch an ICBM. The only way to circumvent this delay was to keep bombers in the air at all times. This would be costly, both in terms of materiel and manpower. Operational readiness for Sokolovsky’s predicted nuclear war was therefore easier and cheaper to maintain if the Soviet Union relied on ICBMs as the primary delivery vehicle for nuclear warheads.

Additionally, the Soviet military planned for a war which would reach deep into enemy territory, striking at both the enemy’s long-range strategic assets and economic centers. Missiles could better accomplish their strategic objectives in such a war because they had a longer range than most bombers. While it was possible to increase the range of a long-range bomber with in-flight refueling, it became more difficult as the bombers get closer to airspace controlled by the enemy. If the success of a flight of bombers were contingent upon being able to refuel, the elimination of the tanker could prevent the bombers from reaching their targets; the airborne tanker was therefore just another point at which enemy anti-aircraft operations could induce systemic failure. On top of this, the Soviet bombers themselves would be susceptible to enemy anti-aircraft operations, both in the form of SAMs and interceptor aircraft armed with nuclear warheads intended for use against bomber formations (e.g. the Douglas AIR-2 Genie). Though the United States developed in the 1970s a countermeasure against missile attacks in the form of
the ABM system, there were no countermeasures against an ICBM during the early Cold War.\footnote{Ibid, 66.} Theoretically, anti-aircraft operations would be less successful if one controlled the airspace near or within enemy borders. However, recalling Lapchinksy’s theories from earlier in the century, the Soviet military establishment realized that such airspace control would be temporary and would require the combined efforts of the other Soviet military branches. Given the geographic scale of a nuclear conflict between the USSR and the US, airspace control was not a feasible strategic goal. Because of the limited range of bombers and the threat of enemy anti-aircraft operations, the missile was a better delivery vehicle for nuclear warheads in a global nuclear war.

This examination of the evolution of Soviet doctrine from the end of the Russian Civil War until the publication of the third edition of Sokolovsky’s \textit{Soviet Military Strategy} has revealed a number of general trends and important concepts in the way the Soviet Union interpreted warfare. By combining what this analysis has revealed about the fundamental Soviet tenets of nuclear war with some basic technological information, the reader can easily understand why the Soviet Union chose missiles instead of long-range bombers as the primary strategic weapon in a nuclear war. However, doctrine alone does not answer explain the Soviet preference for ICBMs: the evolution of missile and jet technology as well as the practical experience of the Soviet aviators must be given due consideration.
Chapter II: The Acquisition and Implementation of Aviation Technology: 1941-1960

Military doctrine and its implications on Soviet global nuclear strategy do not entirely explain the Soviet preference for ballistic missiles as a primary strategic weapon. In order to understand this preference, one must also examine the technology which was available to the Soviet Air Force (VVS) and the Soviet Strategic Rocket Forces (SRF). Because one of these branches better met the strategic requirements of the Soviet high command at the time of key decisions in the development of the Soviet strategic arsenal, technological development is a critical component of this analysis.

Nevertheless, technical information alone is not enough to complete the analysis. Military technologies do not exist in a vacuum. Technologies and their related tactical concepts receive extensive field-testing during armed conflict, establishing tactical, operational and strategic precedents. These precedents define how categories of technologies will be implemented in future conflict. Because these precedents can apply to technological categories (such as medium-range jet bombers, air-to-ground multiple rocket launcher systems, surface to air missiles, jet fighters, etc.) the precedent can survive the retirement and replacement of the original specific technology.

This chapter deals with the development and implementation of Soviet aviation technology during World War II and the first two decades of the Cold War. Chronologically, it begins with an analysis of Soviet aviation in World War II. Although the previous chapter dismissed doctrinal developments under Stalin during World War II (“The Five Permanently Operating Factors”) as insignificant, World War II was a formative experience for Soviet airpower. Three decades after the close of the war, the high command of the VVS still pointed to
the conflict as an important source of practical experience. This chapter reveals two important facts about the VVS at the start of the Cold War. First, it shows that wartime experiences established the precedent that Soviet ground-attack aviation’s main combat role was tactical combat air support (referred to henceforth as CAS) and not long-range bombing. This chapter will also show that at the advent of the Cold War, the Soviet long-range bomber program was technologically underdeveloped.

**Soviet Aviation During World War II**

The surprise attack of 22 June 1941 decimated an already disorganized, poorly trained VVS. The official Soviet account of airpower in the conflict published by the Ministry of Defense of the USSR claims that German airplanes attacked 66 airfields along the front, destroying 800 airplanes on the ground and another 400 in the air. Historian Richard Overy suggests that these heavy losses were the result of the lack of concealment and of the crowded, linear arrangement of Soviet airplanes at airfields near the front. German military authorities claimed that the initial attacks destroyed 322 Soviet airplanes in the air, 1,489 on the ground at airfields, and captured 242 at airfields. These estimates were published on 8 July, just 17 days after the beginning of Operation Barbarossa. Though one could dispute the precision of these figures (either because of manipulation by the state or because of German pilots’ exaggerations), they nevertheless point to massive losses. German intelligence before the invasion had estimated that the VVS had 5,700 aircraft in total; this yields a loss between 21 and 36 percent of total

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Soviet aircraft in a little more than two weeks. The statistics, along with the low German losses, suggest that the Luftwaffe possessed a significant degree of air superiority during the early stages of the conflict. Nevertheless, the opening attacks of Operation Barbarossa did not completely destroy the VVS, which fulfilled several important roles with regard to ground-attack aviation throughout the war. An examination of the common ground-attack airframes in the VVS illustrates these functions concisely and effectively.

One cannot speak of Soviet ground-attack aviation in World War II without giving due attention to the Polikarpov Po-2 biplane, an examination of which is illustrative of several important facts about the VVS in World War II.\(^a\) The Po-2, designed by Nikolai Polikarpov in 1927, was the most common Soviet bomber airplane of the war.\(^b\) The Po-2, produced in the thousands before the war as a training aircraft for Soviet pilots, fulfilled a variety of roles during World War II. The Po-2 could carry a crew of one and a payload of 550 pounds. The biplane’s maximum speed was 70 knots and its range was 280 miles. Because of its M-11D engine, which could produce 115 horsepower, the Po-2 could operate up to 4,920 feet.\(^c\) On their own, these numbers provide readers with only a limited idea of what such capabilities meant in practice; one must compare the performance statistics of contemporary air technologies to glean this meaning. The Po-2 was slower, carried a smaller payload, had a lower service ceiling and shorter range than similar aircraft in other major countries. The US Army Air Corps’ two-seat Boeing-Stearman PT-13 Kaydet with its Lycoming engine had a greater range, a higher service ceiling, and a faster maximum speed.\(^d\) When compared with the most-produced German aircraft of the

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\(^a\) Before the death of its creator in 1944, this bomber was known as the U-2. For the sake of consistency, I will use the Po-2 designation.


war, the Messerschmitt Bf-109, the Po-2’s capabilities seem laughable. The Bf-109’s maximum speed was 370 knots, over five times faster than that of the Po-2. Its service ceiling was 41,400 feet, over eight times that of the Po-2.46

This tremendous disparity in capabilities helped define the combat roles of the most common airplane in the VVS. With its low service ceiling, slow speed and limited range, the Po-2 could hardly offer a direct challenge to German air superiority maintained with the Bf-109. However, Bf-109 pilots found it difficult to challenge the Po-2 in air-to-air combat, allowing Po-2 pilots to conduct CAS with a large degree of freedom. Conventional thinking about air-to-air combat assumes that a disparity in the maximum speeds of two airplanes shifts the combat advantage towards the faster. However, when this disparity reaches a certain point, the advantage is curtailed. The stall speed of the Bf-109 in full landing configuration was 81 knots, a full 11 knots faster than the Po-2’s cruise speed.47 In practice, this meant that the Bf-109 could only make single, high-speed passes at Po-2s, instead of engaging them in a turning dogfight. Bruce Myles confirms this in his sketch of female Po-2 pilots in World War II: “though their aged trainers were slow, they were exceedingly maneuverable. The two characteristics combined were to make the Po-2 virtually attack-proof in daytime, provided they were at very low level and—of vital importance—that they saw the enemy before he saw them.”48 Po-2 pilots adjusted their tactics to make German attacks risky and usually unsuccessful for Luftwaffe fighters. The Po-2 often operated at night and usually at altitudes below 300 meters.49

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These low operating altitudes and speeds were the result of the primary wartime function of the Po-2. While it remained the main training aircraft of the VVS, the Po-2 was also an effective CAS and ground-attack airplane. Though incapable of inflicting the same damage as other Soviet ground-attack aircraft with larger payloads, the Po-2 nevertheless saw action against ground targets. During the battle for Moscow, Po-2 squadrons flew night attack missions in groups of six to nine. The quiet engines of the biplanes, coupled with the irregular spacing and timing the attacks, maximized the psychological effect on Wehrmacht soldiers. The Po-2 was also useful for other forms of small-scale tactical support. In one case, ground crews attached hooks to the underside of the biplane’s fuselage to allow pilots to make low-level passes and cut the temporary communications lines set up between different sectors of the German front.

The case of the Po-2 reveals that much of Soviet ground-attack aviation in World War II was concerned with tactical-level combat air support. This evidence is further supported by the preponderance of other types of ground attack aircraft, whose limited range and ceilings prevented them from undertaking long-range strategic bombing operations. The Ilyushin Il-2 ground-attack aircraft, known affectionately by Russian ground troops as the “Летающий Танк”, or “Flying Tank”. Produced in numbers almost comparable to the Po-2, this bomber was capable of more than its biplane cousin. It had a range of 465 miles, a service ceiling of 13,120 feet, a maximum speed of 292 knots, and could carry a payload of 880 pounds. This increased speed and service ceiling made German fighter attacks a major problem; German fighter pilots could get a clear shot at this faster-moving, higher-flying target. In order to compensate for their disadvantage in maneuverability and speed, the Il-2’s cockpit and engine were enclosed in an

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50 Ibid, 90-1.
51 Von Hardesty, Red Phoenix, 65.
52 Ibid, 224.
“armored shell”, which protected crews from enemy fire in high-speed diving attacks.\textsuperscript{54} II-2 pilots gave tactical combat air support like their Po-2 counterparts, only on a larger scale.

When one looks at Soviet bomber aircraft from World War II as a whole, one finds numerous examples of aircraft which were successful in a tactical CAS role but which lacked the ceiling, payload and flight endurance necessary to act as long-range strategic bombers, such as the Ilyushin II-10, the Petlyakov Pe-2, and the Sukhoi Su-6. The numbers of these aircraft reflected the fact that tactical CAS was the primary function of the ground-attack aviation units of the VVS during World War II. This truth later became a precedent which directly influenced post-war development of the VVS.

The wartime abundance of Soviet tactical combat air support aircraft did not preclude the existence of some crude long-range bombers in the VVS inventory. The largest of these, the four-engine Petlyakov Pe-8, could carry a payload of 8,800 pounds to distances of up to 2,320 miles. With a maximum speed of 238 knots, the Pe-8 could reach a ceiling of 30,500 feet.\textsuperscript{55} Despite these capabilities, it was produced only in small numbers prior to its retirement in 1942.\textsuperscript{56} Other, smaller long-range bombers had similar capabilities. The more widely-produced II-4 had a range of 2,360 miles and a ceiling of 31,800 feet, though with only M-88B engines, its payload was only 2,200 pounds.\textsuperscript{57} In concrete terms, this range meant that an II-4 launched from Moscow could have reached Warsaw and returned with a significant amount of fuel in the tanks, even when the effective range of these bombers was reduced by complicated flight paths, weather, payload and other factors. However, anecdotal evidence suggests that the VVS frequently did not use these bombers as a long-range strategic weapon.

\textsuperscript{54} Von Hardesty, \textit{Red Phoenix}, 170.
\textsuperscript{56} Ibid, 116.
\textsuperscript{57} Ibid, 394.
The term “long-range strategic bomber” is misleading insofar as one could misunderstand the qualifying adjectives as inherently bound together. Technologies that made long-range attacks possible could be utilized as tactical or operations-level assets; “long-range” does not necessarily imply “strategic”. The Il-4 and Pe-8 were long-range bombers were used only occasionally for strategic ends. In one of the few specific examples given in their book of Il-4 operations during the war, the anonymous writers of the Soviet Ministry of Defense recounted the bravery of one Captain N. F. Gastello while, “attacking a motorized column on the Molodechno-Roshkevichi road.”\textsuperscript{58} Other parts of the book imply that the use of long-range technologies against tactical occurred frequently. When describing the air counterattacks against advancing German columns in the late summer of 1941, the authors wrote, “most of its [the Long-range Bomber Forces] flights were made to destroy enemy troops.”\textsuperscript{59} Il-4 operations were against targets in the German rear (including some high profile raids against Berlin) were seldom mentioned, receiving only four paragraphs of the VVS account of the war.\textsuperscript{60} Had long-range strategic bombing been a major function of the VVS during the war, VVS authorities would have given more attention to the subject. All of this evidence suggests that even though the VVS had sufficient long-range bomber technology to conduct strategic bombing against infrastructural targets far behind German lines, the VVS used its wartime long-range bomber fleet to conduct tactical and operations level attacks.

One of the major reasons why the VVS chose to use its long-range bomber fleet for tactical attacks on German forces had to do with the nature of long-range strategic bombing. These missions required more planning than did other ground-attack missions. As the distance covered by a mission increased, so did the ability of enemy air defenses, fuel consumption, and

\textsuperscript{58} Ibid, 44.  
\textsuperscript{59} Ibid, 66.  
\textsuperscript{60} Ibid.
weather to adversely affect the mission. If the VVS considered airspace control through A.N. Lapchinsky’s paradigm, unless ground forces started winning serious victories and capturing Luftwaffe staging areas, the VVS would never have the requisite airspace control necessary to conduct such operations.

Strategic targets in the enemy’s rear also required a large intelligence effort. Planners needed information concerning targets which were far removed from the area of operations, while limited reconnaissance might have provided necessary information for a tactical strike. It was easier to strike a target within the immediate area of operations than one hundreds of miles outside of it. If the goal of strategic bombing runs had been the destruction of the enemy’s political and economic infrastructure, then strategic targeting had to be discerning. Planners determined which targets, if destroyed, would cause the most damage to this infrastructure, even when using area bombing techniques. Making such an assessment required a working knowledge of the infrastructure, obtained presumably through extensive intelligence work.

A stable, well-supplied staging area and a steady front is of the utmost importance to strategic bombers. When air bases face the possibility of capture by enemy ground forces, they must either relocate or take on a tactical role in order to reestablish a secure front. Either choice leads to a disruption of attacks necessary to exact major damage to the enemy political and economic infrastructure through non-precision long-range bomber attacks. This logic helps explain why the VVS used their long-range bombers as a primarily tactical asset, especially during the early months of the war. For the first two years of World War II, the Soviet front constantly faced the possibility of collapse.\textsuperscript{61} In constant retreat during the first half of the conflict, the VVS had little opportunity to establish bomber staging areas and collect information about targets outside of the immediate area of the front. However, it remains unclear why the

\textsuperscript{61} Richard Overy, \textit{Russia’s War}, 194.
VVS did not begin to stage intensive long-range bomber activities later in the war. Doctrinal prescriptions for the VVS, specifically those reflected in the writings of A.K. Mednis, may explain the continued use of long-range aviation technology for tactical and operations-level combat air support.\textsuperscript{62} Regardless of this imperfect explanation for the Soviet use of its long-range bombers as tactical and operations-level assets, all of the above evidence reveals one critical fact for this analysis. At the close of the war, strategic long-range bombing was an underdeveloped concept, despite the wealth of practical experience in ground-attack aviation gained by VVS pilots and commanders.

**The Acquisition and Development of Bomber Technology: 1945-1957**

This chapter will now turn to the Soviet acquisition and development of airpower technology in the years following World War II. It will examine both the methods of acquisition and development of aviation technology in the VVS as well as several important technologies acquired before the opening of the Korean conflict in 1950. The Soviet Union made great leaps in technical progress after the end of the World War II, transitioning in less than five years from a fleet of Il-2s, Il-4s, Po-2s and other such simple propeller aircraft to force of jet-powered Mikhoyan-Gurevich MiG-15s. A thorough examination of the acquisition of aviation technology in this period helps explain why Soviet military planners chose to utilize missiles as their primary strategic weapon when this alternative to bombers presented itself in 1957. This section will outline the different ways in which the military acquired new technologies, using the major milestones in Soviet aviation’s post-war technological development as illustrative examples. Then, it will look directly at the field-testing of aircraft in the Korean War. Ultimately, this

section will show that by the advent of the missile in 1957 the long-range aviation division of the VVS had not met the excessive demands of the high command of the Soviet military.

Despite his purges of the VVS high command in the aftermath of World War II, Stalin recognized the importance of aviation at the dawn of the Cold War. The United States had a bomber fleet of B-29s, whose 3,250 mile range enabled them to reach Soviet cities from either Europe or Japan. Also unnerving was the Soviet lack of nuclear-weapons technology. The ability to defend Soviet territory against American bomber attacks and to threaten the United States with a similar attack was the primary goal of the technical progress of this period. Though nuclear weapons technology often overshadows delivery systems, ineffective delivery systems undermine the value of nuclear weapons technology. Therefore, delivery systems are just as important as the weapons themselves, though perhaps not as popular of a subject. Thus, the Soviet quest for nuclear weapons technology was tied to a search for advanced aviation technology.

The VVS made significant advances aviation technology in several ways. First, the VVS utilized technology from existing research facilities which predated World War II. The Soviet Union also established additional scientific research facilities, which developed technologies acquired during and after the conflict with the Third Reich. A few important technologies were simply purchased from abroad. Finally, the Soviet Union utilized espionage in the US and the capture of US airplanes to acquire valuable aviation technology.

The quest for jet technology in the Soviet Union predated World War II, though the VVS did not fly jet aircraft until after the war. In the late 1930s, a team of engineers led by Arkhip Lyul’ka proposed designs for a jet engine that could producing 880 pounds of static thrust.

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64 Laurence K. Loftin, *Quest for Performance*. 

(henceforth abbreviated with the notation “lbst”). Some time earlier in Leningrad, the People’s Commissariat of the Aircraft Industry (Народный комиссариат авиационной промышленности, or NKAP) had set up a special design bureau for the same purpose. Hence, when Lyul’ka and his fellow scientists brought these plans to the authorities, the NKAP immediately endorsed the project and transferred Lyul’ka to an office in Leningrad. Before the outbreak of World War II, this Leningrad special design bureau (Опытно-конструкторское бюро, henceforth OKB) produced another jet engine, the RD-1, capable of 1,100 lbst, as well as plans for an even more powerful engine.\textsuperscript{65} Though the surprise attack of 22 June 1941 forced the abandonment of these projects, they illustrate that when the Soviet Union began to address the development of advanced aviation technology after World War II, Soviet scientists had both the bureaucratic institutions (the special design bureaus) as well as a body of scientific knowledge on jet propulsion from which to draw.

However, this body of knowledge was overshadowed by the technical information which the Soviet Union acquired from German sources during and after World War II. Germany had more developed jet technology than the Soviet Union did before the outbreak of the war. On 24 August 1939, German scientists successfully tested the Heinkel He-178 aircraft with a Heinkel HeS-1 centrifugal flow turbojet.\textsuperscript{66} Though this was only an experimental design intended to prove that the HeS-1 could function on an airframe, German aircraft designers then produced other jet aircraft for more practical purposes. One such jet aircraft was the Messerschmitt Me-262, a jet fighter which saw combat in World War II. The aircraft could fly up to 559 miles per


\textsuperscript{66} Ibid, 3.
hour and reaching a range of 652 miles. The two Junkers Jumo 004 turbojets were not the only advanced technological aspect of the Me-262; German aircraft designers had overcome the problems with the aircraft’s center of gravity created these engines by giving the wings a slight sweep and experimenting with their placement on the fuselage. The Me-262 represented a wealth of knowledge with respect to both engine design and to fighter airframe design.

German jet design was not limited to fighter technology. The Arado Ar-234 Blitz was a two-engine reconnaissance and mid-range bomber aircraft first flown on 15 June 1943. Powered by two Junkers Jumo 004B-4 axial-flow turbojets (modified versions of the Jumo 004 engine from the Me-262), the bomber could carry a payload of 3,310 pounds and fly at 465 miles per hour. The Ar-234 is an illustrates how Soviet design bureaus acquired and expounded upon preexisting German technologies. When Soviet forces captured an aircraft of particular interest, it was sent to three of the main testing institutes of the NKAP: the Red Banner State Research Institute of the Air Force (Государственный краснознаменный научно-исследовательский институт Военно-воздушных сил, hereafter GKN-VVS), the Flight Research Institute Gromov (Лётно-исследовательский институт имени Громова, hereafter L-II), and the Central Aero- and Hydrodynamics Institute Zhukovskiy (Центральный аэро- и гидродинамический институт имени Жуковского, hereafter TsAGI). After testing, the directors of the NKAP determined whether a particular technology was worth reproducing en masse. After testing the Junkers Jumo 004B-4 engines acquired from the Ar-234 in the final year of World War II, the NKAP charged its chief designer, Vladimir Klimov, with the planning the mass manufacture of the engine. It began in 1946 in an Ufa factory, which also manufactured a descendant of the

69 Yefim Gordon, Early Soviet Jet Bombers, 3.
original Soviet RD-1 jet engine. \textsuperscript{70} In some cases, the NKAP rejected German engine designs in favor of Soviet designs. After comparative testing in 1945, the NKAP chose to produce Lyul’ka’s S-18 turbojet instead of the Jumo 004 from the Me-262. Despite the abundance of German aviation technology available, the NKAP was nevertheless a discerning consumer.

Another method in which the Soviet Union acquired advanced aviation technology after World War II was direct purchase. Having just conquered the Third Reich, there remained only two vendors from which the Soviet Union could purchase advanced aviation technologies: the US and Great Britain. The NKAP acquired two of its most important jet engines in this fashion from Great Britain. Stalin initially scoffed at the notion of purchasing jet technology from the British, assuming that they would never sell this technology to any nation. Stalin purportedly mocked the idea, saying, “Pooh! Who’s stupid enough to sell his secrets?” \textsuperscript{71} Nevertheless, he authorized a special visit in 1946 to Great Britain by several important aircraft designers, including Artyom Mikoyan and Vladimir Klimov. In late 1945, the British Ministry of Aircraft Production and the Air Ministry had begun to declassify and sell their equipment to foreign countries for profit. On 21 December 1945, these ministries authorized the sale of two types of Rolls Royce jet engines, the Derwent and the Nene, to the United States and Sweden. Because the post-war enmity between East and West had not yet been fully established, the British could not refuse the sale of the engines to the Soviet trade delegation without appearing to discriminate against the Soviet Union. \textsuperscript{72} By the end of their visit, Mikoyan and Klimov procured 55 Derwent V, Nene I and Nene II Rolls-Royce centrifugal-type turbo-jet engines. The NKAP sent these engines for extensive testing at TsAGI, where they eventually decided to reverse engineer the

\textsuperscript{70} Ibid, 4.
\textsuperscript{71} Ibid.
engines and produce them as the RD-500 and RD-45 engines. Later in the year, one of the Soviet OKBs incorporated upgraded models of these engines in the design of the Soviet Union’s primary jet fighter of the early Cold War, the Mikoyan-Gurevich MiG-15. This was not the only case in which the NKAP directly purchased airplane parts from foreign powers; an article in the online archives of the National Museum of the Air Force notes that the NKAP also purchased smaller parts for their reverse-engineered Tupolev Tu-4 Bull from companies in the United States.

The Soviet Union also acquired aviation technology through espionage. Despite the sometimes questionable credibility of the investigations of the United States House of Representatives Committee on Un-American Activities, a transcript of hearings before the committee dated 6 June 1949 reveals that Soviet operatives attempted to infiltrate the US aviation industry in order to further their own aerodynamic research programs. Three testimonials described one Russian agent, Andrei Schevchenko, who had been an engineer with the NKAP before the war. When he was charged with the task of stealing classified information about US jet-propulsion systems and airframes, he took the official cover of an aviation department representative of the Soviet Purchasing Commission, allowing him to work in close contact with the Bell Aircraft Corporation as the company’s Soviet liaison. Schevchenko began to frequent Bell’s library of restricted-access aeronautical documents in upstate New York in 1942, coming into contact with librarian Leona Franey. Schevchenko began to frequent the library, asking for the few unclassified, general aerodynamics texts in the collection and making friends with the staff through small gifts. At this time, the Federal Bureau of Investigation

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* This work is cognizant of the fact that the testimonials of
contacted Franey, advising her that they were keeping close surveillance of Schevchenko and asking for her cooperation. Franey complied, but took no immediate action. As time went on, Schevchenko began to ask for documents on more specific, advanced subjects, such as compressibility*. Near the end of his time in the US, he began to request classified documents by their specific call numbers, which were available only on a classified list issued by the National Advisory Committee on Aerodynamics (NACA).75

Franey kept a list of the documents he requested and with FBI authorization provided him with some of the less-important documents*. The majority of these documents were either restricted, confidential, secret or top secret. Some of the titles included: “Swept-Back Wings at High Velocities”, “High-Speed Measurements on a Swept-Back Wing (Swept Back Angle 35 °)” and “Wing Plan Forms for High-Speed Flight”. The list of titles kept by Franey pointed to Schevchenko’s interest in trans- and supersonic aerodynamics. When another American contacts, Loren G. Haas, inquired about this interest, Schevchenko claimed to have had been, “a competitor in a contest the prize of which was 500,000 rubles. The objective of the competition was the complete design of an ultrahigh-speed (sic) aircraft powered by jet propulsion.”76 In his 6 June 1949 testimony, Haas conjectured that Schevchenko had been trying to procure information on an advanced US jet fighter with a 35-degree wing sweep, the Lockheed F-90. While Haas, an engineer with Bell, did not imply that the F-90 itself was of particular value in and of itself, his testimony suggests that the innovations in its propulsion and airframe design

* As an aircraft approaches the sound barrier, the air hitting the surfaces of the aircraft actually compresses and increases in density, instead of simply flowing over the aircraft as a perfectly incompressible fluid. This change in density is of paramount importance for the structural design of supersonic jet aircraft.
75 House Committee on Un-American Activities, Soviet Espionage Activities in Connection with Jet Propulsion and Aircraft, 81st Cong., 1st sess., 6 June 1949.
* There was no way for FBI counterintelligence agents to arrest Schevchenko unless he possessed some restricted information
76 House Committee on Un-American Activities, Hearings on Soviet Espionage Activities in Connection with Jet Propulsion and Aircraft.
were of great importance in the field of transonic aerodynamics. Haas testified, “If Mr. Schevchenko had been able to gather this information and consummate it in such a way, and had the help to do it, 4 years ago the Russians could have had the aircraft which we have today.”

The final way in which the NKAP acquired aviation technology in this period was the capture of US airplanes. This method was uncommon, but one well-known case was critical in the development of the Soviet long-range bomber program. Leonid L. Kerber, an NKAP engineer associated with the Tupolev OKB, described the capture of US Army Air Corps B-29s in 1944:

In the war between Japan and the U.S. there were several occasions when state-of-the-art American strategic bombers, the Boeing B-29 “Superfortress”, damaged by the Japanese, were unable to make it to their bases in the Philippine Islands. President Roosevelt asked Stalin to allow them [the B-29 crews] in such cases to land at Soviet aerodromes near Vladivostok. Permission was given. But since our country was not yet at war with Japan, then, in accordance with international norms, the stranded B-29 crew were interned, and the airplanes came under our custody. That’s how we got three B-29s. And when the Cold War started, Stalin wondered whether we shouldn’t quickly equip our air forces with modern bombers, and to try to reproduce the B-29 here.

Records from the National Museum of the Air Force corroborate this information, though they claim that there were four B-29s which crashed in the Soviet Union.

Reverse-engineering an aircraft as advanced as the B-29 was no easy feat for several reasons, which Kerber mentioned in his memoirs. First, the OKB faced a deadline of one year to produce twenty aircraft. Second, Soviet aircraft manufacturing equipment was in metric, while Boeing’s manufacturing equipment was not. Soviet steelmakers lacked the precision machinery to circumvent this problem, so some parts of the Soviet design were larger or smaller than the

77 Ibid.
79 United States Air Force, “Factsheets: Soviet Union Impounds and Copies B-29”.

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same parts on the American design, changing the weight of the aircraft and its flight characteristics. Additionally, Soviet engineers were unsure of the extent to which they were to copy the B-29. Kerber mentioned parachute design as an example of this problem. While American bomber crew-members wore their parachutes on their backs, Russian bomber crews had special seat-mounted parachutes. Tupolev OKB engineers could not decide whether to install their system or to make a copy of the American parachutes and seats; they had to receive authorization from higher-ranking officials before they decided against the reproduction of the American model. This parachute question may appear absurd, as the parachutes made no difference in the aircraft’s performance. However, one must consider that Tupolev OKB engineers were working on a project which was conceived by Stalin himself. Given his recent purges of the post-war Soviet military, giving Stalin what he wanted was more important than cost-effective decisions concerning the aircraft’s design. Despite these difficulties, the NKAP tested their first reverse-engineered B-29 in the spring of 1947. Though Soviet engineers did not meet the one-year manufacturing deadline for these aircraft, which they gave the title of Tupolev Tu-4, the bomber became one of the more important aircraft in the VVS. It was a Tu-4 which dropped the Soviet Union’s first atomic bomb in August 1949.

The Soviet Union acquired a significant amount of aviation technology through these four methods, creating a formidable force of jet fighters with which to defend itself against American bomber attacks. On 30 December 1947, the Mikoyan OKB tested the first MiG-15, giving the VVS a reliable modern jet fighter. Having survived nearly three years with the looming possibility of a nuclear bomber attack from the West, this development was noteworthy. The chances of World War II fighters destroying an entire fleet of American B-29s and their

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80 Leonid Lvovich Kerber, *Tupolev’s Secret Research and Development in the Gulag.*
81 Leonid Lvovich Kerber, *Tupolev’s Secret Research and Development in the Gulag.*
fighter escorts was slim; their technology was inferior and their pilots inexperienced in attacking long-range bombers. The technological advantage gained by the VVS through the development of the MiG-15 changed this entirely. With its 6,000 lbst. engine, the MiG-15 could wreak havoc on bomber formations flying well below its top speed of 582 knots and its service ceiling of 51,000 feet.\(^{82}\) Updated versions of the B-29, which came out in the late 1940s as the Boeing B-50 “Superfortress”, would have been easy prey for even inexperienced MiG-15 pilots.\(^{83}\) In less than five years after the MiG-15’s initial test flight, the Soviet Union produced some 15,000 of them.\(^{84}\)

Efforts to procure advanced bomber technology did not yield the same dramatic change in the long-range aviation division of the VVS. The development of the Tu-4 was a milestone for Soviet long-range aviation, as this plane could better fulfill its role as a long-range strategic bomber than the older Pe-8 and Il-4.\(^*\) A 1985 United States Air Force publication on Soviet air power estimated that the VVS had built at least 1,000 Tu-4s by 1953, making it the Soviet Union’s first premier Cold War strategic bomber.\(^{85}\) The VVS, after a decades-long experience as a tactical air force, had finally begun to prepare for the challenges of large-scale strategic bombing.

Despite the momentous leap forward which Soviet long-range bombing had taken as a result of the Tu-4, the long-range aviation wing of the VVS (henceforth DA for дальняя авиация) was ill-equipped to enter a full-scale nuclear conflict with the United States. The range of the Tu-4 was not enough to attack the United States from the Soviet Union. NKAP engineers

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83 Ibid.
85 A brief comparison of data from the National Museum of the US Air Force factsheet on the B-29 and the aforementioned Pe-8 and Il-4 yields this conclusion.
looked to jet technology to solve this problem; however, Soviet attempts to incorporate jet technology into long-range bombers were generally unsuccessful in the first seven years after World War II. The German jet bomber, the Ar-234, had neither the payload nor the range for long-range operations. In order to ameliorate this, NKAP engineers had to either design jet engines that were more powerful than the Junkers Jumo 004B-4, or learn how to mount multiple jet engines on a large aircraft without compromising its aerodynamic stability or reducing its range and payload. Neither Soviet sources nor secondary literature on this period in Soviet aviation history explicitly state why exactly this was the case. It is not clear whether NKAP engineers were encountering difficulty in designing more powerful jet engines. However, the list of topics requested by NKAP agent Andrei Šchevchenko at the Bell Aircraft library suggests that NKAP engineers were having difficulties with the airframe design of high-speed jet aircraft.\textsuperscript{86} Kerber also mentioned these difficulties when describing the fitting of the 7,500 kilogram Milukin AM-3 turbojet on the Tupolev Tu-16, one of the mid-range bombers which replaced the Tu-4 in the mid-1950s:

The size of the AM-3 was so unprecedented that mounting one to the aircraft, or \textit{a fortiori}, two of them, did not work out in any way. Hang them underneath the wings? They would touch the ground. Place them inside of the fuselage, like a fighter? There was no room left over for the bombs. Put them on the sides of the fuselage near the tail, as the French later did on the “Caravelle” and the \textit{Ilyushnitsy} on the II-62? It did not happen, as at this time there had not been enough studies for such a crucial step.\textsuperscript{87}

Because of these problems, NKAP engineers did not test a jet-powered aircraft with a greater range than the Tu-4’s for several years. Not until 1953 did the Soviet Union develop a jet-powered alternative: the Tupolev Tu-16. Like its US counterpart, the Boeing B-47 Stratojet,
this bomber lacked the combat range to attack the enemy’s heartland. The Tu-16 was no solution to the problem of creating an intercontinental jet bomber. Kerber recalled that Stalin scorned Tupolev and the rest of the Tu-16’s engineers for failing to create a “much-needed” intercontinental bomber. Stalin’s frustration was understandable, as by 1953, he did not have a bomber which could reach all parts of the United States. Though American long-range bomber technology was not significantly more advanced in the early 1950s, US bombers did not have to fly from North America to strike the Soviet Union. In Stalin’s view, an intercontinental jet bomber was the only way to reestablish strategic parity with the United States, apart from some major technological development outside of the field of aviation. When, after nearly a decade of experimentation, his scientists were unable to produce such an aircraft, Stalin became dismissive of the bomber as the main weapon of nuclear war, ridiculing it as “transitory and fortuitous”. Despite important advances in Soviet bomber technology in the mid-1950s (most notably the development of the iconic Tupolev Tu-95, a 4-engine swept-wing turboprop which could break the sound barrier), the Soviet high command had begun by the early part of the decade to look for an alternative nuclear delivery system.

The failure of NKAP scientists to develop a jet-powered bomber which could reach the interior of North America was not the only reason for Stalin’s dismissive attitude towards the DA. The air war in Korea revealed that without serious improvements in range, speed, and service ceiling, the long-range bomber would lose value as a strategic asset. Korea was an opportunity for the Soviet Union to test its jet fighter technology against contemporary American

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88 Kenneth R. Whiting, *AU-21: Soviet Air Power*, 99. Note: the M-4 appears to have been able to reach the continental US, but many regions of the country still would have been far out of its range.

89 Leonid Lvovich Kerber, *Tupolev’s Secret Research and Development in the Gulag*.

bombers; the results of this test caused Soviet leaders to reconsider the role of their bomber fleet in the jet age.

Air-power was one of the Soviet Union’s greatest contributions to the Korean conflict. As early as August 1950, Stalin stationed several Soviet MiG-15 units in Manchuria as a defensive measure against American bomber attacks. Despite pressure from both North Korea and China to use Soviet MiG-15s only in support of Chinese ground forces on the Korean peninsula, the defense of targets in China and the eastern Soviet Union remained the primary function of these jet fighter units, although Soviet pilots flew occasionall combat-support missions over the Korean Peninsula and trained Chinese pilots in Manchuria.91

The initial involvement of the newly formed United States Air Force hearkened back to the Allies’ strategic bombing campaign in Europe a decade earlier. B-29 bombers flew missions deep into North Korean territory to destroy the country’s economic, political and military infrastructure. These large-scale daylight bombing raids continued well into 1951, when the appearance of the MiG-15 brought them to an end. Despite its durability and defensive firepower, the B-29 could not effectively defend itself against the jet fighters. American fighter escorts, primarily the Republic F-84 Thunderjet and the North American F-86 Sabre, proved ineffective against faster MiG-15s, whose rate of climb made it possible to dive on bomber formations and avoid dogfights with American fighter escorts. Soviet ground controlled intercept radar (henceforth GCI) further compounded the problems of undertaking large daylight bombing raids by enabling the vectoring of large numbers of scattered Soviet and Chinese fighters to one location. Soviet GCI radar was responsible for the worst week of the war for B-29 pilots in late October 1951. Beginning with the loss of three B-29s on 23 October 1951 (later

called “Black Tuesday”) over the Namsi Airfield, the USAF lost a total of 8 B-29s. Compared to the losses of the bomber program in Europe a decade earlier, these numbers were small. However, as historian Conrad C. Crane notes, “These casualties were catastrophic for an organization with less than ninety B-29s and crews, especially when most occurred during one week.”  They demonstrated the ineffectiveness of slow, massive bomber formations as a strategic weapon in the jet age. If bombers were to continue to be an effective strategic weapon, they required the speed and ceiling to avoid jet fighters vectored by GCI radar.

The failure of the B-29 in Korea reinforced Stalin’s critique of bomber aircraft. The victories of Soviet and Chinese pilots against B-29s in the war had an unusual cost: the MiG-15 had just proven most of the VVS’s own bomber fleet to be obsolete. The F-86 was comparably effective, if not superior to the MiG-15 in combat, despite its ineffectiveness in defending B-29s. According to USAF records, by the fall of 1952, the ratio of F-86 kills to MiG-15 kills was eight to one. If American fighter technology were better than that of the Soviet Union, the Tu-4 would have fared worse against the F-86 than the B-29 did against the MiG-15. In this context, Stalin’s cynicism towards the long-range bomber as a strategic weapon was merited. Not only had he witnessed nearly a decade of failed long-range jet bomber development; the Korean War just showed that one of the few successes of the NKAP’s bomber engineering program (i.e. the Tu-4) was obsolete in the world of jet technology. Because of his outdated fleet of Tu-4s and the proven advanced state of US jet fighter technology, Stalin must have realized the improbability of carrying out a successful nuclear attack against either the North American continent or US allies in Europe in the early 1950s.

In the years between the end of the Korean War and the creation of the Soviet Strategic Rocket forces in 1960s, the attitude of the Soviet leadership towards the VVS did not change significantly. While they continued to invest money in the program, the Soviet elite regarded long-range bombers as only a temporary replacement for the developing ICBM force. In this period Khrushchev claimed the airplane would inevitably end up as a relic in a military museum.\textsuperscript{94}

The advances in Soviet and American aviation technology between the Korean War and the creation of the SRF in 1960 did not change this pessimistic attitude.\textsuperscript{95} The Tupolev Tu-95 and its jet cousin, the Myasishchev Mya-4, the first Soviet intercontinental bombers, entered service in 1955. However, the heads of DA in the VVS had no time to establish these aircraft as the primary long-range strategic asset of the Soviet Armed Forces. Given the pessimistic attitude towards bomber technology held by the Soviet political and military elite in this decade, it is no surprise that in 1957, they enthusiastically welcomed the launch of the long-awaited solution to earlier Soviet failures, the ICBM. This relegated long-range bomber technology to a secondary role in Soviet nuclear strategy, effacing the magnitude of the development of the Mya-4 and the Tu-95.

Other technological developments in the mid- and late 1950s increased the cynicism towards bombers that Stalin had expressed earlier in the decade. In the aftermath of Korea, defensive airspace control of the USSR shifted from the VVS to a new branch of the Soviet military: the Противо-воздушная оборона страны (Air Defense Forces, henceforth PVO).\textsuperscript{96} The establishment of this branch showed an increasing awareness of the different types of fighter-based aviation. Both Soviet and American military aviation introduced interceptor

\textsuperscript{94} Ibid, 50.
\textsuperscript{95} Ibid.
\textsuperscript{96} Ibid, 60-1.
technology. While the MiG-15 and F-86 had been used as all-purpose fighters during the Korean conflict, interceptor technologies had one purpose: defensive airspace control of a large area through the destruction of enemy bombers. These aircraft were faster, could climb faster to high altitudes, and had better GCI radar systems than fighters.97 Additionally, they could carry both guided and unguided missiles.98 The interceptors of particular concern to the Soviet Union were the Convair F-102 Delta Dagger, the Lockheed F-104 Starfighter and the Convair F-106 Delta Dart, all of which had capabilities similar to the PVO’s own early interceptors, the Yakovlev Yak-25 and the Tupolev Tu-28.99 The most advanced of these interceptors, the F-106, had, “a maximum speed of 1,525 miles per hour (M=2.31) at 40,000 feet and the capability of climbing to its combat ceiling of 51,800 feet in 6.9 minutes; service ceiling was 52,700 feet.”100 The F-106 also had impressive fly-by-wire capabilities, which made it more effective. Instead of making the pilot rely on GCI to navigate to a “favorable attack position” to launch its nuclear-tipped Douglas AIR-2 Genie anti-bomber rocket, a ground controller could send radio signals to the aircraft’s autopilot, which vectored the aircraft directly to the target, decreasing the likelihood of navigation error by the pilot.101

Equally troubling to the leaders of DA was the advent of the surface-to-air missile (SAM) in the mid-1950s. Testing of the first Soviet SAM had begun in 1952. Four years later, serious deployment of the missiles began around Moscow. By 1958, the Lavochkin OKB produced the

98 Laurence K. Loftin, Quest for Performance.
100 Laurence K. Loftin, Quest for Performance.
101 Ibid.
most effective of the early Soviet SAMs, the SA-2.\textsuperscript{102} The SA-2 demonstrated its effectiveness in 1960 when it shot down the U-2 reconnaissance aircraft of Francis Gary Powers. This was an impressive feat, as the U-2 was could cruise well above the service ceiling of any US bomber.\textsuperscript{103} The leaders of the VVS likely realized that the US had SAMs which could wreak similar havoc on any attacking fleet of Tu-95s or Mya-4s, unless these bombers had the appropriate countermeasures for the missiles.

Interceptor and SAMs changed the nature of the problem faced by the VVS. The Tu-95 and Mya-4 solved the problem of range. However, the advent of American interceptors, which were designed to destroy long-range bombers, made the air defenses of the US a serious concern. Bombers had both to reach America and find a way to avoid the new fast-moving, high-flying aircraft. This presented a conundrum for Soviet engineers: one could increase the speed or service ceiling of a strategic bomber, but only at the expense of range. American engineers at Boeing accepted this challenge and in the mid-1950s began work on the Boeing B-58 Hustler, which first flew on 11 November 1956. Its impressive capability of a “supersonic dash” of Mach 2.0 at 63,150 feet limited its aircraft’s range, resulting in the limited production and eventual abandonment of the aircraft’s production.\textsuperscript{104} Soviet engineers designed but never produced an equivalent of the B-58, the Myasishchev Mya-50, whose design modifications for increased speed and altitude limited its range.\textsuperscript{105} Despite the limited range of early supersonic bombers, their emergence was unnerving for Soviet military planners. Even though the B-58 did not have the range necessary to attack Soviet cities from North America, a fleet of these bombers

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\begin{itemize}
  \item \textsuperscript{104} Ibid.
  \item \textsuperscript{105} Bill Gunston, ed., \textit{The Osprey Encyclopedia of Russian Aircraft} (Oxford, UK: Osprey, 1995), 260-261.
\end{itemize}
launched from a European airfield in the late 1950s could have penetrated Soviet air defenses and struck Soviet targets. Given their lack of a staging area in the Western Hemisphere before the Cuban Revolution in 1959, the Soviet strategic air forces had no recourse for a supersonic bomber counterattack. By the time of the formation of the SRF in 1960, NKAP engineers had not devised aviation technology which overcame the problems of distance and interceptor aircraft countermeasures. The Soviet Union was in desperate need of a nuclear delivery system which could reach North America and could cut through enemy air defenses.

**Conclusions**

Several factors explain why the Soviet Union never adopted the long-range bomber as its primary strategic nuclear delivery system. VVS experiences in World War II proved that the Soviet long-range bomber program was underdeveloped before 1945. While the Soviet Union had a fleet of long-range bombers which could strike targets in Germany, these aircraft were not utilized as a strategic weapon because of the lack of a stable front, a secure staging area, and requisite intelligence for targeting. Unlike the air forces of its allies, the Soviet Union in World War II did not gain extensive experience with long-range strategic bombers; going into the Cold War, there was little precedent for using Soviet long-range bombers as a strategic assets. Unlike the United States, the Soviet Union had no special attachment to the bomber as its primary long-range asset. When a replacement for bombers arrived twelve years after World War II, Soviet had no problem with assigning DA to an inferior place in the Soviet strategic arsenal.

Because the VVS was deficient in bomber technology in 1945, the NKAP began a decade-long attempt to overcome the vast distances of intercontinental nuclear war with the United States. It acquired technology through its own engineering efforts, the salvage of German technologies, reverse-engineering, direct purchase, and espionage. The post-war drive for
aviation technology resulted in several advances in aviation, particularly the Tu-4 bomber. However, the Korean War renewed the search for better bomber technology, showing that the Soviet fleet of Tu-4s was obsolete in a jet-powered conflict. Disappointed with the inability of NKAP engineers to produce an intercontinental, jet-powered alternative to the Tu-4, Stalin began to decry aviation as a fortuitous, transitory part of the Soviet strategic arsenal. Despite the production of two intercontinental bombers in the mid-1950s, this attitude persisted after Stalin’s death. The advent of interceptor aircraft in the mid- and late 1950s created additional challenges for the engineers of the NKAP, who could not produce an aircraft with both an intercontinental range and the capability to penetrate the air defenses of the United States. All these factors resulted in pessimism towards the long-range bomber among the Soviet military elite. The failure to develop effective intercontinental bombers which could penetrate interceptor air defenses led Soviet authorities to look to other delivery systems in hopes of establishing a strategic advantage over the United States in a nuclear conflict.
Chapter III: An Alternative to the Long-Range Bomber

No examination of aviation history should treat aircraft and engines as isolated technologies. The development of aviation technology in the Soviet Union was tied to the development of corresponding alternatives and countermeasures. In this light, this analysis turns now to the evolution of rocket and missile technology from World War II until the early 1960s, when the Strategic Rocket Forces (SRF) became the primary strategic arm of the Soviet Armed Forces. This paper has so far explained the long-range bomber’s subordinate position in the Soviet strategic arsenal of the Cold War, which resulted from the People’s Commissariat of the Aviation Industry’s (NKAP) failure to develop technologies which met the expectations of the Soviet military and political elite, the development of effective bomber countermeasures, and the Soviet Air Force’s (VVS) lack of experience with and attachment to the concept of strategic bombing. These factors would have been insignificant, however, if the Soviet military had no superior alternative to its long-range bomber program.

The Soviet Union found this superior alternative in its intercontinental ballistic program (ICBM), which grew both out of the efforts of Soviet engineers and the expertise of captured German scientists. Like the development of the intercontinental bomber, the development of the ICBM was fraught with shortcomings and disappointments. The Soviet military elite did not look to the ICBM as its primary long-range strategic weapon because the development of the program had been both easily accomplished and wildly successful. Factors outside of the ICBM technology (especially the command and control [C2] of the SRF and the ties of ICBM technology to the Soviet space program) contributed to perceptions that the missile was superior to the bomber.
From St. Petersburg Chimneys to Low Earth Orbit

Russian theories in the field of rocketry predated the Soviet Union by almost two decades. Prominent physicists of tsarist times, such as K.E. Tsiolovsky and I. V. Meschersky, published extensive research in the field of “theoretical rocket dynamics” around the turn of the century. According to the historian G.A. Tokaty, these early designs for rockets were left as simple technological dreams, which “never rose above St. Petersburg’s chimneys.” However, successive designs eventually reached testing facilities, when the engineers G.A. Tsander and M.K. Tikhonravov constructed and tested liquid-propellant rockets in 1933 and 1934. Technologically, these rockets had little influence on the post-war innovations in rocketry, as they were too crude for anything but laboratory experiments. More important were the engineers who conducted these experiments, as they belonged to the generation who later designed early Soviet space and ICBM technologies. The most prominent of these engineers was Sergei Pavlovich Korolev, the future “Глavnый конструктор” or “Chief Designer” of the Soviet space program.

The Soviet ICBM force of the early 1960s owed much to the research of German scientists two decades earlier. At the end of World War II, as Allied forces moved through Germany, France, Poland and the Netherlands, they recovered remnants of the Reich’s rocket program at multiple facilities. The most significant of these, which was located north of Berlin on the Baltic coast between Rostock and Stettin, was Peenemünde. Peenemünde was originally the heart of the German rocket program, but bombing raids in the summer of 1944 caused the

107 Ibid.
dispersion of the program’s facilities among multiple concealed sites across the Reich.\textsuperscript{108} Three days before end of the war, the Second White Russian Army under the command of General Konstantin Rokossovsky captured Peenemünde.\textsuperscript{109} Though the facility had been heavily damaged by Allied bombing raids late in the war, the Soviets recovered a significant amount of technology and, more importantly, German engineers. Between the end of the war and October 1946, the Soviet Union resurrected the German facilities for rocket development in its occupation zone.\textsuperscript{110} Soviet authorities rounded up high-priority engineers in their occupation zone in accordance with a ranked list of figures in German rocketry, attempting at times to entice prominent scientists in Germany’s other occupied zones to work for the USSR. In this way, the Soviet Union obtained the help of Helmut Gröttrup, one of the main deputy designers for guidance systems under famous engineer Werner von Braun. Gröttrup took charge of the development of the rocket facility at Mittelwerk.\textsuperscript{111}

However, these resurrected German rocket facilities in the Soviet occupation zone were short-lived. On 22 October 1946, Stalin ordered General Ivan Aleksandrovich Serov of the NKVD to transport all captured German personnel from the rocket program to the Soviet Union.\textsuperscript{112} Though historian Honoré M. Catudal claims that this occurred simply because Stalin was disappointed with the lack of productivity at these facilities, he was likely worried about defection of the scientists to the Western occupation zones or a possible attack from the United States, which could remove the German engineers from his control.\textsuperscript{113} Regardless, the NKVD moved some 6,000 Germans and their families to Gorodomlya, a small island on a lake north of

\textsuperscript{110} Michael J. Neufeld, \textit{The Rocket and the Reich}, 283.
\textsuperscript{111} Ibid.
\textsuperscript{112} Ibid. 287.
\textsuperscript{113} Honoré M. Catudal, \textit{Soviet Nuclear Strategy}, 34.
Many were moved against their will, as a passage from the memoirs of Gröttrup’s wife, Irmgard, confirmed: “Could these be the same officers who not so long ago had tried, with a courteous smile, to make the reconstruction of our experimental station palatable to us? The same officers who, in response to our tentative inquiries, assured us that we should never be sent to Russia? . . . I tried to get out through the back door. Impossible! The barrel of a gun - a broad face: ‘Nyet.’” Once stationed in Russia, the German scientists worked alongside Soviet special design bureaus (OKB). However, the Germans were never fully incorporated into Russian rocket engineering programs. By 1951, Stalin had sent all the German scientists back to East Germany. Nevertheless, in six years, German scientists and their captured rocket technologies made a profound impact on the development of Soviet rocket technology.

The two most important technological contributions of these German engineers were the V-2 and A-9/A-10 rockets. The wartime V-2 Vergeltungswaffen (henceforth A-4, in accordance with German engineers’ system of designation) attacks on civilian targets in England, which began in September 1944, were the first military use of a long-range ballistic missile. Several features of the missile illustrated the capabilities and limitations of the first rocket technologies that the Soviet Union obtained in the post-war era. Despite the attention which the A-4 has received from World War II scholars, it was not an effective weapon, even for breaking civilian morale in indiscriminate attacks. In his book, The Rocket and the Reich, author Michael J. Neufeld asserts that all 3,200 high-profile German A-4 attacks against London and Antwerp during the war killed fewer people than some of the individual RAF air raids on German

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114 Ibid.
cities. In order to kill a handful of civilians, the Reich used resources that could have built 24,000 fighter aircraft. The A-4 was neither economical nor militarily effective. Its ineffectiveness was the direct result of its targeting systems. Electronics and computer systems in the 1940s were too crude to create an accurate guidance system. The A-4 could only target major cities with reasonable accuracy, making it little more than a rocket-based version of the famous Paris Gun. However, much like the Paris Gun, no existing countermeasures could stop an A-4 once it was in flight. Soviet military authorities likely realized that an improved guidance system could make a ballistic missile an effective long-range weapon. Thus, the A-4 was a good starting point for Soviet scientists, who sought to design larger rockets.

At this time, the United States’ air bases in Western Europe enabled US bombers to strike the heart of the Soviet Union. The Soviet Union, on the other hand, had neither the bases nor the long-range bombers to launch a strike against the US. As a result of this strategic dilemma, the long range of German rocket technologies was of particular interest to Stalin and his military leaders. The A-4, however, was not long-ranged: its 25,000 lbst engine could carry a one-ton warhead only 256 miles, much less than the range of contemporary heavy bombers. Early German forays in the design of multi-stage missiles enhanced the range of the Soviet Union’s acquired rocket technologies. Before 1942, German engineers had produced plans for the A-9/A-10 missile, which used a 220,000 lbst liquid-oxygen and alcohol engine in the first stage, followed by the engine of an A-4 during the upper stage of flight. Though it was never produced, such a rocket could have flown more than 3,000 miles, making the A-9/A-10 the

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118 Ibid, 273.
119 Ibid, 274.
121 Michael J. Neufeld, The Rocket and the Reich, 282.
122 Ibid, 283.
world’s first ICBM. This rocket was a marvel of German engineering. While the engineers of
the NKAP struggled to overcome problems of distance and flight endurance, this rocket-based
solution to intercontinental distances existed almost a decade before thermonuclear warheads. If the A-9/A-10 had entered production, however, accuracy would have hindered its military
effectiveness to an even greater degree than the A-4. The firing of an upper stage engine while
in flight compounded the problems of guidance, while the increased distance amplified
inaccuracies by a large scale.

The German rocket technologies which the Soviet Union recovered in the aftermath of
World War II were not particularly effective. Nor were these rocket technologies more or less
advanced than the jet-engine and airframe technologies which the Soviet Union had acquired
from German, British, and American sources. Inherited technologies in both fields had their
separate problems, leaving the Soviet Union rocket program in 1946 with no advantage over
aviation technology.

The initial post-war development of Soviet rocket technology mirrored the development
of Soviet aviation technology. As in the case of bomber technology, the first major step forward
took place in 1947 and was a copy of a preexisting technology. In September, the Soviet OKB
on Gorodomlya moved to a desolate island on the Volga, near Stalingrad. At this site,
Kapustin Yar, the Soviet Union tested the R-1 ballistic missile on 30 October. R-1 was a
duplicate of the A-4. It suffered from the same problems of guidance and limited range; like the
A-4, it was not an effective strategic weapon. However, it marked the end of Soviet dependence
on German rocket engineering and the beginning of a decade of experimentation with Soviet
designs for ballistic missiles.

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In the ten years which passed between the testing of the R-1 and the first flight of Sputnik, Soviet rocket engineers constructed eight different models of ballistic missiles, encountering numerous difficulties with propulsion, heat, guidance, stability during warhead separation, and the weight of warheads. For example, before the acquisition of the hydrogen bomb, no ballistic missile could carry any nuclear device in the Soviet arsenal; fission-driven warheads were too heavy. Only the advent of lighter thermonuclear (i.e. fusion-driven) warheads starting in late 1953 ameliorated this situation.\textsuperscript{125} The decade following the testing of the R-1 was one of numerous problems and small successes; no single design solved all the major problems. As with bombers, not until the mid-1950s were Soviet ballistic missile designs ready for use in intercontinental nuclear warfare. Not until 1956 could Soviet engineers launch a medium-range ballistic missile, the R-5M, with a live nuclear warhead.\textsuperscript{126}

The most successful of the early Soviet ballistic missiles was the R-7, known in the NATO coding system as the SS-6. The R-7 was a fusion between a decade of Soviet engineering and the German concept of a multi-stage rocket. The R-7’s 403.4 tons of static thrust could propel the two-stage missile and a 5.4 ton warhead 4,971 miles. The first three tests of the missile in 1957 failed, primarily because stability issues in the first phase of flight. The fourth test of the R-7, on 21 August 1957, brought the missile’s first successful flight to a destination point, making it the world’s first ICBM. Shortly thereafter, on 29 March 1958, the R-7 delivered a warhead to a designated destination.\textsuperscript{127} Despite its similarity to the multi-stage designs of German engineers from fifteen years earlier, the R-7 was more than an upgraded A-9/A-10.

\textsuperscript{125} Honoré M. Catudal, *Soviet Nuclear Strategy from Stalin to Gorbachev*, 36.
Korolev, one of its main designers, had developed a new system of guidance. Instead of utilizing radio-controlled fins, he devised a system of small vernier thrusters on the sides of the missile for direction control and stabilization. In conjunction with an onboard set of gyroscopes, these thrusters gave the missile more accuracy and stability than its predecessors.\footnote{Ibid.}

The R-7 was most famous for its involvement in the early Soviet space program, not for its role as a strategic weapon. In fact, the R-7 never became a major part of the Soviet ICBM arsenal. The Soviet military elite instead chose to wait for the development newer ICBMs, such as the R-16 (NATO designation SS-9) and the R-9 (NATO designation SS-8), later in the decade before building ICBM units for the SRF.\footnote{Honóre M. Catudal, \textit{Soviet Nuclear Strategy from Stalin to Gorbachev}, 51.} The R-7 nevertheless remained a cornerstone of Soviet rocketry as the propulsion system of choice for two of the major events of the early Space Race, Sputnik I and Vostok I.*\footnote{* According to The Rocket Men, 78, Gagarin’s capsule was launched by an upgraded, three-stage version of the R-7}

Though Soviet documents from these early stages of the Space Race are not readily available to explain engineers’ preferences for the R-7, American documents from the same era provide an answer. In an analytical survey of the Soviet space program by the Aerospace Technology Division at the Library of Congress, dated 17 March 1965, the author noted that guidance systems and in-flight stability of any missile were crucial for putting a space capsule into orbit: “The missile guidance system starts functioning as soon as the missile is launched. Precise measurements of the flight path of a missile make it possible to put the spaceship into the desired orbit.”\footnote{Honóre M. Catudal, \textit{Soviet Nuclear Strategy from Stalin to Gorbachev}, 46-7.} The same features that made the R-7 a more accurate ICBM than its predecessors made it a suitable rocket for the space program. Utilizing the basic principles of

precession and stability, the R-7’s gyrosopes provided the automated vernier thrusters with information to maintain a stable attitude and trajectory.\textsuperscript{132} The R-7 revealed that ballistic missiles were a dual-use technology, which could function either as strategic nuclear weapons or rockets for space travel. The development of ICBMs was inextricably linked to the Soviet space program.

**A Decision from Outside of the Box**

Early Cold War Soviet rocketry and jet development were in many ways similar. In both cases, Soviet engineers inherited a wealth of technologies from abroad. In their original forms, these technologies were crude and unsuited for an intercontinental nuclear conflict. It took approximately a decade for scientists in both fields to develop an intercontinental nuclear delivery system; the intervening years were filled with setbacks and obsolete, copied technologies (such the Tu-4 and the R-1). The choice to make the ICBM the primary component of Soviet nuclear strategy was therefore not the result of a technological disparity immediately before the creation of the SRF.

The Soviet military leadership’s perceptions of the technological development of its strategic arsenal were critical. The lack of intercontinental bomber technology did not relegate the long-range aviation program of the VVS to a subordinate position in Soviet strategy for nuclear war. Instead, both Stalin and Khrushchev adopted pessimistic attitudes towards the prospects of long-range bomber development. This attitude made the Soviet leadership more receptive to the ICBM.

This conclusion raises an interesting question. Had the ballistic missile program experienced a faster, more successful development than the bomber program, Stalin and

\textsuperscript{132} S.P. Korolev RSC Energia, “Principal Characteristics of Rocket R-7,” \url{http://www.energia.ru/english/energia/launchers/rocket-r7.html}. 
Khrushchev’s pessimism towards the NKAP and the VVS would have been understandable. However, the ICBM took as long to develop as did the long-range bomber; its development was as riddled with challenges and setbacks. Why, then, did Stalin and Khrushchev decry long-range bombers as a passing technological phenomenon? The answer was the sheer novelty of the ballistic missile in military arsenals worldwide. By the time of Stalin’s death, the airplane had existed for half of a century. For these five decades, military leaders around the world had demanded faster and larger airplanes with greater ceilings and ranges. Stalin’s request for an intercontinental bomber was a logical continuation of the demands that military leaders had traditionally placed upon aeronautical engineers. By reflecting upon the historically ‘normal’ rate of evolution in aviation technology, Stalin cultivated expectations of the pace and results of the NKAP’s research.

Ballistic missiles had existed for much less time. The Soviet development from the R-1 to the R-7 was one of the world’s first ventures in ballistic-missile technology. There was no historical precedent from which Soviet military leaders developed expectations. It was not clear during the mid-1950s if the ballistic missile could function as a strategic weapon, much less how powerful or accurate the Soviet ICBM arsenal would be after ten years of development. Thus, as long as the OKBs in charge of rocket technology continued to make small steps forward, ballistic missiles could never disappoint Stalin or Khrushchev to the extent to which aircraft could, regardless of setbacks.

The ICBM’s ties to the Soviet space program also influenced the choice of missiles over bombers. Space flight was a novel concept in the late 1950s. Any progress, Soviet or American, received attention from the American press. This attention often reflected the panic of those who believed that the US might fall behind the Soviet Union in the arms race. In less than ten days

Khrushchev had not foreseen that the Soviet space program would provoke such a reaction in the United States. However, he quickly realized that through the ICBM and space program, he could simultaneously conduct a buildup of his strategic arsenal and psychological warfare against the US. By the time of Sputnik, bombers could not provoke a public reaction from the American public. Two years earlier, this was not the case. On 12 July 1955 at the Soviet Aviation Day Parade in Moscow, a small group of Myasishchev M-4s made multiple passes over the parade ground, giving onlookers the impression that the VVS had a large fleet of these bombers. When this fact reached the American public, it engendered the belief of a gap in bomber technology, perhaps best expressed in a 4 May 1956 special in the *New York Times* entitled “Big Russian Jets Estimated at 100”. This article expressed concern that the United States Air Force Strategic Air Command (SAC) had fallen both numerically and technologically behind the long-range bomber wing of the VVS. However, after this incident, Khrushchev did not attempt to use the long-range bomber for propaganda in the American press, probably because imagery intelligence collected from U-2 reconnaissance overflights starting in 1956 could have revealed the state of DA. A large strategic bomber force required airfields with long

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133 Kremlin and the Cosmos, 175.
runways and spacious ramps, which even the best deception could not conceal. However, American reconnaissance could not find evidence to disprove Soviet claims made about space and ICBM technology. If the Soviet military made exaggerated claims regarding the size of their ICBM force, imagery intelligence could not locate all underground ICBM silos in remote locations. Only the small network of human intelligence sources could report on Soviet claims, as American signals intelligence technologies were not particularly advanced in this period.135 By making ICBMs their primary strategic asset, Soviet leaders made every space flight an indicator that the USSR had a strategic advantage. ICBMs also gave Soviet military leaders the opportunity to make unassailable claims regarding the size of their strategic arsenal.

The decision to create the SRF and give it preeminence among the branches of the Soviet military also had to do with power dynamics within the Soviet Union. Despite Stalin’s purges of the VVS, the branch remained large during the early Cold War.136 The size of the VVS, which the sheer number of personnel required to operate a fleet of aircraft, meant that many people were involved with launching a nuclear strike on the United States. The chain of command for such a launch ran from the Supreme High Command, to the General Staff, and then to the theater commanders.137 Individual theater commanders therefore had a great deal of responsibility and power. When Khrushchev created a new branch of the military and gave it the leading role in Soviet nuclear strategy, it represented an attempt to consolidate his power. The smaller C2 structure of the nascent SRF meant that the authority in the nuclear-launch process was concentrated in the hands of fewer commanders.138 Because the SRF was new, Khrushchev and the Supreme High Command could hand-pick its leaders. When he began to implement this

137 Honoré M. Catudal, Soviet Nuclear Strategy from Stalin to Gorbachev, 163.
bureaucratic change at the Twenty-First Party Congress, Khrushchev created a small entourage of loyal officers, in whose hands he concentrated large amounts of power.

Even if Khrushchev had not undertaken bureaucratic change in the Soviet military, the choosing of ICBMs as the primary strategic weapon gave him greater assurance that his orders would be carried out in the event of nuclear war. This was because of the quick-launch capabilities of Soviet ICBMs. Though the first ICBM, the R-7/SS-6, could not be launched quickly, the storable liquid fuel system of the SS-7 and the SS-8 allowed the SRF to launch them on short notice. ¹³⁹ In a number of public statements, Khrushchev suggested that this was an ability which he expected of his nuclear strategic arsenal. In an interview published in Life magazine on 13 July 1959, Khrushchev warned Averell Harriman that if the US tried to reclaim Berlin, “Our [Soviet] rockets will fly automatically.” ¹⁴⁰ An ICBM strike on the United States would take less time to execute and involve far fewer opportunities for failure than a bomber strike. After the launch of an ICBM, there was no opportunity for pilot error, and in this era before the advent of anti-ballistic missile technology (ABM), the US had no countermeasures. Thus, to a greater degree than airplane, ICBM technology gave assurance to the Soviet High Command that their orders could be carried out quickly and successfully.

The Soviet decision to use the ICBM force under the SRF as the primary strategic weapon had as much to do with technological factors as it did with non-technical reasons. Like the evolution of bombers, the evolution of the ballistic missiles after World War II faced numerous challenges and setbacks, from an initial inability to lift fission-driven warheads to problems with guidance. However, because missile technology was novel, the Soviet military leadership could not use historical precedent to create expectations for the pace and result of

¹³⁹ Honoré M. Catudal, Soviet Nuclear Strategy from Stalin to Gorbachev, 167.
ICBM development. Only with great difficulty could the OKBs responsible for ballistic missiles have disappointed the Soviet leadership. This was also in part due to the dual use of ballistic missile technology. Thanks to their secondary use in the Soviet space technology, ICBMs could act both as weapons of strategic nuclear war as well as weapons of propaganda. Beyond these two uses, the ICBM was also a tool in Khrushchev’s to consolidation of power. By crafting a new branch with a smaller C2 structure and larger role in Soviet nuclear strategy than the VVS’s, Khrushchev had more direct control over the state’s nuclear arsenal.
Strategic Parity, Doctrinal Evolution and Cold War History

The choice of ICBMs over long-range bombers as the primary strategic weapon of Soviet Union during the Cold War was neither an arbitrary nor a simple decision. A myriad of factors contributed to the decision, ranging from the formative years of the Soviet Union just after the October Revolution to the eve of the creation of the SRF in late 1959. This work has looked not only at the military doctrine that underscored the decision, but also at contributing factors that emerged from the respective development of missile and long-range bomber technology following World War II.

Synopsis

At the beginning of this analysis, was a direct question: Was the preeminence of the ICBM over the long-range bomber in the nuclear strategy of the Soviet Union during the 1960s an arbitrary choice? The answer to this question is obvious. It was not.

The first chapter looked examined Soviet military doctrine, starting with the writings of V. I. Lenin and ending with the doctrinal pronouncements of V. D. Sokolovsky in the early 1960s. The three earliest writers, Lenin, A.M. Lachinsky, and M.V. Frunze, made important, albeit indirect contributions to doctrine. Frunze established the idea of a single unified doctrine, so later Soviet doctrine applied to all branches of the Soviet military. Frunze spared this analysis of the tedious task of trying to ascertain the combined effects of multiple, possibly disparate doctrines. Lenin’s contribution had more concrete repercussions. His overarching emphasis on economic production ensured that future Soviet doctrine was based in a materialist worldview. Even in the early Cold War, this view influenced the Soviet concept of intercontinental nuclear war. It set the enemy’s economic infrastructure as a primary target, which meant that Soviet global nuclear strategy included deep offensive operations, a topic which M.N. Tukhachevsky
addressed in his writings. Last but not least, A.M. Lapchinsky addressed questions of air power, revealing that since its inception, Soviet air power doctrine had always emphasized combat air support as the primary function of military aviation.

After Stalin quashed the flourishing dialogue of Soviet military thinkers in the late 1930s, Soviet military doctrine had little direction. Dialogue only resumed several years after Stalin’s death; the most influential thinker of this post-Stalin doctrinal revival was V.D. Sokolovsky. Drawing on Lenin and Frunze, Sokolovsky wrote a unified doctrine for the Soviet armed forces in global war with the United States. If such a war started, it would be nuclear in character, beginning with either a surprise attack or the escalation of a smaller, conventional conflict. The early stages of such a war would be the most critical, requiring the quick deployment of strategic assets to strike deep in the enemy rear. Thus, in order to be prepared for such a war, these strategic assets would have to remain in constant readiness. The Soviet military leadership shared this characterization of nuclear warfare, and believed that the ICBM better suited the needs of the Soviet strategic arsenal. ICBMs could reach their targets much faster than long-range bombers, without in-flight refueling, and required fewer personnel and resources to remain in operational readiness. The ICBM was the best weapon in the Soviet Cold War strategic arsenal for global nuclear war as Soviet military conceived it.

Doctrine, however, cannot fully explain the Soviet leadership’s choice of ICBMs over long-range bombers. The second chapter examined aviation technologies and the practical field-testing they received in World War II and the Korean War. The story of Soviet ground-attack aviation in World War II was primarily about the small, Polikarpov Po-2 biplane and the heavier Ilyushin Il-2 “Flying Tank,” which undertook tactical and operations-level combat air support. While the VVS possessed the technology to perform long-range strategic bombing, the ever-
changing, perilous Soviet front prevented their use outside the tactical and operational levels of warfare. Thus, when the war ended, long-range strategic bombing was conceptually underdeveloped, and Soviet military planners of the early Cold War had no precedent to gauge the future development of DA, nor any special attachment which might have kept these same planners from subsequently reducing the long-range bomber’s role.

The post-war technological development of Soviet military aviation also factored into the composition of the Soviet strategic arsenal. Having acquired a base of technology through the capture of German aircraft, espionage, direct purchase, and reverse-engineering, the NKAP struggled to increase the range of its bombers. The decade of development, which lasted from the end of World War II to the flight testing of the Soviet Union’s most capable and iconic bomber, the Tupolev Tu-95, was fraught with setbacks and disappointments. The NKAP’s primary engineering accomplishment, the Tupolev Tu-4, was immediately offset by the realities of the Korean War, in which Soviet military leaders realized that their fleet of new propeller-driven aircraft was obsolete. Furthermore, only with great difficulty did Soviet engineers overcome the problems of airframe design, which had prevented the mounting of multiple jet engines on aircraft wings. Frustrated by the fact that his engineers had jet-engine technology but had failed to create an intercontinental strategic bomber before his death, Stalin began to decry the bomber as an unimportant, transitory phase in the evolution of Soviet strategic weapons. Khrushchev clung to this pessimistic attitude, which was reinforced by the advent of interceptor aircraft guided by GCI radar and the first SAMs. Despite the eventual advent of the Mya-4 and the Tu-95, both of which were capable intercontinental bombers, Khrushchev still perceived the Soviet long-range bomber program to be an unimportant, passing element of the Soviet strategic arsenal. This made Khrushchev more receptive to alternatives to the long-range bomber.
The final chapter of this work examined the evolution of the Soviet rocket program from its earliest days of salvage at Peenemünde to the launch of Vostok I in 1961. The detailed history of Soviet rocket program reveals that OKBs working in missile technology also encountered setbacks and failures, notably the original weight of fission-drive warheads and problems with guidance systems. However, because missile technology was new, Soviet leaders were never as demanding when dealing with missile OKBs. On a basic level, Soviet leaders did not know if an intercontinental missile was even possible, let alone what to expect from a decade of development. Thus, the same animus against bombers never affected the Soviet ballistic missile program. The multiple uses of the ICBM also helped catapult it to preeminence within the Soviet strategic arsenal: its ties to the space race made it a powerful weapon of propaganda abroad, while its small C2 structure made it a tool for Khrushchev to control the Soviet military more directly.

**The Greater Significance: Doctrine and Parity**

As noted at the beginning of this analysis, the Cold War was undeniably complex: both temporally/geographically and conceptually. It is therefore unlikely that any historian could succinctly summarize all of the conceptually diverse phenomena of this period without the heavy usage of blanket terminology. Broad terms give the historian a tool to discuss larger, abstract concepts. One can only imagine the difficulty of describing US-Soviet relations in the Cold War without using words such as “detente”, “deterrence” or “mutually-assured destruction”. Such commonplace terms are useful for the historian, but they have one major drawback. They take broad, complex issues and boil them down to a terse expression; the true complexity of the issue is usually glossed over and concealed. If historians and readers do not occasionally reexamine
the definition of these terms when they use or read them, it becomes easy to misuse them or make false assumptions about their meaning.

One such term, “strategic parity”, typically arises in discussions of mutually-assured destruction and nuclear deterrence. Military thinkers such as Soviet Major General Yuri Lebedev use the term to describe the equivalent ability of the US and the USSR to accomplish the objectives prescribed by their doctrines of nuclear warfare.141 Supporting these discussions are usually figures explaining how many of each type of warhead or missile each superpower possessed. These figures are essential for creating a clearer picture of Cold War military history and for allowing the military historian to formulate questions and answers. When assessing the strategic capabilities of each superpower, however, it is easy to treat strategic parity as a concrete concept, dependent only on the quantitative distribution of nuclear-capable strategic forces. This perception is simply incorrect; one has to also make a qualitative assessment of these forces.

However, no worldwide nuclear conflict to gave the US and the USSR benchmarks for determining how qualitative elements would reconcile with quantitative elements in the assessment of strategic capabilities (such as whether 45 SLBMs would be more effective than 30 ICBMs in a nuclear exchange, and such similar questions). Therefore, the military historian can never be sure which strategic assets would have proven more valuable than others. Hence, he or she simply cannot talk about strategic parity during the Cold War as a fixed absolute which both superpowers could easily ascertain. Attempts to determine whether strategic parity existed are nothing more than exercises in speculative history. The military historian can only examine the superpowers’ perceptions of their strategic assets and their potential for achieving strategic parity. This examination requires one to understand how the military of each superpower

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perceived the value of various weapons, as well as its abstract perception of the character, causes and driving forces behind warfare. Thus, this analysis has both attempted to answer questions about the ostensible Soviet preference for missiles over bombers, while indirectly examining how the Soviet Union assessed strategic value throughout the early Cold War.

The choice to make ICBMs the primary strategic weapon of the Soviet Union was an important change, and a significant step forward in the general paradigm of the Soviet military elite. As evidenced by espionage involving the F-90, the reverse engineering of the Tu-4, and the purchase of Rolls-Royce jet engines, the Soviet Union began its Cold War pursuit of strategic parity by attempting to match the United States airplane-for-airplane. Soviet leaders quantified strategic parity as having a similar number of aircraft with similar capabilities. The formation of the SRF marked the point at which the Soviet military leadership accepted that strategic parity did not require a similar number of equally-matched bombers. Instead, the Soviet leadership invested in a different technology, which they could not compare directly with SAC’s assets. Thus, strategic parity became something more abstract than it previously was. This step also made strategic advantage more difficult to quantify: if both sides disagreed whether bombers or ICBMs were more valuable strategic assets, a comparison of numbers was irrelevant. The post-1960 interpretation of strategic parity undoubtedly contributed to the complexity of the Strategic Arms Limitation Talks, when Soviet leaders tried to take strategic parity in the abstract and return it to a game of numbers. Thus, the choice of the ICBM was not just significant for the concrete changes that it caused in the structure of the Soviet armed forces; it also marked a major evolution in Soviet military thinking during the Cold War.

Another important point about military doctrine in general underscores the evolution of the Soviet strategic arsenal. If one were cynical in his or her interpretation of the ICBM choice,
one could say that the Soviet concept of warfare changed only because the structure of the Soviet military changed. This was obviously not the case, as such cynicism oversimplifies the origins of military doctrine. Concepts of warfare, and more generally, military doctrine, are functions of technology, geopolitics, practical experience in war, and other outside factors. While these outside factors influence military doctrine, doctrine in turn influences planning for future wars. When planning affects technological change, the structure of the military, and the conduct of war, one can clearly see that the evolution of doctrine both causes and is dependent on changes in outside factors. This exposes one of the problems with any analysis of military doctrine: it is difficult to pinpoint exactly what caused a particular doctrine to arise or become obsolete.

Despite the amount of concrete, often technical information which this analysis has covered, there is obviously no quick and easy explanation for this major change in Soviet military science. The complexity apparent in this important juncture of Soviet military history is indicative of the multi-dimensionality of the Cold War. While this analysis might not have covered every factor contributing to the Soviet ICBM choice, it has nevertheless provided a sound, detailed analysis of the most significant parts of the answer to a deceptively simple question.
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