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The art of net assessment and uncovering foreign military innovations: Learning from Andrew W. Marshall's legacy

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ABSTRACT
Andrew W. Marshall, who shaped the way in which contemporary international security experts think about strategy, has been mostly associated with the invention of net assessment. The intellectual sources of this analytical technique, and of the related competitive strategies concept, could be traced to Marshall's efforts to uncover Soviet post-World War II defense transformations. This article outlines the essence of these Soviet innovations – the empirical frame of reference that inspired Marshall. It provides a new perspective on the history of the net-assessment methodology, advances the debate within strategic studies over the nature of military innovations, and offers insights for experts examining defense transformations worldwide.

Introduction

International security theorists and practitioners concur that Andrew W. Marshall, who passed away in March 2019, was an extraordinary person who shaped the way in which contemporary scholars and practitioners on strategy think about national security, great-power competition, measuring military balances, the changing nature of war, and the drivers of military innovation. Marshall commanded unparalleled respect among scholars of strategic studies and national security establishments worldwide.[1] Among

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[1]Thomas Mahnken, 'Andrew W. Marshall: in Memoriam', *War on the Rocks*, 8 April 2019; Eliot Cohen, 'The Brain of the Pentagon', *The Atlantic*, 8 May 2019; Andrew Krepinevich, 'On the Lasting Value of Net Assessment', *Foreign Affairs*, 19 April 2019; Dakota Wood, 'Lessons Learned: the Legacy of Andrew W. Marshall', *The Heritage Foundation*, 9 April 2019; Editorial, 'Ask the Right Question. Obituary: Andrew Marshall died on March 26th', *The Economist*, 11 April 2019; Editorial, 'Andrew Marshall, Pentagon's Threat Expert', *The NYT*, 11 April 2019; Matt Schudel,"Andrew Marshall, Pentagon's gnomic Yoda of long-range planning," *The Washington Post*, 28 March 2019; Editorial, 'Andrew Marshall obituary', *The Times*, 22 April 2019; Mie Augier and Wayne Hughes, 'In Grateful Memory: Andrew Marshall and his Quest for Questions', *CIMSEC*, 2 July 2019; David Goldman, 'Andrew Marshall, the last wise man', *The*

'the most consistent and perceptive contributors to national security since the United States emerged as a global power,'[2] Marshall, along with experts from his legendary Pentagon Office of Net Assessment (ONA), which he headed between 1973 and 2015, have been most associated with the invention of the unique, and today widely referenced, analytical technique known as net assessment.

This approach, which has been defined as 'what Andy Marshall does,'[3] relies on the modeling of a dynamic and multidimensional competition between strategic antagonists. The holistic analytical framework of net assessment incorporates all the available social-ideational-cultural-organizational characteristics of both competitors, as well as trends in the strategic environment within which the competition occurs, and aims to diagnose the intended and unintended first- and second-order consequences of the interaction over time. The insights of net assessment are meant to serve as a basis for strategic planning. Although the goal of net assessment is to produce actionable insights, in essence it is a diagnostic rather than prescriptive undertaking.[4]

In Marshall's own words, the intellectual sources of net assessment can be traced back to his experience at RAND during the 1950 s. The lessons Marshall learned from exploring, along with his colleague Joseph Loftus, three Soviet postwar military innovations – mega-projects aimed at establishing Soviet strategic offensive and defensive capabilities: air defense, nuclear weapons, and long-range ballistic missiles – left the most profound impression upon him. Insights from this work led Marshall to question the basic assumption, common at that time within the U.S. strategic community, 'that states made decisions just like a rational, value-maximizing individual would.' He argued instead that large and complex national security bureaucracies often make ineffective and suboptimal strategic choices. Diagnosing these natural inclinations of

Asia Times, 1 April 2019; Aaron Mehta, 'Andy Marshall, the Pentagon's Yoda dies at age 97', *Defense News*, 26 March 2019; Editorial, 'Umer izvestnyi kak magistr Ioda analitik Pentagona Endriu Marshall', *RBK*, 27 March 2019.

[2]Krepinevich, 'On the Lasting Value of Net Assessment'. Also see: Sharon Weinberger, 'The Return of the Pentagon's Yoda', *Foreign Policy*, 12 September 2018.

[3]Krepinevich, 'On the Lasting Value of Net Assessment'.

[4]Marshall's intellectual credo emphasized asking the right questions, rather than finding definite answers to questions that are, irrelevant. For the central works on the net-assessment analytical technique, on the intellectual history of the Office of Net Assessment, on Mr. Andrew Marshall's biography and his intellectual legacy, see: Thomas G. Mahnken (ed*.), Net Assessment and Military Strategy: A Retrospective and Prospective Analysis* (Amherst, NY: Cambria Press, 2020); Thomas G. Mahnken (ed.), *Competitive Strategies for the 21st Century*, (Palo Alto: Stanford University Press, 2012; Andrew Krepinevich and Barry Watts, *The Last Warrior: Andrew Marshall and the Shaping of the American Defense Strategy* (New York: Basic Books, 2015); Paul Bracken, 'Net Assessment: A Practical Guide', *Parameters* 36/1 (Spring 2006), 90–100; Stephen Peter Rosen, 'Competitive Strategies: Theoretical Foundations, Limits, and Extension', in *Competitive Strategies*; Philip A. Karber, *Net Assessment for SecDef Future Implications from Early Formulations* (Washington DC: Potomac Foundation, 2014).

adversarial establishments, their self-imposed weaknesses of sorts, became crucial for Marshall. In his view, if pinpointed accurately they could be exploited to one's advantage in a protracted competition.[5]

His findings at the time, which are still the professional credo of the net-assessment approach and of the Office of Net Assessment, have been a source of insight for several postulates of international security theory, highlighting the importance of factoring in cultural, organizational, bureaucratic, and psychological influences when exploring strategic choices, crisis behavior and military modernizations. Marshall inspired several of the trail-blazing IR studies, including Wohlstetter's and Allison's seminal works, and he mentored and supported the professional development of a cohort of leading scholars who have has shaped the academic discipline of strategic studies and international security.[6]

Although Marshall's argument, which he distilled from his RAND experience, is well known in the expert community,[7] the nature of the Soviet innovations that inspired him has been largely inaccessible to scholars. There has been no academic work outlining the empirical frame of reference that stimulated Marshall's argument. What actually happened on the Soviet side that caught his attention and led him to his profound argument? Was his take on the Soviet military innovations of the time, especially in air defense, their drivers and implications correct? Do his insights matter today for scholars and practitioners of international security? These are the main research questions of this study.

This article addresses these queries on the basis of newly available sources: declassified Russian archival materials, official histories of the Soviet military-industrial complex and memoirs of its scientists and veterans; Russian academic historiography, especially sources published by the authors with access to otherwise inaccessible primary sources, and oral history accounts from Andrew Marshall and experts from the ONA. Taken together, and critically discussed, this corpus of sources makes it possible to reconstruct the history of the major Soviet military transformations of the time, specifically the case of the Soviet air-defense innovation, which shaped Andrew Marshall's professional worldview.

The article argues that the empirical evidence highlights the unparalleled accuracy of Marshall's diagnosis. Indeed, immediately after the war the

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[5]Krepinevich, 'On the Lasting Value of Net Assessment'. Interviews with Andrew Marshall, 2016–2017. Interviews with experts of the ONA, 2015–2019.

[6]Mahnken, 'Andrew W. Marshall: in Memoriam'; Cohen, 'The Brain of the Pentagon'; Krepinevich, 'On the Lasting Value of Net Assessment'.

[7]Andrew Marshall, *Problems of Estimating Military Power* (Santa Monica, CA.: RAND, 1966); Rosen in Mahnken'Andrew W. Marshall: in Memoriam'; *The Last Warrior*; Karber, *Net Assessment for SecDef Future Implications from Early Formulations*; Andrew Krepinevich and Robert Martinage, *Dissuasion Strategy* (Washington DC.: CSBA, 2008), 15; Austin Long, *Deterrence: From Cold War to Long War* (Washington DC: 2008), Chapter 5.

Soviets highly prioritized nuclear, missile, and air defense capabilities – as Marshall and Loftus argued, contrary to the conventional wisdom within the U.S. intelligence and strategic community at the time – that shaped Soviet military power in the following decades. As Marshall argued, Soviet doctrinal publications of the period indeed were not indicative of the leadership's genuine strategic-conceptual vision, as well as of the new weapons R&D and procurement initiated at that time. Most intriguingly, Marshall's argument that the implementation of the leadership's strategic guidance was irrational, suboptimal, and ineffective due to organizational struggles, bureaucratic wars, the managerial-administrative pathologies typical of the Soviet system, and the personal ambitions of the key players proved to be correct, when checked against the Russian sources.

It should be noted, however, that without access to the U.S. primary sources, especially the sensitive raw intelligence materials of that time, one cannot establish categorically how much of what this article describes was apparent to Marshall at the time it was unfolding and how much became apparent only in retrospect. Interviews with former officials that are knowledgeable on the subject, and the claims of Marshall himself, suggest that the insight that nonstrategic factors had a major impact on Soviet conduct became evident to Marshall at a relatively early stage. Once the contours of the phenomenon became apparent to him, the subsequent pieces of data, which arrived incrementally over the years, and which he deliberately sought later on, further concretized the general picture for him and supported his initial hypothesis.[8]

Marshall and his RAND colleagues explored all three of the Soviet mega innovations. The nuclear and ballistic missile cases, however, are beyond the scope of this article, which focuses on the air defense (AD) project, an often-overlooked Soviet national security priority of the first postwar decade. The Soviet AD program – a network of radars and early warning systems, with command and control centers linking them to anti-aircraft artillery, interceptor aviation and surface-to-air missiles – was so wide, sophisticated and expensive that it was comparable to the nuclear weapons program, even if strategic defense lagged behind strategic offense somewhat in terms of funding. Although data on the exact scope of the financial expenditure is unavailable,[9] Russian scholars argue that at the cost of enormous financial expenditure and organizational effort, by the 1960 s the Soviet Union had produced the densest AD network in the world.[10]

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[8]Interviews with experts of the ONA, 2015–2019. Also see: Marshall, *Problems of Estimating; The Last Warrior*; Krepinevich, 'On the Lasting Value of Net Assessment'; Long, Chapter 5.

[9]The main limitation of the historiographical aspect of the research is the lack of accurate Soviet data on budget allocations.

[10]I.V, Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny* (Moscow: RAN, 2000), chapters 1–6, and pp. 270–271, pp. 124–152, cited in Zaloga (2002), p. 18; Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 150.

The article focuses on this innovation for three reasons. First, in Marshall's words, the AD case study, even more than the nuclear-missile case study, had the most profound impact on his intellectual predisposition. Work on the AD innovation was a starting point for his analytical endeavors, shaped his approach, and informed his subsequent diagnostic efforts on the nuclear-missile matters and beyond. Second, the findings from this undertaking had a profound impact on strategic theory. Insights produced by Marshall regarding the Soviet AD laid the foundation for one of the main intellectual products of the ONA – the notion of cost-imposing competitive strategy, an indirect approach that 'involves creating in the mind of one's rival a belief that the benefits of pursuing the course of action (in this case, maintaining and modernizing a national AD) exceed [...] the costs incurred.'[11] Finally, the insights from the AD case study had a profound impact on strategic practice. Marshall's diagnoses of the Soviet AD proclivities continued to be an actionable insight at the heart of the cost-imposition strategy he advocated, which was a centerpiece of U.S. defense policy at the peak of the Cold War during the Reagan administration.[12]

This article outlines these strategic considerations, such as the Soviet threat perception, beliefs about the nature of the security environment, and trends in warfare at that time, as well as nonstrategic but influential factors, such as organizational politics, the preferences of the defense bureaucracy, and parochial motivations of key personalities. In attempting to reproduce the historical reality on the Soviet side, as it relates to the analysis Marshall and his colleagues produced, this article aims to distill lessons for experts exploring foreign strategic behavior and military innovations today. It offers three contributions. First, historically, it provides scholars with new empirical evidence about great-power competition during the early Cold War and the intellectual history of the net-assessment methodology. Conceptually, it advances the debate within the strategic studies literature on the nature of military innovations. Beyond the historical case presented here, insights regarding Soviet conduct are relevant to any diagnostic effort aimed at uncovering foreign innovations and the practical application the of net-assessment technique. Finally, it article offers insights for experts examining current Russian military innovations – force buildup, concept of operations, organizational structures and strategic theory – that are driving defense transformations today.[13]

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[11]Krepinevich and Martinage, *Dissuasion Strategy*, 16.

[12]Krepinevich and Martinage, *Dissuasion Strategy*, 15–16; Jay Kosminsky, 'The Competitive Strategies Concept: Giving the U.S. A Battlefield Edge', *The Heritage Foundation*, 1989.

[13]For the recent Western efforts to uncover the current Russian art of strategy and the military innovation driving it, see: Michael Kofman, 'Moscow School of Hard Knocks', *War on the Rocks*, 17 January 2017; 'It's Time to Talk about A2/AD', *War on the Rocks*, 5 September 2019; 'Raiding and International Brigandry', *War on the Rocks*, 14 June 2018; Kristin Ven Bruusgaard, 'Russian Strategic Deterrence', *Survival*, vol. 58, no. 4, 2016; Katrzyna Zysk, 'Escalation and Nuclear Weapons in Russia's Military

The article consists of three parts. Part 1 traces the preliminary stage of Soviet AD innovation and highlights the strategic considerations behind its inception. Specifically, it traces the evolution of Soviet AD towards and during the Great Patriotic War – a period that left a strong imprint on Stalin's strategic psyche – and explores the essence of Stalin's threat perception, his views on the nature of war, and his decision to invest enormous resources in the strategic defense project. Part 2 shows how nonstrategic factors influenced the form, essence and effectiveness, or lack thereof, of this innovation and its course. It highlights how inter- and intra-service struggles shaped this innovation under and after Stalin and focuses on the surface-to-air missiles (SAM) project at the heart of the Soviet strategic defense plan. The Conclusion discusses the findings and offers several lessons for the theory and practice of international security.

Part 1: Strategic considerations behind the Soviet AD innovation

Stalin's threat perception and strategic defense decision (1945-1946)

Although Soviet intelligence closely followed the progress of the U.S. nuclear project, Stalin did not internalize its strategic implications until the appearance of the bomb in summer 1945. It was only then that the revolutionary role of nuclear weapons and his country's daunting situation became clear to Stalin. The bomb not only offset Soviet conventional military power in the European, or any other, theater of operations, but also posed a direct threat to the Soviet Union, which in its own eyes had just acquired a position of unprecedented security, power and geographical control. It was clear to Stalin that a massive Soviet ground offensive in Europe could only partially deter the U.S., and was ultimately useless against the nuclear-capable enemy. The Soviet Union lagged behind its opponent in both the offensive and defensive dimensions. There was a need for different countermeasures.[14]

Stalin carefully concealed this feeling of insecurity by demonstrating to the West a lack of appreciation of the revolutionary implications of the new weapon.[15] Official propaganda and military doctrine promoted the 'permanent operating factors'[16] that had proved victorious in the Great Patriotic War

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Strategy', *The RUSI* 163/2 (2018); Dmitry (Dima) Adamsky, *Cross-Domain Coercion: the Current Russian Art of Strategy* (Paris: IFRI, 2015); Alexander Lanoszka, 'Russian hybrid warfare', *International Affairs* 92/1 (2016); Andrew Monaghan, *Power in Modern Russia* (Manchester: Manchester UP, 2017); Lawrence Freedman, *Ukraine and the Art of Strategy* (Oxford: Oxford UP, 2019); Johh Deni (ed.), *Current Russian Military Affairs* (Carlyle: US Army War College SSI, 2018); Stephen Blank (ed.), *Russian Military in Contemporary Perspective* (US Army War College SSI, 2019); Bettina Renz, *Russia's Military Revival* (London: Polity, 2018).
[14]Holloway; Drogovoz, *Vozdushnii Schit Strany Sovietov*, 12–23.
[15]David Holloway, *Stalin and the Bomb* (Yale UP, 2005).
[16]Resilience of the rear; morale and spirit of the military; the quality and quantity of divisions; military equipment and armaments; and the organizational capabilities of the senior military command.

(GPW) assigned the leading role to the ground troops and discounted the effectiveness of nuclear weapons. In part this was a genuine assumption, as Stalin presumed that the West would need several years to equip itself for a large-scale nuclear war. It was also the state of mind of the then senior and operational-level Soviet officers. Mainly, however, this was *maskirovka*, a deception, meant to buy time for building countermeasures – strategic offense (nuclear weapons and their means of delivery) and strategic defense (air defense) capabilities.[17] Contrary to his propagandistic statements, Stalin immediately started working to offset this dual inferiority.

In the early postwar years, in parallel to a radical reduction of the armed forces and the recovery of the economy, Stalin initiated three colossal crash projects, subordinated to him personally and aimed at bridging the strategic gaps in offense and defense. The first crash program, charged with the nuclear project, was established on 20 August 1945, two weeks following the bombing of Hiroshima and Nagasaki. Stalin turned the Special Committee for Nuclear Energy working on 'problem no. 1'[18] into the First Chief Directorate (PGU). The Second Chief Directorate (VGU), charged with the utilization of ballistic rocket technology as a means of delivering nuclear weapons, was established in May 1946 as Committee no. 2 and renamed the VGU in 1950. The Third Main Directorate (TGU) focused on countermeasures to nuclear weapons and their main means of delivery – strategic bombers. It worked on anti-air missiles – a new weapon that would become the heart of the integrated Soviet national AD system. The predecessor of the TGU, Special Committee No. 3 on radiolocation, which was established in 1946 and disbanded in 1949, was charged with the development of radar and radio-guided weapons. Beria, the tsar of the Soviet intelligence and counter-intelligence apparatus, left his post to oversee the heads of all three directorates. In the early 1950 s the PGU merged with the VGU. In 1953 it was united with parts of the TGU and turned into the Ministry of Medium Machine Building – the Soviet nuclear affairs ministry.[19]

After the war ended, doctrinally the Soviet General Staff (GS) focused on a proactive offensive strategy, paying minor attention to the issues of strategic defense.[20] Although this inclination towards massive ground armor offensives featured widely in the professional publications and military theory of the time,[21] it did not accurately depict the genuine mindset of the Soviet

[17]Andrei Kokoshin, *Armia I Politika* (Moscow: Mezhdunarodnye Otnosheniia, 1995) pp. 132–138. Drogovoz, *Vozdushnii Schit Strany Sovietov*, 12–23; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 520.

[18]Sudoplatov, chapter 7; Holloway.

[19]Chertok, *Rakety I Liudi* (Chapter: Stanovlenie na rodnoi zemle); V.V. Polunin, 'Stanovlenie tsentral'nykh Organov Upravleniia Atomnoi Promyshlennostiu SSSR', *Novyi Istoricheskii Vestnik* 2/16 (2007).

[20]Baluevsky, 18.

[21]A.I.Kalistratov, 'Sovetskoie voennoe isskustvo v pervoe poslevoennoe desiatiletie (1945–1955)', *VM*, no. 10, 2009, pp. 2–9.

leadership. Probably around late 1945, Stalin internalized the idea that strategic AD was becoming a common denominator both for the Soviet 'armored feast' aimed at Europe and for defending the Soviet Union from the U.S. strategic threat, especially as long as Moscow lacked strategic offensive capabilities.[22] Despite doctrinal statements glorifying offense, Stalin was interested in the question of strategic defense no less than creating nuclear weapons and their means of delivery.[23] A highly prioritized strategic defense program, which included AD radar, anti-air artillery (AAA), interceptor aviation (IA), and later surface-to-air missiles (SAMs), took up much of Stalin's attention and a major share of the state's budget and procurement efforts from 1945 until his death in 1953.[24]

As long as there was no nuclear parity, it was necessary to cover the window of vulnerability to the U.S. atomic monopoly by means other than deterrence. The response was a combination of strategic bluff, i.e., pretending that the Soviet Union did possess this capability, and building a solid AD shield as quickly as possible over the Soviet Union and over its emerging nuclear-missile potential and the industry supporting it.[25] In terms of strategic defense, the operational challenge was twofold: first, to defend the country during the window of vulnerability as long as there was no equivalent deterrent (Stalin ordered that the bomb be ready by 1948[26]); and second, to defend all the emerging 'strategic offensive' potential that was under construction during those years, especially as the West might be considering a preventive strike. Although strategic defense became one of the three main directions of the postwar arms race, an important factor that slowed its development, compared to strategic offense, was the greater technological sophistication and complexity of the systems involved.[27]

Formative experiences during the GPW and the first crises of the Cold War contributed to Stalin's sense of urgency in taking the leap forward in strategic defense. The psychological imprint that the GPW left on Stalin is especially important, since Stalin, who was personally involved in designing the postwar AD innovation, underwent his most traumatic formative experiences related to AD then (on which more below). Suffice it to say that Stalin's memories of the summer catastrophe of 1941 – the destruction of Soviet aviation within several days, German raids on Moscow, and the sense of confusion and disorientation that they produced – affected him forever.[28]

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[22]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 12–23.
[23]Bystrova, *Voenno-Promyshlennyi Kompleks SSSR v gody Kholodnoi Voiny*, 235–236.
[24]Iu. V. Votintsev, 'Neizvestnye voiska ischeznuvshei sverkhderzhavy', *VIZh*, no. 8, 1993; Zaloga (2002), p. 8.
[25]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 21–22.
[26]Sudoplatov, chapter 7.
[27]I.V. Bystrova, *Voenno-Promyshellnyi Kompleks SSSR v Gody Kholodnoi Voiny (1945–1964): Stratetgicheskie Programmy, Instituty, Rukovoditieli* (Moscow: PhD Dissertation, Institute of Russian History, 2001), 234–235.
[28]Votinsev (1993); Drogovoz, *Vozdushnii Schit Strany Sovieto*, 16.

The sting of the Soviet Union's inferiority in the air was worse than that of the debacles of the ground war. Stopping the Wehrmacht's Panzers was often an issue of throwing more manpower into the battle, of heroism and of firing squads behind the retreating troops. In the case of the Luftwaffe, similar steps were impossible – sophisticated countermeasures were required. Stalin was also keenly aware of the strong imprint the operational helplessness in the face of Luftwaffe had left on collective public memory and on the mindset of the military servicemen.[29] Also, what the Soviets had learned about the ineffectiveness of the German AAA- and IA-based air defenses against the Allied strategic bombing raids played a role. Many Soviet AD senior officers observed the results of these campaigns firsthand. The Berlin operation in spring of 1945 exposed the Soviet AD commanders to the Allies' bombing capabilities; the scale and effectiveness of these operations impressed them.[30] The functioning of the British and German AD during the war taught the Soviets that despite high attrition rates, the bombers always got through. They were hardly decisive contributors to the allied victory, but bombers armed with atomic weapons changed the whole calculus. In the nuclear era, a single bomber getting through would mean catastrophe. The impressive functioning of Allied aviation and low efficiency of the German AD during the war contributed to Stalin's prioritization of AD and stimulated his quest for more technologically sophisticated solutions, such as SAMs.[31]

In parallel, Moscow was closely following U.S. air power modernization towards the establishment of the Strategic Air Command (SAC) in 1946. Given the speed, depth and accuracy with which Soviet intelligence reported on the construction, tests, and lessons learned from the first use and subsequent production of nuclear weapons,[32] and its level of penetration in the U.S. and UK, it is reasonable to assume that it reported on emerging U.S. and UK operational plans for the strategic bombing of the

[29]For the imprint of the German bombings on the collective memory, see: Konstantin Simonov, *Zhivye I Mertvye* (Moscow: Khudozhestvennaia Literatua, 1984). This traumatic experience was partially tempered by his feeling of potency for having successfully reformed the AD under bombardment in Moscow. Stalin arranged the most concentrated AD of Moscow, more than that of London and Berlin. The Luftwaffe conducted 141 bombing raids on the city, in total involving 8600 airplanes. According to the Soviet statistics, 1400 airplanes were shot down, and 234 actually made it to Moscow, causing some minor damage. Zaretsky, Alekhin and Kutsenko. N.N. Bazhenov, D.M. Degtev, and M.V. Zefirov, *Svastika nad Volgoi. Liuftvaffe protiv Stalinksoi PVO* (Moscow: AST, 2007).
[30]I.A. Tkachev, 'PVO Frontov v Berlinskoi Nastupatel'noi Operatsii', *VIZh*, no. 5, 2004; Chertok; Gromadin, the first-ever commander of the PVO Strany, nominated first in 1941 and again in 1946, commanded the AD operations of Lublin, Bialystok, Poznan and Berlin during the Soviet offensive there. V.L.Golotiuk and D.A. Tsapaev, *Komandyi sostav Voisk PVO Krasnoi Armii v gody Velikoi Otechestvennoi I Sovietsko-Iaponskoi voin 1941–1945gg* (Moscow: Veche, 2012).
[31]V.M. Kanaev, 'PVO krupnykh gorodov vo Vtoroi Mirovoi Voine', *VKO*, 20 October 2013; Zaloga (2002), p. 18; Drogovoz, *Vozdushnii Schit Strany Sovieto*, 30, 44.
[32]Sudoplatov, *Spetsoperatsii*, chapter 7; Holloway.

Soviet Union with similar alacrity.[33] These plans, which were produced between 1946 and 1948, and some of which Moscow acquired and were leaked intentionally, emphasized a massive air-nuclear bombing campaign against the political-administrative centers and industrial infrastructure as the main tool of future war.[34] Actual tensions added to the Kremlin's concern. During 1945–1946 the Soviet leadership became privy to certain details of *Operation Pincher* (a war plan for a massive strategic bombing) and picked up signals of the intention to execute it, as a countermeasure to the Kremlin's efforts to pressure Turkey.[35] During March 1946, in the heat of the Iran crisis, Moscow took serious notice of what it considered to be the U.S. signaling a nuclear bombing.[36] Churchill's Fulton speech, which was delivered at around the same time, and its emphasis on air power further elevated the level of threat perception in Moscow as regards a threat to the strategic rear.[37]

All these factors, together with reports about plans to deploy bombers closer to Soviet borders, created a strong sense of a window of vulnerability that would persist until Moscow could build its own bomb and means of delivery, and/or be capable of repulsing the threat by defensive means.[38] Thus, the strategic defense program became the highest Soviet national security priority, trumping even the strategic offensive projects in terms of urgency and resource allocation. The implementation of Stalin's vision of strengthening AD, however, could not have been farther from perfection. It turned into a more than decade-long, nonstop round of cumbersome organizational reforms – seven reorganizations, averaging approximately one every two years. No other service of the postwar Soviet military underwent such frequent and damaging transformation, no other service was allotted and spent such huge sums of money, and no other service suffered from such low operational effectiveness under real combat conditions.[39] All of these resulted from inter- and intra-service struggles, nonstrategic considerations, and bureaucratic and personal dynamics, as described below.

[33]Sudoplatov, *Spetsoperatsii*, chapter 7; A.I. Kolpakidi and D.P. Prokhorov, *Imperia GRU* (Moscow: Olma Press, 1999), chapters 9 and 10; Group of Authors, *Ocherki Istorii Rossiskoi Vneshnei Razvedki: 1945–1965* (Moscow: Mezhdunarodnye Otnosheniia, 2003), vol. 5.

[34]Orlov, *Tainaia Bitva Sverkhderzhav*, chapter 2, part 1. Also see: Edward Kaplan, *To Kill Nations* (Ithaca: Cornell UP, 2015).

[35]Gordon Barrass, *The Great Cold War* (Pale Alto: Stanford UP, 2009), pp. 46–47; Vladislav Zubok and Constantine Pleshakov, *Inside the Kremlin's Cold War* (Cambridge: Harvard University Press, 1997), 93–95.

[36]A.S. Orlov, *Tainaia Bitva Sverkhderzhav* (Moscow: Veche, 2000), chapter 2, part 1.

[37]Zaretsky, Alekhin and Kutsenko. The Allies' airlift during the Berlin blockade impressed the Soviet leadership in term of the U.S. and UK air power capabilities and further fueled their ingrained air defense anxieties. Barrass, p. 58.

[38]Dmitry Leonov, *Kniga Pamiati o 685 ZRP* (Moscow, 2016), chapter 1. Also see: N.N. Iakovlev, *TsRU protiv SSSR* (Moscow: Pravda, 1983). The concern was so high that in the late 1940 s the head of the sabotage and special operations department of the NKVD was ordered to prepare a plan for neutralizing the U.S. strategic air superiority, by conducting diversionary missions against nuclear targets in the U.S. and in Europe. Drogovoz, *Vozdushnii Schit Strany Sovietov*, 41–42.

[39]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 44–49; Krinitsky (2005).

Part two: The impact of nonstrategic factors on the execution of decisions

The Soviet AD before and during the Great Patriotic War (GPW)

The period before and during the GPW served as the source of organizational tensions and bureaucratic struggles that shaped the form and essence of Soviet AD and informed decisions on AD matters across subsequent generations of political and military leaders. These decisions have also left a strong imprint on the Russian way of war, peculiar strategic mentality, and unique approach to military thought.

The first effort to conceptualize and organize Soviet AD was made by Mikhail Frunze, the first commissar of military affairs and a prominent theoretician. Frunze, and after his death in 1925, his followers, 'the reformists,' distilled the principles for the organization of AD by exploring the nature of war at the time. They argued that the increasing depth of air penetration would cover both the front and the rear, giving rise to two main missions: air support of ground and naval forces, and independent air operations aimed against military-civilian infrastructure located in the rear and supporting the front. Consequently, they argued in favor of establishing an integrated, combined arms (air interceptor units and artillery) service under an independent unified command. However, due to several rounds of purges among 'the reformists' during the 1930 s, this ideal type of independent combined-arms service under one unified command was never established.[40]

From the start, the service acquired a complicated command and control (C2) architecture. Since the main AD tool at the time was AAA, the service was assigned to the Artillery Corps in terms of force buildup, training and equipment. The combat AD units were assigned to the Military Districts (MDs) under the authority of the assistant to the district commander for AD affairs, at the time two ranks lower than the commander of the air force within the MD. As the war approached, at the level of the General Staff (GS) the reformists succeeded in establishing a demarcation line between AD of the strategic rear of the state territory (*PVO Strany*), subordinated to the GS, and AD of the military districts (*Voiskovaia PVO*), subordinated to the MD commanders. Despite this nominal division, the commanders of the MDs were *de facto* responsible for both missions, executed solely by the AAA. This initial organizational disposition became the source of all subsequent inter- and intra-service struggles. The main competitors in the AD service – the MDs, Ground Forces (GF), and Air Force (AF) – emerged at this time.[41]

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[40] I.V. Erokhin, 'Bitva za PVO', *VKO* 19 September 2013; Boris Zaretsky, Iurii Alekhin and Sergi Kutsenko, 'Voiska PVO Strany: Vzlety I Padeniia', *VKO*, 27 June 2012.
[41] Erokkhin (2013).

In the first days of the GPW this C2 proved to be a catastrophe and resulted in colossal losses and damage both on the front and in the rear. Even those MDs (turned into the wartime Fronts) that did not collapse following the German invasion were incapable of conducting the two AD missions (front and rear), which differed in terms of territorial coverage, weaponry, C2, and doctrine. Moreover, Front commanders were unwilling to take on both missions. When their Fronts began falling apart and withdrawing deep into the state's territory, they either neglected the *PVO Strany* units subordinated to them in the rear, which then became disorganized and collapsed, or dragged them to the frontline. German bombers easily outflanked this sporadic AD architecture, based only on AAA and lacking AF support, penetrated to a depth of 600–800 km and destroyed undefended industrial, civilian and military infrastructures. The special directive of the GS from July 1941, obliging the PVO commanders of the Fronts to resume their responsibilities in the front and to concentrate on the rear areas, produced no results. The colossal bombing of undefended targets in the rear was so devastating that in the first week of the war Stalin received more than twenty telegrams from the directors of the biggest defense industries and from the Party seniors in the rear, 'begging [him] to defend them from the merciless bombings.'[42]

It took the Soviet leadership time to get to the root of the problem. When Stalin asked Zhukov, then Chief of the GS, 'Where is our PVO Strany, and what is it doing?' Zhukov was unable to respond. The watershed moment came in August 1941 when, as a result of several rounds of bombings, the Luftwaffe practically obliterated the most important military-industrial objects in Voronezh, far behind the front line. Stalin demanded that the GS analyze the *PVO Strany*'s problems and elaborate its reorganization. He was personally involved in the staff work, correcting the suggestions, and on 9 November 1941 finally approved the order of the State Defense Committee on 'Strengthening and Improving PVO Stany,' which outlined a totally new AD architecture. According to the order, *PVO Strany* was taken from the MDs and turned for the first time into a separate corps (*rod voisk*) and subordinated directly to Stalin. General-Major Gromadin was nominated as its first commander. All the districts of the AD in the European part of the Soviet Union were reorganized and subordinated to him. Also, in 1942 Stalin ordered that regiments of the interceptor aviation from the AF be subordinated to the new commander of the *PVO Strany*, thus turning the PVO Strany into a combined arms service (AAA and IA).

Now the administrative disposition of *PVO Strany* no longer coincided with the borders of the Fronts, but was driven by the logic of potential air strikes. Indeed, Stalin's reform corresponded with the initial blueprints of the reformists from the 1920 s.[43] When by 1943 the situation stabilized and the Red

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[42]Erokhin; Zaretsky, Alekhin and Kutsenko.
[43]Ibid.

Army started to advance westwards, the unified corps was divided into three huge Fronts, Western, Central and Eastern, and the Special PVO Army of Moscow. Although the previous organization had ensured the effective defense of Moscow and subsequent major operations, the Main Defense Committee ordered that the position of *PVO Strany* commander be eliminated, that two big *PVO Strany* Fronts, Western and Eastern, be established, and that they be re-subordinated to the commander of the Artillery Corps. This arrangement remained in place until the end of the war. Retrospectively, the Soviet experts saw this elimination of the one unified coordinating function of *PVO Strany* as a mistake.[44]

AD reorganizations under Stalin (1946-1953)

Toward the end of the war, in June 1945, the Soviet GS approved the reduction of the 11 million-strong Soviet military. Demobilization lasted till 1948 and affected 8.5 million people.[45] Reduction of the military created the most intensive competition among the large number of marshals and generals that had emerged during the war, and the services associated with them. Each service and its marshals tried to preserve themselves from the downsizing. Marshals and generals engaged in intrigue, built coalitions, spread rumors and reported on each other. Stalin encouraged this dynamic, on the assumption that a divide-and-rule approach would allow him to execute control better and decrease the risk of any plotting against him by the popular war heroes.[46] Internal competition, in particular among the PVO troops, which by October 1946 had been reduced from 637 thousand to about 147 thousand,[47] was more intense than anywhere else.

In 1945 the Soviet Army shifted from the wartime Fronts back to the peacetime MDs and did not preserve the effective administrative arrangements of the PVO zones established during the war. This, coupled with the postwar force reduction, resulted in the renewal of the prewar 'inter-service struggle' (*mezhvedomstvennaia bor'ba)* between *PVO Strany*, the MDs, and the AF. The ambitions of the services intensified against the backdrop of the military reductions, in light of Stalin's strategic emphasis on AD and the increasing number of Western air reconnaissance penetrations, which each of the services utilized to increase its influence, and which the PVO leadership saw as a 'blessing' that enabled it eventually to prevail over its competitors.[48]

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[44]B.F. Cheltsov, 'Shtab Voisk PVO: Osnovnue Sozdaniia, Razvitiia I Deiatel'nosti', *VM*, no. 2, February 2007; Erokhin; Zaretsky, Alekhin and Kutsenko.

[45]Iu. N. Balueevsky, "Deiatel'nost' GS v pervye poslevoennye gody (1946–1953), *VIZh*, no. 1, 2003.

[46]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 53; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 493.

[47]B.F. Cheltsov, 'Zarozhdenie I Razvitie PVO Strany', *VIZh*, no. 2, 2004, pp. 18–27.

[48]Erokhin; Zaretsky, Alekhin and Kutsenko.

In addition to the inter-service struggle, there was also an intra-service struggle *(vnutredevodmstvennaia bor'ba)* for primacy within the PVO between the IA and AAA (and later also the SAM lobby). Each corps of the PVO had alliances with and patrons in the outside services, in the AF and Artillery Corps, so often that the intra-service struggles naturally linked to the inter-service competition and came to be exploited by the seniors from the competing services. These struggles would last for decades and result in several rounds of organizational reform.[49]

In 1946, due to the growing threat from U.S. strategic aviation, the Party Central Committee decided to strengthen significantly *PVO Strany*. In 1947 the Council of Ministers qualified all the territory of the Union as being threatened by air strikes, and despite the devastating postwar economic situation ordered total AD coverage of the state.[50] The decision also affected the nuclear project. Building the bomb entailed complicated efforts to mine and process uranium that required the labor of tens of thousands of workers in geographically dispersed locations.[51] The industrial effort towards creating and procuring the bomb represented a colossal effort in terms of investment, people and geography and demanded constant AD. New districts of the PVO, established in 1946–1947, coincided with the locations of the nuclear project.[52] Although the 1947 Soviet Plan of Defense was oriented towards a massive ground offensive, it strongly emphasized the role of the PVO.[53] The post of *PVO Strany* commander was reintroduced, and its wartime commander was re-nominated.[54] This time, however, he was not subordinated directly to Stalin, but to the commander of the Artillery Corps.[55]

In 1947, Stalin nominated one of the lesser known and least ambitious of his marshals, but among the most professional – and probably for these reasons the most trusted – to head a special commission charged with formulating proposals for the reorganization of the Soviet AD.[56] This political emphasis on the importance of AD intensified the inter-service struggle. Briefing this special commission, the recently re-nominated PVO commander argued for restoring the 'wartime' architecture, increasing the number of PVO districts and units, and covering all the territory of the Soviet Union under its

[49]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 46–49.
[50]Erokohin; Zaretsky, Alekhin and Kutsenko; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 236.
[51]Stalin charged Beria with completing the first test in 1948. Zaloga (2002), pp. 7–8.
[52]Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 477.
[53]Orlov, *Tainaia Bitva Sverkhderzhav*, chapter 2, part 2. On 10 July 1946, the special committee for coordinating work on radiolocation technique was established and started the crash production of various types of radars and plants producing radiolocation equipment. Between the late 1940 s and early 1950 s, the industry was overwhelmed by orders from the military demanding the new types of radiolocation equipment. Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 236–241.
[54]Cheltsov.
[55]Zaretsky, Alekhin and Kutsenko; Cheltsov.
[56]V.L. Telitsyn, *Marshal Govorov: Put' Russkogo Ofitsera* (Moscow: Veche, 2013); Cheltsov.

unified command.[57] The Ground Forces opposed a unified PVO architecture commanded by a different service and demanded a return to the prewar organization, when all AD missions and forces were assigned to the MDs. The Air Force demanded that PVO troops be placed under its full command, and also claimed sole responsibility for AD missions.[58] Govorov, who headed the commission, was unable to reconcile the mutually exclusive proposals of the services contending for PVO control, and passed the issue back to Stalin.[59]

Unable or unwilling to broker inter-service tensions, Stalin opted for the so-called 'intermediate option.' In June 1948 he divided the territory of the Soviet Union into the 'border zone' and 'internal territory.' MDs located near the border were assigned responsibility for the 'border zone,' *PVO Strany* troops for the internal territory of the Soviet Union. The GF also had their AD units to cover their forces, and so did the Navy, which also received AD units under its command.[60] *PVO Strany* was removed from subordination to the Artillery Corps Commander and declared the fourth service (*vid voisk*) of the Soviet military.[61] Marshal Govorov, who had headed the commission, became its first commander.[62] Stalin was so deeply and personally involved in organizing the new service that he himself even chose Govorov's deputy to command the interceptor aviation component of *PVO Strany*[63] and personally cherry-picked among the best and brightest of the Soviet generals, appointing them to other senior posts in the new service.[64] Around that time personal and family connections started to play a role in the inter-service struggles.[65]

What this first postwar reorganization meant was that for about a year, until the second reorganization, there were in parallel five different entities equipping themselves for AD missions, operating independently of each other, but with lots of blind spots, duplications, and operational ineffectiveness. Reorganization was unable to prevent even solitary reconnaissance penetrations, not to mention a massive strategic air invasion. In February 1949

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[57]Iu. V. Krinitsky, 'Protivovozdushnaia oborona: otechestvennyi opyt reorganizatsii I sovremennost'', *VM*, no. 2, 2005, pp. 76–80.

[58]Erokhin; Zaretsky, Alekhin and Kutsenko.

[59]A.D. Volkov, 'Pervyi Glavnokomanduiuschii Voiskami PVO Strany', *VM*, no. 5, 2003.

[60]Erokhin; Zaretsky, Alekhin and Kutsenko.

[61]Volkov; Cheltsov; Baluevsky; A.V. Shlykov, 'Kafedra Operativnogo Iskusstva VVS Voennoi Akadenii GSh RF', *Vestnik AVN* 4/21 (2007). Govorov's commission also recommended establishing the faculty of PVO in the department of Operational Art of the GSh Academy. 'Govorov Leonid Aleksandrovich: Poslevoennyi Periud', Biography website established by Govorov's family (marshall-govorov.ru).

[62]Volkov; Cheltsov. A.N.Kiselev, *Polkovodtsy I voenachialniki VOV* (Moscow: ZhZL, 1960), 35; Gruppa Avtorov, *Voiska Protivvozdushnoi Oborny Strany* (Moscow: Voenizdat, 1968), Chapter 3, part 1.

[63]E.Ia. Savitsky, *Polveka s Nebom* (Moscow: Voenizdat, 1988) Chapters: 'Parad v Tushino', and 'V Predverii Sverkhzvukovykh.'

[64]Aleksandr Kochiukov, 'Beria, Vstat'! Vy Arestvanny!', *KZ*, 29 June 2003.

[65]For example, Vasilii Stalin, who in 1948 became the head of the AF of the Moscow District, demanded the re-subordination to him of the best airfields of the IA of the PVO located near Moscow with the modern jets, mainly in order to be able to organize air parades.Drogovoz, *Vozdushnii Schit Strany Sovietov*, 47.

the second PVO reorganization began, but was limited to assigning the border zones to the MDs. This did not improve the effectiveness against air penetrations whatsoever. Following the establishment of NATO, these flights intensified in numbers and increased in depth of penetration, reaching Leningrad, Minsk, Smolensk and Kiev.[66] The MDs gave to the AD in the border zones low priority, being focused on the ground-related combat planning, and seeing IA more in terms of close air support than in terms of the AD missions. For example, in August 1951 eight bombers spent 14 minutes over Soviet territory. The investigation concluded that the MDs had repeatedly violated all the PVO-related directives, saw the AD of the border as a secondary task, did not practice regular air patrols, and did not establish C2 interception procedures between early warning stations, MD headquarters and IA assets assigned to it.[67] Despite the seeming rise in the service's importance, the lack of a unified command and lack of a unified airspace picture had negative implications for the effectiveness of combat readiness.[68]

Frustrated, in 1951–1952 the Soviet leadership initiated the third PVO reorganization. The AD responsibilities were taken from the GF, renamed AD of the Border Zone, and reassigned from the MDs to the Air Force. The first deputy of the AF commander also became the head of the new structure. Accordingly, AD responsibilities within the MDs now moved to the districts' deputy AF commanders.[69] For the AF, which had been bypassed during the first two reorganizations, this was a huge achievement within the organizational struggle. In 1951, the Council of Ministers ordered the establishment, in addition to the two zones within the Soviet Union, of the 'external zone' of the PVO within the Socialist countries of Eastern and Central Europe, as the forward echelon of defense. In 1952, the Soviet Union started to equip and train its European allies to enable them to conduct independent AD missions.[70] Thus, during this period there were actually three parallel AD services: PVO of the Border Zone, headed by the AF; PVO of the troops and objects of the MDs, headed by the district commanders; and *PVO Strany*, headed by its commander.[71]

Despite the reorganization, the end result was the same: unstoppable air penetrations increased and started to reach the outskirts of Moscow.[72] These included not only penetration by bombers but also an increase in missions to parachute sabotage and reconnaissance groups.[73] Assigning huge AD assets to the MDs was also paradoxical in terms of self-imposed obstacles when it

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[66]Erokhin; Zaretsky, Alekhin and Kutsenko.

[67]A.V. Samokhin, 'Vozdushnaia oborona granits SSSR v nachiale 1950-kh godov', *VIZh* 12 (2016), 25–28.

[68]Cheltsov, 'Zarozhdenie I Razvitie PVO Stran'.

[69]Erokhin; Zaretsky, Alekhin and Kutsenko.

[70]Bystrova, *Voenno-Promyshlennyi Kompleks SSSR v gody Kholodnoi Voiny*, 247, 499.

[71]Samokhin, 'Vozdushnaia oborona granits SSSR v nachiale 1950-kh godov'.

[72]Erokhin; Zaretsky, Alekhin and Kutsenko.

[73]Samokhin, 'Vozdushnaia oborona granits SSSR v nachiale 1950-kh godov'.

came to the actual utilization of these assets. The commanders of the MDs subordinated many of these assets to the nonexistent in peacetime but preplanned wartime fronts. This was probably also one of their main arguments during the inter-service struggle – to ensure AD of the fronts for a future war. However, in practice the combat-ready and functioning PVO structures became subordinate to the nonexistent in peacetime command functions, whose deployment was planned only in case of war. While the AD assets were expected to react immediately to a lightning air attack, the command chains of their ground-forces commanders required several days to activate wartime structures.[74]

As the new service began massive rearmament, procurement and training of the cadre,[75] two main rivals emerged in the intra-service competition – AAA (and later SAMs) and IA PVO. The Soviets realized the ineffectiveness of their piston-engine IA against jet-engine strategic bombers and started a crash program for copying, testing and manufacturing (from 1949) of the MIG-15 and YAK-15 jet fighters, most of which went to the IA of the PVO.[76] By the mid-1950 s almost the entire fleet of IA PVO consisted of jet fighters.[77] This leap forward in terms of IA capabilities occurred before the leap forward in SAM production, which in the early 1950 s gave the IA a good chance of claiming AD primacy. The effectiveness of the MIG-15 jets and ineffectiveness of the AAA of the Soviet expeditionary force in Korea against strategic bombers strengthened the IA in the PVO intra-service competition, and the AF in the inter-service struggles.[78] Despite the acceleration of jet fighter production, until the all-weather and night generations of MIGs became available in the late 1950 s, the AAA refused to capitulate and in 1948 started to equip itself with radar-directed AAA,[79] investing huge sums in the procurement of a wide range of guns.[80]

Despite rapid and massive rearmament by these intra-service competitors, the Soviet PVO continuously failed to intercept low- and night-flying targets and lagged behind the enemy's development of aviation.[81] The end result was low effectiveness of the command and combat readiness of *PVO Strany* and parochial procurement of weapons systems.

[74]Krintisky (2005).

[75]Volkov; 'Govorov Leonid Aleksandrovich: Poslevoennyi Periud.'

[76]Igor' Drogovoz, *Vozdushnii Schit Strany Sovietov* (Minsk: Kharvest, 2003), 23–25; E. Arseneyev and L. Krylov, *Istrebitel' MIG-15* (Moscow: Armada, 1999).

[77]YAK-15, MIG-15, MIG-15b, YAK-17b, MIG-17, MIG-17b, YAK-25, MIG-19 S.A. Bil'ko, V.V.Gindrankov, and T.IA. Kolpakov, 'Rol' istrebitel'noi aviatsii v stanovelnii I razvitii protivovozdushnoi oborony strany', *VM*, no. 9, 2015; V.S. Mikhailov, 'K 9- letiu VVS', *VIZh*, no. 8, 2002, pp. 2–15.

[78]Zaretsky, Alekhin and Kutsenko; Drogovoz, *Vozdushnii Schit Strany Sovietov*, 115–135; Zaloga (2002), p. 15.

[79]Zaloga (2002), p. 19.

[80]Leonov, chapter 2.

[81]Still, by 1952, less than 30% of the forces had a sufficient number of radars, and several areas of the Soviet border were still uncovered. Bystrova,*Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 242.

In contrast to the official propaganda about sealed borders, U.S. aircraft on reconnaissance missions regularly penetrated Soviet airspace and air-dropped diversion-reconnaissance groups in the Baltics and Ukraine.[82] The Party Central Committee was infuriated. A special investigation designated the low quantity and quality of radiolocation, poor preparation of troops, and poor coordination between the sub-services as the main reasons for the failure.[83] In May 1950 Govorov sent a special letter to the Council of Ministers requesting development of SAM capabilities.[84] His earlier requests, together with other factors, were probably the background to Stalin's initiation of the SAM project.[85]

Surface to air missile (SAM) project

The establishment of an impenetrable AD system demanded special measures. To this end, in parallel with the organizational changes to *PVO Strany*, Stalin initiated the most innovative and formidable endeavor, the development and deployment of SAMs.[86] This megaproject was similar to the nuclear one in that it became a main vector of the strategic defense programs. The idea of the Moscow AD merging all the newest technologies of radiolocation and rocket science, and then having these means replicated over Soviet territory, probably came to Stalin in late 1947.[87]

In the course of 1947–1948, Stalin had several conversations with Kuksenko, the patriarch of Soviet radio-engineering[88] and military designer who in 1947, together with Sergei Beria, the son of Lavrentii Beria, led the newly established design bureau (SB-1) working on radio-guided rocket systems.[89] A belletristic reconstruction of one of their encounters illustrates Stalin's state of mind:

> Do you know [Stalin asked Kuksenko] when an enemy airplane last overflew Moscow? On 10 July 1942. This was a solitary reconnaissance plane. Now imagine that a solitary plane appears over Moscow, but with an atomic bomb. And if from the massive raid [on Moscow] only a few solitary planes got through, as happened on 22 July 1941, but now with nuclear bombs? […] And even without nuclear bombs – what was left of Dresden after the massive air strikes of our yesterday's allies? And now they have more planes, and enough nuclear bombs, and they are nesting nearby. That means we need a totally new PVO, capable during a massive raid of not letting a single plane pass through to the defended

[82]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 48–49.
[83]Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 248–252.
[84]Volkov.
[85]'Govorov Leonid Aleksandrovich: Poslevoennyi Periud.'
[86]K.S. Alperovich, *Rakety Vokrug Moskvy* (Moscow: Voenizdat, 1995), p. 5.
[87]Votintsev, 'Neizvestnye voiska ischeznuvshei sverkhderzhavy',; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 242.
[88]Evtif'ev, pp. 49.
[89]Kisun'ko, *Sekretnaia Zona*, chapter 8.

object. What can you say regarding this hugely important problem? [Kuksenko responded] We with Sergei Lavrentivich Beria attentively examined captured materials on the German development of the guided zenith rockets. According to our estimates, formulated together with German specialists working for us, prospective PVO systems should be built based on a merger of radiolocation and guided rockets, 'surface-air' and 'air-air.'[90]

When Kuksenko 'emphasized that the scientific-technological difficulty and scale of the problems were not less than the problem of creating nuclear weapons,' Stalin said:

> There is an opinion, comrade Kuksenko, that we should immediately start creating the PVO system of Moscow, aimed at countering a massive enemy air raid from any direction. To this end, the special Main Directorate will be created next to the USSR Council of Ministers, along the lines of the First Main Directorate on the nuclear thematic. The new Main Directorate will have a right to involve in its work any organizations of any ministries and institutions, providing to them material funds and financing, according to the needs and with no limits. Such a Main Directorate should have a powerful scientific-design organization that will take the lead in dealing with this problem, and we intend to create this organization on the basis of [his and Beria's] SB-1, reorganizing it into Design Bureau no. 1 (KB-1)."[91]

The KB-1, which Stalin designed as the brain of the future Third Main Directorate, was analogous in its role to the KB-11 in the nuclear project. The establishment of the KB-1 was unusually rapid. The TGU would only be officially established in 1950, but specialists started to arrive at the design bureau by the second half of 1948.[92] Since late 1945 Soviet engineers had been systematically exploring German rocket technology and the first German SAM designs. This occurred mainly within the Second Main Directorate (VGU) which dealt with all the rocket-related issues.[93] The central design bureau of the VGU, Scientific-Technological Institute no. 88 (NII-88), worked in parallel on two rocket families: ballistic SSMs, and SAMs.[94] It first worked to recreate the German missiles and then, based on them, to develop indigenous weapon systems.[95]

In NII-88, the ballistic missile program, headed by Korolev, advanced well, but work on the SAMs lagged behind schedule. The delay stemmed in part from the fact that German knowledge of SSMs was more advanced than that

[90]G.V. Kisun'ko, *Sekretnaia Zona* (Moscow: Sovremmenik, 1996), chapter 8.
[91]Kisun'ko, *Sekretnaia Zona*, chapter 8.
[92]Bystrova, *Voenno-Promyshlennyi Kompleks SSSR v gody Kholodnoi Voiny*, 242; Kisun'ko (1996), chapter 8; Alperovich, *Rakety Vokrug Moskvy*, 6; Anatolii Dokucahev, 'Rasskazivaem vpervye: gordaia taina Almaza', *KZ*, 12 September 1992.
[93]Alperovich, *Rakety Vokrug Moskvy*, ; Chertok; Kisun'ko; G. Dyakonov and K. Kuznetsov, 'Zenitnye upravliaemye rakety tretego reikha', *Tekhnika I Vooruzhenie* 5–6 (1997), 11–23.
[94]K.S. Alperovich, *Gody Raboty nad Sistemoi PVO Moskvy (1950–1955): Zapiski Inzhenera* (Moscow: Uniserv, 2003), 7–8.
[95]M.D. Evtif'ev, *Iz Istorii Sozdaniia Zenitno-Raketnogo Schita Rossii* (Moscow: Vuzovskaia Kniga, 2000), 25–26.

of SAMs, while the scientific-technological demands of the guidance mechanisms and maneuverability of the latter were more complicated than those of the former. However, the main reason was subjective – the tensions and power struggles between the team working on SSMs and that working on SAMs. Each demanded enormous resources and attention, and each team attempted to gain control of various design bureau scientific departments and resources. The struggles were so acute that even during the Party meetings within NII-88, the SAM developers accused Korolev, who headed the SSM program, of usurping all the capabilities of the design bureau for the needs of his theme, at the expense of the SAMs.[96]

Although both the nuclear and the missile projects were state priorities, conditions were not equal, as the state was unable to provide equally for both megaprojects. The missile people saw themselves as 'poor relatives' of their nuclear colleagues, and during those years operated from a position of limited funds as compared to them.[97] Korolev managed to manipulate the situation in such a way that the major effort – especially of the guidance systems department, critically important to SAMs – went to his 'baby project,' long-range SSMs, somewhat to the detriment of the SAMs.[98] It is unclear to what extent Stalin's decision to initiate *Berkut* as the standalone and prioritized program as well as the establishment of the TGU was driven by his internalizing the fact that the cause of the slow progress was the bureaucratic struggles among the designers.[99] Eventually, however, the SAM program was taken from the VGU and given to the TGU.[100]

Berkut (later renamed S-25), which is translated from Russian as golden eagle, stands for the abbreviation of Beria and Kuksenko.[101] The project was aimed at countering massive bomber raids and consisted of two circles of short- and long-range warning and target acquisition radars and two circles of SAMs located 50 and 90 kilometers respectively from Moscow.[102] Its operational capability was meant to ensure Moscow's defense from an attack by a thousand bombers[103] – Stalin's perception of the scale of the Allied strategic bombing raids on German cities.[104] The project was top secret. The Minister of Defense approved it without informing his immediate subordinates. At some point they began to realize that there was a mammoth

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[96]Evtif'ev, pp. 45–47.
[97]Chertok, vol. 1, chapter 4, pp. 231–232.
[98]Boris Chertok, *Rakety I Liudi* (Moscow: Mashiostroenie, 1999), vol. 1, chapter 5, pp. 266–272; Evtif'ev, p. 45.
[99]Chertok; Evtif'ev.
[100]Evtif'ev, pp. 45–47.
[101]Votintsev, 'Neizvestnye voiska ischeznuvshei sverkhderzhavy',; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 242; Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 15.
[102]Kisun'ko, *Sekretnaia Zona*, chapter 8; Alperovich (2003), pp. 21–22; Zaretsky, Alekhin and Kutsenko; Evtif'ev, p. 50.
[103]Votintsev, 'Neizvestnye voiska.'
[104]Zaloga (2002), p. 19; Alperovich, *Rakety Vokrug Moskvy*, 11.

construction and weapons development project going on under their noses, but remained unaware of its substance. To maintain secrecy, the TGU established its own military-industrial quality control organ, its own testing range, and its own troops to operate the system. The plan was to transfer *Berkut* to the MoD in a state of full combat readiness, with the weaponry and troops.[105] The TGU got unlimited access to funds and materials that it received without delay.[106] Young Beria was an important administrative resource. All the organizations and superiors, whether they thought that KB-1 was right or wrong, would do anything to please him.[107]

Despite favorable conditions, it took a while for progress to be made.[108] The scientific complexity accounted for lagging behind schedule,[109] but subjective issues mattered too. The KB-1 had the deficiencies and dysfunctions of the *sharashka* – a secret design bureau within the Soviet political prisons system. In addition to the free staff, it included NKVD officers in the leading administrative positions, captured German scientists, and Soviet scientists who were political prisoners. Technologically incompetent managers from the NKVD and a high level of secrecy and compartmentalization hampered the work.[110] Due to rushed and unrealistic deadlines, the project suffered from significant defects. 'Non-optimal exploitation of resources and forceful imposition of decisions' led to deadlocks and blunders.[111]

In parallel to the tests, the construction and deployment of the system around Moscow was finalized by 1954.[112] However, after Stalin's death and Beria's arrest the SAM lobby lost its main patrons. The system was renamed S-25 and its future was not assured. When it came time for deployment in other parts of the Soviet Union, intra-service tensions intensified and slowed down the process. The AAA lobby did not want to surrender their central position in the PVO and demanded that competitive tests be conducted to test the effectiveness of their recently developed guns versus the capacity of

[105]Kisun'ko, *Sekretnaia Zona*, chapter 8. Votintsev, 'Neizvestnye voiska ischeznuvshei sverkhderzhavy',; Alperovich, *Rakety Vokrug Moskvy*, 10–11; Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 9–12.

[106]Evtif'ev, p. 50; Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 15; Alperovich, *Rakety Vokrug Moskvy*, 6, 10.

[107]Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 18. He was also influential in delicate situations when it came to preserving the Jewish scientists of his bureau from repression. The work on Berkut coincided with the peak of the anti-Semitic campaign, which resulted in massive firing of Jews from important positions. Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 32–33; Evtif'ev, p. 48.

[108]Kisun'ko, *Sekretnaia Zona*, chapter 8.

[109]Bystrova, *Voenno-Promyshlennyi Kompleks SSSR v gody Kholodnoi Voiny*, 243, 510.

[110]Alperovich, *Rakety Vokrug Moskvy*, 6. For example, German and Russian teams working in parallel ended up with different design solutions. Alperovich (1995), pp. 29–31. Alperovich (2003), pp. 39, 53, 55, 57–71.

[111]Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 39, 53, 55, 57–71, 151.

[112]Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 71–123, 136, 142; Evtif'ev, pp. 52–53.

the S-25 missiles against bombers simulating nuclear strikes.[113] The military, which by then had learned about the project, also took a conservative position and appeared averse to getting new and unknown weapons, demanding prolonged tests.[114] As the tests continued, the military resisted the introduction of the system to the troops. Only Khrushchev's order not to fear technologically advanced weapon systems resolved the issue. However, although the introduction of the S-25 was approved in 1955, for almost two years the system was deployed among the troops but inactive. The military preferred not to operate it. Only the incident in August 1957, when radar pinpointed a target moving in the direction of Moscow, prompted the MoD to switch all the rockets to combat readiness mode.[115]

The next goal was to cover all Soviet territory and to produce a mobile SAM with increased range and low-altitude capability. The work on what would become the S-75 began. The military and several civilian ministers strongly opposed and almost killed the project. Zhukov, then-minister of defense, saved it, siding with the main designers against several marshals. This reflected a traditional tension within the Soviet military-industrial complex between the military, which thought to acquire the cheapest weapons in the greatest quatity as rapidly as possible, and industry, which sought to promote more sophisticated and expensive weapons types. The pro-SAM coalition was also personal: Only two years before, Zhukov and the PVO seniors had been the small group of ten entrusted by Khrushchev with arresting Beria. The ties forged then enabled the SAM lobby to drive the allocation of administrative resources.[116]

In late 1957 the S-75 entered the force and work on the S-125 began.[117] The intra- and inter-service struggles within the military, however, resulted in low operational effectiveness of the SAMs; the struggles between the military and industry slowed serial production. Despite the leap forward in Soviet AD, U.S. jets continued their unstoppable penetrations.[118] Khrushchev would sound the final chord in the inter-service struggle between SAMs, AAA and IA only following the successful interceptions of the U2 over the Soviet Union in May 1960 and then over Cuba in October 1962. These established the primacy of the SAMs within the intra-service struggle, nudging the IA incrementally into a secondary position and turning it into the supporting echelon

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[113]Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 125; Alperovich, *Rakety Vokrug Moskvy*, 56.

[114]Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 144–148.

[115]Votintsev (1993); Orlov, *Tainaia Bitva Sverkhderzhav*, chapter 2, part 2; Zaretsky, Alekhin and Kutsenko; Alperovich, *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera*, 149; Leonov, chapter 2; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 258; Volkov.

[116]Orlov, *Tainaia Bitva Sverkhderzhav*, chapter 2, part 2; Evtif'ev, pp. 53–54; Sergei Ganin, Vladimir Korovin, Aleksandr Karpenko, Rostislav Angelskii, 'Sistema 75', *Teknika I Vooruzhenie*, nos. 10, 12, 2002 and nos. 1, 3, 4, 2003. Bystrova (2001), p. 514.

[117]Alperovich, *Rakety Vokrug Moskvy*, 54–55.

[118]Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 258.

of the major effort. From that time on the pace of production, procurement and deployment of the SAMs would intensify.[119] The first Soviet SAMs were, according to Western sources, 'a remarkable accomplishment,' given the Soviet backwardness in the field of electronics. However, they were impotent against the supersonic bombers that started to appear in the late 1950 s, and were threatened by air-to-surface missiles. For this reason, the PVO strategic defense platform was 'horribly expensive, technically unsound, and bound for premature obsolescence.'[120]

AD reorganizations after Stalin (1953-1960 s)

Frustrated by unstoppable Western raids, the Soviet leaders continued to reform the AD service. The fourth PVO reorganization was probably prepared by Stalin but occurred after his death, in 1953. It discharged the AF from the AD missions, reassigning some of its forces to *PVO Strany* and the rest to the MDs and the Navy. On the one hand, this reorganization assigned the general responsibility for all AD missions of the Soviet Union to *PVO Strany*; on the other hand, however, it preserved the dual subordination within the MDs with no unity of command. The formal strengthening of *PVO Strany*, but without actually ensuring its control over the AD missions of the MDs, made no improvement in the overall operational effectiveness. NATO airplanes conducting reconnaissance missions and parachuting agents and equipment could still reach Moscow with impunity. The watershed occurred in spring of 1954. On 29 April, on the eve of the May Day Parade, three B-47 strategic bombers penetrated from the Baltic Sea all the way to Novgorod, Smolensk and Kiev. The same occurred on 8 May, on the eve of the Victory Day Parade. The Party's Central Committee investigation found that the U.S. simply exploited purely nominal coordination, competition and a terrible level of interoperability between various AD organizations (MDs, Fleets, and *PVO Strany*). On 27 May 1954, the Central Committee issued a special decree 'On the Unpunished Flights of the Foreign Aviation over the Soviet Territory,' which discharged aviators from the command posts of the PVO Strany and became the basis for the fifth PVO reorganization.[121]

The fifth PVO reorganization, outlined in May 1954 and lasting till 1957, was a major enterprise. It largely terminated the parochial organizational struggles between the GF, MDs, AF and PVO Strany and revived the independent and unified PVO wartime architecture. Due to the 'rapid development of the continental and intercontinental strategic aviation of the U.S., threatening

[119]Erokhin; Volkov; 'Govorov Leonid Aleksandrovich: Poslevoennyi Periud;'Vladimir Iaroshenko, 'Osnova Ognevoi Moschi', *VKO*, 10 February 2013; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 258–259; Drogovoz, *Vozdushnii Schit Strany Sovietov*, 138–144.

[120]Zaloga (2002), pp. 19–27.

[121]Erokhin; Zaretsky, Alekhin and Kutsenko.

the strategic rear and economic potential of the Soviet Union … and in light of the increasing scale of the NATO aviation's penetrations of Soviet airspace,' *PVO Strany* was changed from a corps (*rod voisk*) into a service (*vid voisk*). This meant that the rank of the service commander was elevated to that of the heads of the AF, GF, Navy and MDs. The new service incorporated almost all the AD forces of the Soviet military, including the IA units in the MDs; the borders of its area of responsibility coincided with the borders of the Soviet Union. The MDs were left a tiny portion of the AD systems of the GF and the Fleets regained their AD systems.[122] In August 1954, work on establishing the Central Command Post of *PVO Strany* service began, but it was not until 1961 that the actual system of command and control of all PVO staffs became operational.[123]

On the same day the Council of Ministers approved another decree 'On Supplying PVO Strany Troops with New Technique.' According to the Russian AD specialists, until then the military leadership had been over-fixated on organizational reforms and 'primitively analyzed the scientific-technological impact' on the nature of war. As a result, technologically, 'the superior adversary was unattainable for the PVO Strany.'[124] Despite the slow-down in weaponry development, from the mid-1950 s the new service gave it new momentum. It reorganized all the scientific-technological institutions, dispersed till then among various services and corps, into the first scientific-research institute functioning solely for the needs of the PVO, and established two military higher education institutions, all located in one city, to ensure a scientific-R&D-educational ecosystem for the needs of the service. Only then did coordinated force buildup, R&D, procurement and equipment of the forces, and systematic education and training begin.[125] In 1954 the formation of the Radio-Technical Corps was accomplished and procurement of several new models of radar began.[126]

Struggles with the GF did not end even when the golden era of *PVO Strany* began. Even then the PVO did not succeed in imposing the unified command on all the AD forces. The *PVO Strany* wanted to administer the service internally according to the standard Soviet military classification – i.e., districts, armies, corps, and divisions. However, the GF demanded that the administrative divisions from the time when it controlled the service through the MDs be preserved, in order to ensure better interoperability. The

[122]Erokhin; Zaretsky, Alekhin and Kutsenko; 'Govorov Leonid Aleksandrovich: Poslevoennyi.'
[123]Cheltsov.
[124]Erokhin; Zaretsky, Alekhin and Kutsenko.
[125]Erokhin; Zaretsky, Alekhin and Kutsenko; Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 253–254.
[126]Zaretsky, Alekhin and Kutsenko.Nikolai Simonov, *Voenno Promyshlennyi Kompleks SSSR v 1920–1950e gody* (Moscow: ROSSPEN, 1996), 257–263. Grigorii Lazun, 'TsOK RTV', *VKO*, 15 February 2013. Still, the significant lag in the field of radiolocation resulted in the systematic failures to countermeasure air threats in the Soviet Union and in Korea. Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 244–247.

leadership devised a compromise: *PVO Strany* got its desired internal administrative division, but the number and borders of its districts were synchronized with those of the GF. This seemingly conciliatory arrangement came at the expense of combat effectiveness. The PVO's maneuvering capabilities were restricted by the artificial geographical divisions, as the vectors of the NATO air strikes were not organized in keeping with the logic of the Soviet administrative division. PVO seniors pointed to the absurdity of this situation, arguing that the enemy would not cooperate and would exploit these self-imposed Soviet restrictions when designing its raids into the Soviet rear. Their remonstrance fell upon deaf ears for three years. The GF were so determined to preserve even the small portions of the AD in the MDs that they even decreased the number of military districts.[127] Parallel chains of command, often unsynchronized in terms of geography and hierarchies, resulted in unresolved strategic-operational interoperability between various command levels and different services.[128]

Only in 1960, during the sixth PVO reorganization, did the service succeed in aligning the borders of its districts not with the logic of the GF MDs but with the most optimal configuration for countering the air aggression. Amazingly, the rivalry did not stop there, since the GF preserved their control over the PVO assets at the operational levels below the MDs – within the corps and divisions. Only the seventh PVO reorganization, which occurred between 1960 and 1962, better streamlined *PVO Strany* assets at the operational-tactical level. Another important innovation of that reorganization was that it produced a fully integrated combined arms service up to the tactical level that incorporated all corps of the PVO service: radiolocation, IA and SAMs.[129] But even at this time, the inter-service fighting assumed grotesque dimensions.[130] Khrushchev's fascination with rockets enabled the SAM lobby to prevail in intra-service struggles and *PVO Strany* to triumph in the inter-service struggles. At the same time, the inter-service struggles and high demand for various types of AD systems led to the allocation of enormous funds and the investment of efforts in redundant and 'stillborn projects,' enormously expensive infrastructures which were often rendered useless, and usurpation by specific services of the advanced capabilities.[131]

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[127]Erokhin; Zaretsky, Alekhin and Kutsenko; Krinitsky, 'Protivovozdushnaia oborona: otechestvennyi opyt reorganizatsii I sovremennost'', .

[128]Krinitsky, 'Protivovozdushnaia oborona: otechestvennyi opyt reorganizatsii I sovremennost'', . Although the PVO service enjoyed an almost twenty year-long 'Golden Era', it abruptly ended in 1978 when the Chief of the GS Ogarkov reassigned almost half of the PVO Strany assets back to the MDs. Volter Krasovsky, 'Krestnyi Otets Sovietskoi PVO', *NVO*, 30 June 2000.

[129]Erokhin; Zaretsky, Alekhin and Kutsenko; Cheltsov.

[130]Aleksei Frolov, 'O Sluzhbe Tyla', *VKO*, 13 February 2013.

[131]In the second half of the 1950 s, when the PVO Strany reached its maximum dominance in the inter-service struggles, they ensured that the PVO of the GF lacked a modern C2 system, resulting in its very low functioning and effectiveness. The PVO of the GF bombarded Khrushchev with complaints that the PVO Strany had usurped all state-of-the-art C2 systems and forces to itself. In parallel, the IA still

Conclusion: Struggle and unity of strategic and nonstrategic negations

In the postwar years Stalin established three special directorates subordinate to him personally. The first, charged with the creation of nuclear weapons, emerged in summer of 1945; the second, established in spring of 1946, dealt with missile technology; the third, established in summer of 1946, dealt with radiolocation and AD. These three were then the most secret, powerful, and resource-consuming Soviet entities. The biggest ministries, departments, industries, scientific institutions and construction organizations, and millions of civilians and military were subordinate to these three directorates, which reported to neither the republican nor the all-Soviet authorities. In none of the transcripts of the Supreme Soviet is there a single line even mentioning their names. However, they were the main engines of the future Soviet military power. No funds or means were spared for their sake.[132] In theory, thanks to their direct access to Stalin and abundant resources, the heads of the directorates could have made and implemented decisions quickly and effectively, bypassing all bureaucratic and financial obstacles.[133] In practice, however, the implementation of Stalin's guidance, especially in the AD project, then the most pressing necessity and highest priority, could not have been farther from the ideal doctrinal-organizational-industrial process.

This article has demonstrated that the shape and essence of the Soviet AD innovation resulted from three constantly interacting strategic and nonstrategic factors: (1) an understanding of the nature of the adversary and the image of the future war; (2) organizational rivalries, civil-military relations, and personal power struggles among the bureaucratic actors competing over professional prestige, budgets and access to decision-makers; and (3) the traits of strategic culture, including formative historical experiences, mental frames of reference and unconditioned organizational and personal reflexes. Each of these factors is necessary but insufficient to explain the innovation under scrutiny. Eventually, the Soviet R&D and procurement decisions, weapons deployment and employment patterns, and creation of organizational structures resulted equally from rational choices and irrational and counter-intuitive considerations. Despite Stalin's guidance, the actual innovation was often ineffective and self-defeating, conditioned by the imprint of the social-cultural factors, which are summarized below.

Nowhere else in the Soviet military did inter- and intra-service struggles and personal and institutional wars flourish as in the PVO. The military

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refused to concede defeat, for in 1959 it started to equip itself with modern radars and air-to-air rockets. Bystrova, *Voenno-Promyshlennyi Kompleks SSSR v gody Kholodnoi Voiny*, 256–261, 269.

[132]I.V. Bystrova and G.E. Riabov, 'Voenno-promyshlennyi kompleks SSSR', in Iu.N. Afanas'ev, *Sovetskoe Obschestvo: Vozniknovenie, Razvitie, Istoricheskii Final* (Moscow: RGU, 1997), pp. 150–208.

[133]Chertok, vol. 1, chapter 4, pp. 226–228.

downsizing, the Kremlin's emphasis on the AD role, and the lack of doctrinal clarity as to who would play the first violin in the new service left room for competition over primacy between the proponents of AAA, IA and later SAMs. Often there was a coalitional linkage between the internal competition for primacy of the corps within the PVO service and the external competition for control over the AD missions within the Soviet military. Personal ambitions and professional visions had a strong impact on the decision-making. Family connections (*semeistvennost'/semeinii blat*) were an important administrative resource. Against the backdrop of the leadership changes, inter-service power struggles and personal rivalries saturated with family connections often resulted in the low effectiveness, slow progress and abandonment of prospective projects.[134] Such ills plagued not only the PVO innovation, but were evident also in the nuclear-missile realm.[135] In addition, Stalin may have employed a divide-and-rule approach, and he did not try to settle organizational and personal struggles in order not to strengthen one party at the expense of others, as his decisions in other fields might indicate. Thus, each of the frequent reorganizations might have deliberately empowered a different service or personality.[136]

The lack of synchronized procurement of weaponry across the armed forces left plenty of room for parochial maneuvers of the services and resulted in suboptimal outcomes.[137] The inter- and intra-service competitions fueled a parallelism in procurement and ineffective fund allocation. When the PVO troops were downsized and reorganized, each actor tried to increase its own arsenal, equipping itself in a rather parochial way, hence the overall growing numbers of AD weapons systems. The growing quantity of equipment, but absent any unification and standardization, did not translate into effective combat functioning.[138] Due to the high number of requests from the services, their orientation toward their 'own developers' within the industry, and the 'lack of a mechanism for coordinating the R&D and production of the new weapons,' the types of systems and their spare parts kept on multiplying, often duplicating themselves. This was true across the military, but especially acute in AD.[139] Procurement parochialism

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[134]Still, family *blat* was not an ultimate weapon that could force opponents to capitulate in the inter-service rivalries. Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 262, 501–504; Kisun'ko.

[135]Pavel Suduplatov, *Spetsoperatsii* (Moscow: Olma Press, 1997), chapter 7.

[136]Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 493.

[137]Baluevsky, 16–17.

[138]A.P. Skotnikov, A.B. Ruchkin, E.S. Klimovich, 'Ot vidovykh semeistv ZRS S-300 k edinoi sisteme zenitnogo oruzhiia', *VM*, no.10, 2007. The authors, colonels, two on active duty and one retired, serve in the 2nd TsNII.

[139]For a relatively long time there were two parallel channels of procurement of weaponry – the Main Armaments Directorate of the PVO and Main Artillery Directorate of the MoD. One worked for the interests of the PVO Strany and the other for the interests of the AD of the Ground Forces. The AD of the Navy based its procurement on both of the above.

made repair and maintenance more complicated, with the nomenclature of the spare parts growing exponentially, and led to the ineffective exploitation of the state's economic potential. The first serious effort to terminate the services' 'parallelism' in developing AD weaponry was made in 1968 but failed.[140]

The military's relative aversion to procuring state-of-the-art weapons, as illustrated by the case of *Berkut*, stemmed partly from the strategic mentality that emerged during the GPW. At the time the Soviet Union often emphasized quantity over quality in terms of weapons systems and ammunition. The Kremlin concentrated procurement efforts on the limited number of relatively cheap and proven capabilities, disregarding prospective weapons as 'unaffordable luxuries.' This cultural trait persisted through the postwar years. Marshals were often concerned about the numbers of the weapons systems, disregarding their quality, and concentrated on a few projects that assured the quickest output that the military could utilize.[141] Reliance on obsolete technology was partly a 'testament to the power of institutional inertia' and partly an objective demand for the military to defend itself with what it had. Other reasons for this disinclination of the military might be the difficulty of entrusting new technology into the hands of poorly educated conscripts,[142] and the phenomenon of a 'catching-up country' – a cultural pathology of the Soviet leaders, who often worshiped Western weapons even when the locally produced Soviet prototypes were no worse.[143]

The quantity without quality phenomenon was in keeping with another trait of the Soviet culture – sticking to accomplishing the plan at any cost – and with the Russian ethos of *pokazukha* – staging events for show and falsifying the picture of reality.[144] The most important task was to accomplish the plan in terms of the numbers and on time. The fact that the low quality of these big numbers resulted in a high number of accidents and decreased military effectiveness was ignored.[145] After the GPW, every director in the military industry knew what the price of lagging behind the plan would be. In this culture of sticking to the plan, quality mattered less and falsifications flourished.[146] Secrecy and compartmentalization, which often hampered R&D

[140]Skotnikov, Ruchkin, and Klimovich; Editorial, 'General'nyi Zakazchik Vooruzheniia: general'nomu zakazchiky vooruzheniia PVO 50 let', *VKO*, 21 February 2013.

[141]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 10, 17; Zaloga (2002), p. 4; Bystrova (2001), p. 504.

[142]Zaloga, (2002), p. VI, p. 19.

[143]Bystrova, *Voenno-Promyshlennyi Komplex SSSR v gody Kholodnoi Voiny*, 269–270.

[144]Adamsky (2010).

[145]Drogovoz, *Vozdushnii Schit Strany Sovietov*, 18, 57.

[146]During the war non-combat losses of the Soviet AF accounted for more than 50% of the overall losses. After the war, accusations regarding the low quality and backwardness of Soviet aviation, specifically the systematic transfer to the AF of deficient airplanes and concealment of the defects in weapons quality, were one of the drivers of the 'Aviators Trial' in 1946. Drogovoz, *Vozdushnii Schit Strany Sovietov*, 57–59, 70.

and production, also made it possible to conceal the defects and deficits (*pripiski*), avoid the control of the administrative organs and please the leadership, while faking the real state of affairs.[147]

What lessons does the reconstruction of this Soviet postwar innovation, and the way in which Andrew Marshall grasped it, hold for scholars and practitioners of international security? Consider the following three practical and conceptual insights that Marshall's legacy offers.

First, the most important takeaway from Marshall's endeavor is that military innovations are driven by a confluence of strategic and nonstrategic factors. This article has demonstrated that strategic motives only provided the general setting and initial framing of the problem for the Soviet innovation. The subsequent considerations were filtered through formative experiences, cultural inclinations, and organizational-bureaucratic dynamics to such an extent that the eventual outcome – budget allocations, structural reforms and concepts of operations, as well as actual operational behavior – was often counterintuitive, dysfunctional, ineffective and self-defeating. Despite all the attention that political-military leaderships worldwide are paying to national security innovations and the enormous recourses that they allocate to these enterprises, due to the influence of nonstrategic factors, these undertakings might result in irrational decision-making, counterproductive policy choices and suboptimal moves. This insight is generic and applicable beyond the Russian case. In order to uncover the essence of any foreign military innovation and diagnose its prospective contours and trajectory, one must not only pay attention to the strategic calculus of the adversary, but also factor in the impact of frequently disregarded, nonstrategic considerations, which might seem irrelevant at first glance.

Second, experts scrutinizing the current Russian military-technological transformations may wish to factor this insight into their work as well. The magnitude of the Soviet military innovations at the time – AD, nuclear and missile – are comparable to the comprehensive conceptual-organizational defense transformations and weapons modernizations that have been ongoing in Russia since 2008 in the conventional, sub-conventional and nuclear domains. This major innovation includes re-conceptualizing the current nature of war and developing a novel theory of victory for it, substantive reforms of the current organizational structures from the strategic to the tactical levels and the establishment of new organs, among others the Command of Special Operation Forces in the GS and Main Military-Political Directorate in the MoD (possibly a variation on the theme of the Informational Operations Command), and massive modernization of the conventional and nuclear arsenals with state of the art weaponry. Since, as a rule, the culture of any given strategic community transforms seldom and

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[147]Bystrova, *Voenno-Promyshlennyi Kompleks SSSR v gody Kholodnoi Voiny*, 487–489, 493.

slowly and demonstrates more continuity than change,[148] the social-organizational factors that drove the Soviet military innovation and are highlighted in this article might be shaping the course of the current defense modernizations in Russia, and as such might be relevant to current Moscow watchers trying to uncover their essence and drivers, estimate their effectiveness and diagnose their future trajectories.

Third, the history of this Soviet innovation suggests that when exploring any foreign military's doctrinal discourse, critical analysis should explore in depth at least the following three issues: (I) whether or not the idealized visions of future war, as expressed in the doctrinal-theoretical discourse, are divorced from the military's capacity to realize them; (II) whether or not the strategic declaratory narrative is intended to deceive the audience[149]; and (III) whether or not the doctrinal discourse waged by military theoreticians is divorced from the actual visions of the political leadership.[150] One way to deal with these three issues might be to compare and contrast doctrinal publications with actual budget allocations, procurement tendencies, evidence from exercises, and actual combat experience. It is also necessary to situate the whole discussion in the context of the strategic-managerial culture and organizational-personal dynamics of the given strategic community. Another way to refine the insights might be to synthesize the views on the subject of interest coming from strategic communities of different countries. Each strategic culture may offer its own and sometimes rather different interpretation of the strategic behavior under scrutiny and address these three issues in a different way. Synthesizing these different insights on the same subject matter coming from various parts of the world might increase one's understanding of an actor under scrutiny.

Finally, this article offers a useful lesson for the designers of competitive strategy, which lies at the heart of Andrew Marshall's legacy. The AD case illustrated how one can effectively exploit the proclivities of the adversary to maneuver his strategic investments away from threatening realms. 'By continuing to field new bombers, the United States gave voice to those in the Soviet Union who argued for sustaining the AD system.' This shaped the Soviet strategic behavior during the peacetime competition in a way favorable to the U.S., since it prompted the Kremlin to invest huge funds 'that could have been invested in far more threatening capabilities – for example,

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[148]For example, see: Colin Grey, 'Strategic Culture as Context', *Review of International Studies* 25/1 (January 1999); *Out of the Wilderness: Prime Time for Strategic Culture* (Fort Belvoir VA: DTRA, 2006); Jeffrey Lantis and Darryl Howlett, 'Strategic Culture ', in John Baylis, James Wirtz and Colin Grey (eds .), *Strategy in the Contemporary World* (Oxford: Oxford UP, 2016).

[149]For example, Stalin's diminution of the role of nuclear-missile capabilities was aimed at concealing his mega efforts in exactly these fields.

[150]For instance, due to the unique nature of Soviet postwar civil-military relations, the military was completely unaware of the strategic orientation and force buildup driven by the leadership, and thus did not reflect them at all in its doctrinal-theoretical discussions. The seeming stagnation of military thought did not reflect the advanced thinking of the senior political leadership on the subject.

nuclear strike systems, advanced submarines, or next generation armor, […] into Soviet AD, a relatively benign capability.' The aim was to impose 'the maximum costs the Soviets would be willing to bear to modernize their AD,' but without forcing them to abandon this mission.[151] Diagnosis of the adversary along the lines of net-assessment methodology makes it possible to highlight cultural-organizational factors that shape strategic behavior, especially those inclinations which result in suboptimal, self-defeating and counterproductive actions. In turn, accurate diagnosis of these nonstrategic proclivities can serve as a solid basis for a plan that maximizes and exploits these inclinations to shape an adversary's strategic choices in the desired way and maneuver his behavior in the desired direction.[152]

Acknowledgements

Disclosure statement

No potential conflict of interest was reported by the authors.

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[151]Krepinevich and Martinage, *Dissuasion Strategy*, 15–16.
[152]For a detailed discussion, see Rosen in Mahnken.

Bibliography

Adamsky, Dmitry (Dima), *Cross-Domain Coercion: The Current Russian Art of Strategy* (Paris: IFRI, 2015).

Afanas'ev, Iu.N., *Sovetskoe Obschestvo: Vozniknovenie, Razvitie, Istoricheskii Final* (Moscow: RGU, 1997).

Alperovich, K.S., *Rakety Vokrug Moskvy* (Moscow: Voenizdat, 1995).

Alperovich, K.S., *Gody Raboty Nad Sistemoi PVO Moskvy (1950-1955): Zapiski Inzhenera* (Moscow: Uniserv, 2003).

Arseneyev, E. and L. Krylov, *Istrebitel' MIG-15* (Moscow: Armada, 1999).

Augier, Mie and Wayne Hughes, 'In Grateful Memory: Andrew Marshall and His Quest for Questions', *CIMSEC*, 2 Jul. 2019.

Avtorov, Gruppa, *Voiska Protivvozdushnoi Oborny Strany* (Moscow: Voenizdat, 1968).

Balueevsky, Iu. N., 'Deiatel'nost' GS V Pervye Poslevoennye Gody (1946-1953)', *VIZh* 1 (2003), 95–106.

Bazhenov, N.N., D.M. Degtev, and M.V. Zefirov, *Svastika nad Volgoi. Liuftvaffe protiv Stalinksoi PVO* (Moscow: AST, 2007).

Blank, Stephen, ed.. *Russian Military in Contemporary Perspective* (Carlisle Barracks, PA: US Army War College SSI, 2019).

Bracken, Paul, 'Net Assessment: A Practical Guide', *Parameters* 36/1 (Spring 2006), 90–100.

Bruusgaard, Kristin Ven, 'Russian Strategic Deterrence', *Survival* 58/4, 2016.

Bystrova, I.V., *Voenno-Promyshlennyi Kompleks SSSR v Gody Kholodnoi Voiny* (Moscow: RAN, 2000).

Bystrova, I.V., 'Voenno-Promyshellnyi Kompleks SSSR v Gody Kholodnoi Voiny (1945-1964): Stratetgicheskie Programmy, Instituty, Rukovoditieli', Moscow PhD Dissertation: Institute of Russian History, 2001.

Cheltsov, B.F., 'Zarozhdenie I Razvitie PVO Strany', *VIZh* 2 (2004), 18–27.

Cheltsov, B.F., 'Shtab Voisk PVO: Osnovnue Sozdaniia, Razvitiia I Deiatel'nosti', *ViZh* no. 10 (2007), 18–25.

Chertok, Boris, *Rakety I Liudi* (Moscow: Mashiostroenie, 1999).

Cohen, Eliot, 'The Brain of the Pentagon', *The Atlantic*, 8 May 2019.

Deni, Johh, ed. *Current Russian Military Affairs* (Carlyle: US Army War College SSI, 2018).

Dokucahev, Anatolii, 'Rasskazivaem Vpervye: Gordaia Taina Almaza', *KZ* 12 September 1992.

Drogovoz, Igor', *Vozdushnii Schit Strany Sovetov* (Minsk: Kharvest, 2003).

Dyakonov, G. and K. Kuznetsov, 'Zenitnye upravliaemye rakety tretego reikha', *Tekhnika I Vooruzhenie* 5-6 (1997), 11–23.

Editorial, 'General'nyi Zakazchik Vooruzheniia: General'nomu Zakazchiky Vooruzheniia PVO 50 Let', *VKO*, 21 Feb. 2013.

Editorial, 'Andrew Marshall, Pentagon's Threat Expert', *The NYT*, 11 Apr. 2019;

Editorial, 'Ask the Right Question. Obituary: Andrew Marshall Died on March 26th', *The Economist*, 11 Apr. 2019.

Editorial, 'Umer izvestnyi kak magistr ioda analitik Pentagona Endriu Marshall', *RBK*, 27 Mar., 2019.

Editorial, 'Andrew Marshall Obituary', *The Times*, 22 Apr. 2019.

Erokhin, I.V., 'Bitva Za PVO', *VKO* 19 Sept. 2013.

Evtif'ev, M.D., *Iz Istorii Sozdaniia Zenitno-Raketnogo Schita Rossii* (Moscow: Vuzovskaia Kniga, 2000).

Frolov, Aleksei, 'O Sluzhbe Tyla', *VKO*, 13 Feb. 2013.

Ganin, Sergei, Vladimir Korovin, Aleksandr Karpenko, and Rostislav Angelskii, 'Sistema 75', *Teknika I Vooruzhenie* no. 10 (2002), 24–28; no. 12 (2003), 1–8.

Goldman, David, 'Andrew Marshall, the Last Wise Man', *The Asia Times*, 1 Apr., 2019.

Golotiuk, V.L. and D.A. Tsapaev, *Komandyi sostav Voisk PVO Krasnoi Armii V gody Velikoi Otechestvennoi I Sovietsko-Iaponskoi voin 1941-1945gg* (Moscow: Veche, 2012).

Grey, Colin, 'Strategic Culture as Context', *Review of International Studies* 25/1 (January 1999). *Out of the Wilderness: Prime Time for Strategic Culture* (Fort Belvoir VA: DTRA, 2006) 49–69.

Holloway, David, *Stalin and the Bomb* (New Haven, CT: Yale UP, 2005).

Iakovlev, N.N., *TsRU Protiv SSSR* (Moscow: Pravda, 1983).

Iaroshenko, Vladimir, 'Osnova Ognevoi Moschi', *VKO*, 10 Feb. 2013.

Kalistratov, A.I., 'Sovetskoie voennoe isskustvo v pervoe poslevoennoe desiatiletie (1945-1955)', *VM* 10 (2009), 2–9.

Kanaev, V.M., 'PVO Krupnykh gorodov vo Vtoroi Mirovoi Voine', *VKO*, 20 Oct. 2013.

Kaplan, Edward, *To Kill Nations* (Ithaca: Cornell UP, 2015).

Karber, Philip A., *Net Assessment for SecDef Future Implications from Early Formulations* (Washington DC: Potomac Foundation, 2014).

Kiselev, A.N., *Polkovodtsy I Voenachialniki VOV* (Moscow: ZhZL, 1960).

Kisun'ko, G.V., *Sekretnaia Zona* (Moscow: Sovremmenik, 1996).

Kochiukov, Aleksandr, 'Beria, Vstat'! Vy Arestvanny!', *KZ*, 29 Jun. 2003.

Kofman, Michael, 'Moscow School of Hard Knocks', *War on the Rocks*, 17 Jan. 2017.

Kofman, Michael, 'Raiding and International Brigandry', *War on the Rocks*, 14 Jun. 2018.

Kofman, Michael,'It's Time to Talk about A2/AD', *War on the Rocks*, 5 Sept. 2019.

Kokoshin, Andrei, *Armia I Politika* (Moscow: Mezhdunarodnye Otnosheniia, 1995).

Kolpakidi, A.I. and D.P. Prokhorov, *Imperia GRU* (Moscow: Olma Press, 1999).

Kolpakov, T.IA., 'Rol' istrebitel'noi aviatsii v stanovelnii I razvitii protivovozdushnoi oborony strany', *VM* 9 (2015), 65–69.

Kosminsky, Jay, 'The Competitive Strategies Concept: Giving the U.S. A Battlefield Edge', *The Heritage Foundation*, 1989.

Krasovsky, Volter, 'Krestnyi Otets Sovetskoi PVO', *NVO*, 30 Jun. 2000.

Krepinevich, Andrew, 'On the Lasting Value of Net Assessment', *Foreign Affairs*, 19 Apr., 2019.

Krepinevich, Andrew and Robert Martinage, *Dissuasion Strategy* (Washington DC.: CSBA, 2008).

Krepinevich, Andrew and Barry Watts, *The Last Warrior: Andrew Marshall and the Shaping of the American Defense Strategy* (New York: Basic Books, 2015).

Krinitsky, Iu. V., 'Protivovozdushnaia Oborona: Otechestvennyi Opyt Reorganizatsii I Sovremennost'', *VM* 2 (2005), 76–80.

Lanoszka, Alexander, 'Russian Hybrid Warfare', *International Affairs* 92/1 (2016), 175–195.

Lantis, Jeffrey and Darryl Howlett, 'Strategic Culture', in John Baylis, James Wirtz, and Colin Grey (eds.) *Strategy in the Contemporary World* (Oxford: Oxford UP, 2016), 89–108.

Lawrence Freedman. *Ukraine and the Art of Strategy* (Oxford: Oxford UP, 2019).

Lazun, Grigorii, 'TsOK RTV', *VKO*, 15 Feb. 2013.

Leonov, Dmitry, *Kniga Pamiati O 685 ZRP* (Moscow, 2016).

Long, Austin, *Deterrence: From Cold War to Long War* (Washington DC.: RAND, 2008).

Mahnken, Thomas 'Andrew W. Marshall: In Memoriam', *War on the Rocks*, 8 Apr. 2019.

Mahnken, Thomas G., ed. *Competitive Strategies for the 21st Century* (Palo Alto: Stanford University Press, 2012).

Mahnken, Thomas G., ed.). *Net Assessment and Military Strategy: A Retrospective and Prospective Analysis* (Amherst, NY: Cambria Press, 2020).

Marshall, Andrew, *Problems of Estimating Military Power* (Santa Monica, CA.: RAND, 1966).

Mehta, Aaron, 'Andy Marshall, the Pentagon's Yoda Dies at Age 97', *Defense News*, 26 Mar., 2019.

Mikhailov, V.S., 'K 9- Letiu VVS', *VIZh* 8 (2002), 2–15.

Monaghan, Andrew, *Power in Modern Russia* (Manchester: Manchester UP, 2017).

Orlov, A.S., *Tainaia Bitva Sverkhderzhav* (Moscow: Veche, 2000).

Polunin, V.V., 'Stanovlenie Tsentral'nykh Organov Upravleniia Atomnoi Promyshlennostiu SSSR', *Novyi Istoricheskii Vestnik* 2/16, 2007.

Renz, Bettina, *Russia's Military Revival* (London: Polity, 2018).

Rosen, Stephen Peter, 'Competitive Strategies: Theoretical Foundations, Limits, and Extension', in Thomas Mahnken (ed.), *Competitive Strategies for the 21st Century* (Palo Alto: Stanford University Press, 2012), 12–28.

Samokhin, A.V., 'Vozdushnaia oborona granits SSSR v nachiale 1950-kh godov', *VIZh* 12 (2016), 25–28.

Savitsky, E.Ia., *Polveka s Nebom* (Moscow: Voenizdat, 1988).

Schudel, Matt,'Andrew Marshall, Pentagon's Gnomic Yoda of Long-range Planning', *The Washington Post*, 28 Mar. 2019.

Shlykov, A.V., 'Kafedra Operativnogo Iskusstva VVS Voennoi Akadenii GSh RF', *Vestnik AVN* 4/21, 2007, 150–153.

Simonov, Konstantin, *Zhivye I Mertvye* (Moscow: Khudozhestvennaia Literatua, 1984).

Simonov, Nikolai, *Voenno Promyshlennyi Kompleks SSSR v 1920 – 1950e Gody* (Moscow: ROSSPEN, 1996), 257–63

Skotnikov, A.P., A.B. Ruchkin, and E.S. Klimovich, 'Ot vidovykh semeistv ZRS S-300 K edinoi sisteme zenitnogo oruzhiia', *VM* 10 (2007).

Suduplatov, Pavel, *Spetsoperatsii* (Moscow: Olma Press, 1997).

Telitsyn, V.L., *Marshal Govorov: Put' Russkogo Ofitsera* (Moscow: Veche, 2013).

Tkachev, I.A., 'PVO Frontov v Berlinskoi Nastupatel'noi Operatsii', *VIZh* 5 (2004), 8–16.

Volkov, A.D., 'Pervyi Glavnokomanduiuschii Voiskami PVO Strany', *VM* 5 (2003), 77–80.

Votintsev, Iu. V., 'Neizvestnye Voiska Ischeznuvshei Sverkhderzhavy', *VIZh* 8 (1993), 8–10.

Weinberger, Sharon, 'The Return of the Pentagon's Yoda', *Foreign Policy*, 12 Sept. 2018.

Wood, Dakota, 'Lessons Learned: The Legacy of Andrew W. Marshall', *The Heritage Foundation*, 9 Apr. 2019.

Zaretsky, Boris, 'Iurii Alekhin and Sergi Kutsenko, "Voiska PVO Strany: Vzlety I Padeniia"', *VKO*, 27 Jun. 2012.

Zubok, Vladislav and Constantine Pleshakov, *Inside the Kremlin's Cold War* (Cambridge: Harvard University Press, 1997).

Zysk, Katrzyna, 'Escalation and Nuclear Weapons in Russia's Military Strategy', *The RUSI Journal* 163/2 (2018), 4–15. doi:10.1080/03071847.2018.1469267