ARROYO CENTER

The Future of the Russian Military

Russia's Ground Combat Capabilities and Implications for U.S.-Russia Competition

Appendixes

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Preface

This document presents the results of a project titled *U.S.-Russia Long Term Competition*, sponsored by the Deputy Chief of Staff, G-3/5/7, U.S. Army. The purpose of the project was to help the U.S. Army understand the shifting relative capabilities of the U.S. and Russian militaries of the next twenty years.

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Summary

Understanding how Russian military capabilities will develop over the next 20 years is critical to future Western defense planning. Perfectly predicting the future is not possible, but one can gain insights for the future of key Russian ground capabilities by analyzing the critical political, economic, demographic, and societal factors underlying Russian military power.

Factors Underlying Russian Military Power

A relatively coherent and consistent view of Russia's security policy goals currently exists, and these have been translated into a political-military strategy for the armed forces that involves five key tasks: strategic deterrence (to prevent aggression on the Russian homeland); regional dominance, including responding to instability, terrorism, or conflict in the near abroad (meaning the non-Baltic former Soviet Union); expeditionary operations; preparedness in case of a major ground war; and domestic stability. While changes are possible, we expect continuity in this strategy.

Other economic, demographic, and societal factors underlying Russian military power over the last decade have undergone significant change, but they also show signs of remaining stable over the medium term (ten years). Public attitudes show support for Russia's government, foreign policies, and the military. Russia is projected to experience relatively stagnant economic growth of 1 percent to 2 percent of gross domestic product (GDP), due to low growth in oil and gas export revenue, poor prospects for domestic reform, and low investment, although higher and lower growth scenarios are possible. Russia's military budget has increased substantially due to larger acquisition expenditures, although we expect future military budgets to level out and grow proportionate to GDP. While Russia is not expected to enjoy major population growth, its demographic situation is not by any measure crippling. Russia also has built a relatively stable mixed conscript and contract manning system for the military.

In aggregate, we expect these factors to facilitate continued incremental modernization of Russia's military but not major discontinuous improvements or collapse.

Key Capability Areas for Ground Combat

To analyze Russia's developing ground combat capabilities, we look at eight key areas: maneuver ground forces; indirect fire (<100 km range); long-range strike; rapidly deployable forces; command, control, communications, computers, intelligence, surveillance, and reconnaissance

(C4ISR); air defense, electronic warfare (EW); and internal security forces. For each of these areas, we systematically analyze recent trends in doctrine, spending, personnel, and recent operations, and extract the near-term outlook from these trends.

We identify three general modes of development that characterize the changes we observe in the key capability areas: retain-and-adapt, in which Russia draws on sometimes-modernized Soviet-era systems or concepts; emulate-and-adapt, in which Russia draws on foreign models or concepts; and asymmetrically countering foreign threats.

Russia's maneuver ground forces are the prime example of the retain-and-adapt approach. The ground forces have received a small proportion of resources for procurement and modernization. Modernized Soviet-era platforms, such as the T-72B3, can be made almost as effective as new platforms with the addition of new components (such as fire control or active protection systems) at a fraction of the cost. Russia has maintained a massed and area-effects threat by retaining a large volume of indirect fire launchers and munitions from the Soviet Union with less significant modernization. Russia's rapidly deployed forces—including the Airborne and GRU Spetsnaz—also build on Soviet-era formations, but represent new and dramatically reformed forces, with novel C4ISR systems and other state-of-the-art equipment. Russia's internal security forces, which play an important role in the defense of Russia, have been built from pieces of Soviet-era structures within newly created or reorganized institutions.

Russia also retained-and-adapted Soviet designs in its acquisition of long-range strike systems (i.e., systems that are used at the theater level, generally with >100 km range) while emulating-and-adapting U.S. operating concepts in its doctrine and approach. Russia has developed the ground-launched Iskander-M from the Oka intermediate-range ballistic missile, and the sea-launched Kalibr from the RK-55 Relief ground-launched cruise missile. Russia has long sought to emulate aspects of the U.S. use of long-range strike systems, as in Kosovo, Afghanistan, and Iraq. However, Russia needed the additional resources that became available after 2008 to begin deploying additional air-, sea-, and ground-launched long-range strike systems. Russia's C4ISR also represents a combination of legacy Soviet systems and the emulation-and-adaptation of concepts and approaches such as net-centric warfare. Russia's highly advanced air defense systems build on the extensive Soviet-era investment in air defenses, while its EW offers a primary example of where Russia has invested in capabilities that can asymmetrically counter perceived U.S. advantages.

We also examine how the Russian government has funded or subsidized the defense industry. We identify different patterns of investment and state support that shed light on priorities and future developments. In some areas, particularly long-range strike and C4ISR, the Kremlin has invested significant resources in recapitalizing particular enterprises, indicating its prioritization of the systems they produce. In other areas, such as air defense and EW, Russia has engaged in long-standing support of companies producing systems that are strategically significant. A third pattern reflects the collapse and incorporation of troubled enterprises into state-owned holding companies. This has been the fate of Russia's main producers of tanks and infantry fighting vehicles, in part because of weak demand and undercapitalization. A fourth approach is investment in more speculative technologies through means such as venture capital, but these efforts are quite modest. The overall outlook for Russian development in these key capabilities is continuity in terms of overall approach and with respect to the characteristics of the military industrial complex.

Projecting Future Russian Capabilities

Looking back, Russia's development of its ground capabilities reflects the strategy we identified for the armed forces, within the constraints of Russia's economic performance, defense budget, demographics, and military personnel system. Russia improved its long-range strike, C4ISR, and air defense capabilities to strengthen strategic deterrence. Changes in military personnel policy, among other reforms, enabled the professionalization, increased reliability, and greater readiness of Russia's rapidly deployable forces. In turn, these forces strengthened Russian military capabilities for the task of regional dominance, as shown by its operations in Ukraine. Russia's investment in rapidly deployable forces and long-range strike also improved its expeditionary capabilities, as shown by Russia's operations in Syria. Still, Russia retained the ability to fight a major ground war with the West or China through the capability of its maneuver ground forces, indirect fires, and long-range strike, its rescue of firms producing ground vehicles, and the retention of conscription.

The same underlying factors that shaped Russia's military development in the past will also likely shape Russian capabilities in the future. While there may be continued incremental developments in the future, we view the most likely future as one of continuity in the strategy for the armed forces and social stability, small growth in the economy and defense budget, and a small demographic decline. Russia will continue to focus on achieving dominance in its near abroad, with an emphasis on readiness and professionalization of a small component of the force. Some expansion and incremental improvements will occur in long-range strike, rapidly deployable forces, C4ISR, and air defense, while relative stagnation will occur in the maneuver ground forces and indirect fires.

While we see continuity as most likely, we recognize that change is possible. Energy prices could increase or decrease, which could, in turn, affect growth in the economy and Russia's defense budget and military capabilities. Another possibility is that changes in Russia's economic growth and security strategy could occur because of shifts in relations with the West or China. Such changes could give Russia incentives to shift priorities within its strategy for the armed forces and pursue different ground capabilities, but in general we continue to expect a prioritization of capabilities associated with strategic deterrence, regional dominance, and internal security.

Policy Implications

To achieve U.S. interests, the U.S. military will need to provide forces that can compete with Russia across a range of different types of interactions, from cooperation to conflict. Given Russia's extensive conventional and nuclear strategic deterrent capabilities, the key challenge will be how to develop U.S. capabilities that can achieve U.S. interests at any intensity of competition without escalation. The United States will also need to consider how to minimize cost, given the limited risk of Russian actions threatening U.S. core interests and competing budgetary priorities. Using the framework of our identified Russian strategy for the armed forces, we describe the policy implications for the United States of our analysis of Russia's future interests, capabilities, and priorities, with a focus on the U.S. Army.

The first and last elements of Russia's security strategy, strategic deterrence, and internal security, are inherently defensive, although strategic deterrent forces could threaten the United States and its allies. Russia clearly sees threats from the North Atlantic Treaty Organization (NATO) enlargement and the enhancement of U.S./NATO military capabilities on its borders, and the possibility exists that Russia's view of the threat could increase or a crisis could develop that could lead to unintended military escalation. U.S. policymakers need to be attuned to Russian perceptions of the threat posed by U.S. force deployments in Europe.

Regional dominance, the second element of Russia's strategy for the armed forces, poses a more immediate threat to U.S. interests, given that Russia's primary desired sphere of influence includes former Soviet republics such as Ukraine and Georgia, who aspire to join Euro-Atlantic institutions. Given Russia's growing capabilities and greater interests, U.S. support has not been, and does not appear likely to be, able to significantly undermine Russia's regional dominance; however, the U.S. military can explore options to bolster partners' security forces by improving the quality and capacity of niche areas such as foreign area officers, units focused on providing security-force assistance, information operations, and military medical units.

Russia's expeditionary operations and capabilities, the third element in Russia's strategy for the armed forces, pose a complex challenge that will require both flexibility and preparedness for high-intensity conflict with well-armed adversaries. While Russia has invested in special forces, long-range strike, and air defense, the Russian military is not configured to be a global expeditionary military, especially given its gaps in expeditionary logistics and standing basing arrangements. Nevertheless, Russia may support proxies who may undermine U.S. interests. The U.S. Army should investigate options to prepare for the challenge of Russian expeditionary capabilities, such as ensuring that its forces deployed in areas where a conflict with Russia is conceivable have the necessary training and equipment and are prepared to take action while avoiding escalation.

Perhaps the most dangerous possibility is a large-scale ground war with Russia. We see it as unlikely that Russia is preparing to initiate such a war given its security goals and strategy, past decisions to develop key capabilities, and the constraints posed by its economy, demography, and personnel policy. Nevertheless, beyond Russia's advantage in the size of ground forces in Europe, existing research shows various ways that Russia's current and projected near-term capabilities pose a threat to the U.S. Army in Europe.

To address these developments in Russian capabilities, our analysis offers insight across the range of capability areas outlined. For the maneuver ground forces, the Army should prepare for challenges from the overall size of the Russian forces and modernized Soviet-era platforms. To address the challenge posed by Russia's indirect fire and long-range strike capabilities to U.S. forces at all echelons of the battlefield, the U.S. Army should investigate options to attrite Russian systems; to pursue dispersal, denial, and deception; and to improve EW and air and missile defenses. Improving U.S. cyber and EW capability at the tactical and operational level could help address Russia's growing parity in C4ISR, although this may require investment in command, control, and planning, as well as possible changes in authorities to use cyber. The U.S. military should also continue to pursue options to bolster communications, positioning, navigation, and timing (PNT), and intelligence, surveillance, and reconnaissance (ISR) against Russia's EW, and Multi-Domain Battle and related concepts to address Russia's anti-access/area denial (A2/AD) capabilities.

In addition to filling U.S. Army capability gaps, a joint U.S. military and combined alliance response will be required. For allies who border Russian territory, including Poland and the Baltic states, finding ways to better compete with Russian military forces in possible collaboration with U.S. forces could be invaluable for deterring both Russian subversion short of war and high intensity conflict.

While Russia's ground capabilities will continue to develop, they will be constrained and directed by political, demographic, economic, and social factors within Russia, which will likely change slowly over the next five to ten years. Studying Russia's priorities and its constraints helps shed light on how the U.S. military can best develop its full range of capabilities to better compete with Russia and achieve U.S. interests, while minimizing financial cost and the risk of war.

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Abbreviations

A2/AD	Anti-access/area denial
ALCM	air-launched cruise missile
AMZ	Arzamas Machine-Building Plant
APC	armored personnel carrier
APFSDS	armor piercing, fin-stabilized, discarding sabot
AWAC	Airborne Warning and Control
BMEW	ballistic missile early warning
BTG	Battalion Tactical Groups
C3	control, command, and communication
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CAST	Center for Analysis of Strategies and Technologies
CEP	circular error probable
CIS	Commonwealth of Independent States
DCS	data computation system
DIA	Defence Intelligence Agency
DRLO	long-range early warning aircraft
EKS	Unified Space System
ELINT	electronic intelligence collection
EO	electro-optical
EW	electronic warfare
FAPSI	*Federal'noye Agentstvo Pravitel'stvennoy Svyazi i Informatsii* (Federal Agency of Government Communications and Information)
FDSU	Federal Road Construction Administration

FLIR	forward-looking infrared
FFRDC	federally funded research and development center
FMS	Federal Migration Service
FOI	*Totalförsvarets forskningsinstitut* (Swedish Defense Research Agency)
FPI	*Fond Perspektivnykh Issledovaniy* (Foundation for Advanced Studies)
FPS	Federal Border Service
FSB	*Federal'naya Sluzhba Bezopasnosti* (Federal Security Service)
FSIN	*Federal'naya Sluzhba Ispolneniya Nakazaniy* (Federal Penitentiary Service)
FSKN	*Federal'naja sluzhba Rossijskoj Federacii po kontrolju za oborotom narkotikov* (Federal Drug Control Service of Russia)
FSNP	Federal Tax Police Service
FSO	*Federalnaya sluzhba okhrany* (Federal Protection Service)
FSUE	Federal State Unitary Enterprise
FTsP	Federal Targeted Programs
GDP	gross domestic product
GLBM	ground-launched ballistic missile
GLCM	ground-launched cruise missiles
GLONASS	*Globalnaya Navigatsionnaya Sputnikovaya Sistema* (Global Navigation Satellite System)
GRU	*Glavnoye Razvedatel'noye Upravleniye* (Main Intelligence Directorate)
GUO	Main Guards Directorate
GUSP	Main Directorate For Special Programs
GUVD	*Glavnye upravleniya vnutrennikh del* (main directorates)
ICBM	intercontinental ballistic missile
IFF	identification of friend-or-foe
IFV	infantry fighting vehicles
IISS	International Institute for Strategic Studies
IO	information operations
IRBM	intermediate-range ballistic missile
ISR	intelligence, surveillance, and reconnaissance
KBP	*Konstruktornoe Biuro Priborostroenie* (Instrument Design Bureau)

KMZ	*Kurganmashzavod* (Russian arms manufacturer)
KRET	*Kontsern Radioelektronnyye Tekhnologii* (Radio-Electronic Technologies Concern)
KSO	*Komandovaniye Sil Spetsial'nykh Operatsiy* (Special Operations Command)
KTRV	Tactical Missiles Corporation
MChS	*Ministerstvo Rossii po Delam Grazhdanskoy Oborony, Chrezvychaynym Situatsiyam i Likvidatsii Posledstviy Stikhiynykh Bedstviy* (Ministry of Emergency Situations)
MD	Military District
MITT	Moscow Institute of Thermal Technology
MOD	Ministry of Defense
MRBM	medium range ballistic missiles
MRL	multiple rocket launcher
MTC	Military Training Center
MTLB	*Mnogotselevoy Tyagach Legkiy Bronirovannyy* (multi-purpose towing vehicle light armored)
MVD	*Ministerstvo Vnutrennikh Del* (Ministry of Internal Affairs)
NATO	North Atlantic Treaty Organization
NDMC	National Defense Management Center
NGO	nongovernmental organization
NII	*Nauchno-Issledovatel'skii Institut* (Scientific Research Institute)
NPO	*Nauchno-Proizvodstvennoye Ob'yedineniye* (Scientific and Production Association)
NSNW	nonstrategic nuclear weapon
OCO	overseas contingency operations
OKB	Experimental Design Bureaus
OMON	*Otryad Mobilny Osobogo Naznacheniya* (Special Purpose Mobile Units)
OTH	over-the-horizon
PGM	precision-guided munition
PNT	positioning, navigation, and timing
PUIC	Project Unique Identification Code

PVO	Russian air defense
R&D	research and development
RANEPA	Russian Presidential Academy of National Economy and Public Administration
RFAF	Russian Air Force
RND	regional nuclear deterrence
RSFSR	Russian Soviet Federative Socialist Republic
SAM	surface-to air missiles
SAP	State Armaments Program
SBP	Presidential Security Service
SDO	State Defense Order
SDR	software-defined radio
SEAD	suppression of enemy air defenses
SIPRI	Stockholm International Peace Institute
SLBM	Submarine-launched ballistic missiles
SOBR	*Spetsialnyi otryad bystrogo reagirovaniya* (Special Rapid Response Detachment)
SOCOM	U.S. Special Operations Command
SOE	state-owned enterprise
SOF	Special Operations Forces
SORM	*Sistema Operativno-Rozysknykh Meropriyatiy* (System for Operative Investigative Activities)
SRF	Strategic Rocket Forces
SRS	Special radio communication
SVR	*Sluzhba Vneshney Razvedki* (Foreign Intelligence Service)
TEL	tractor-elevator-launcher
TFR	total fertility rate
UAS	unmanned aircraft systems
UAV	unmanned aerial vehicle
UCIN	United Information and Communications Network
UGV	unmanned ground vehicles

UIMC	United Instrument Manufacturing Corporation
UN	United Nations
UVD	*Upravleniya vnutrennikh del* (directorates)
UVZ	*Uralvagonzavod* (Russian arms manufacturer)
VDV	*Vozdushno-desantnye voyska* (Airborne Troops)
VKO	*Voyskaya Vozdushno-Kosmicheskaya Oborona* (Aerospace Defense Forces)
VKS	*Vozdushno-Kosmicheskiye Sily* (Aerospace Forces)
VNIIS	*Voronezhskiy Nauchno-Issledovatel'skiy Institut Svyazi* (Voronezh Scientific Research Institute for Communications)
VPK	*Voyenno-Promyshlennaya Kompaniya* (military industrial company)
VV	*Vnutrenniye Voyska* (Internal Troops)
VVS	Deputy Air Force Commander
ZVO	Western Military District

APPENDIX A

Societal Support

Katya Migacheva and Andrew Radin

Overview

Societal attitudes are an important factor in the future development of Russia's military over the next 20 years. First, while the ruling regime, led by President Vladimir Putin and other elites, exert considerable influence over the opinions of the population, Putin and his government also pay close attention to public opinion and may be guided by it in some important ways.[1] This suggests that, at least in some sense, public opinion can be a constraint on acceptable policy options, and at the very least, the Kremlin must expend effort to manage popular attitudes. Second, public opinion bolsters the stability of Putin's regime and would support a similar successor regime if, and when, he leaves power. Negative public attitudes, by contrast, could be an indicator of, and a catalyst for, the potential for a change in government or, less radically, a change in foreign and defense policies. Finally, public opinion shapes Russia's ability to generate and sustain military forces, especially because public opinion influences the ease of recruiting conscripts and contract personnel.

Existing survey data and research evidence is used here to assess the trends in Russians' attitudes in these three domains (the regime in general, foreign policy, and the military) and analyze possible sources of change. In all three areas Russians generally support (or choose not to oppose) the status quo, indicating the likelihood of continuity in defense policy. Such continuity may, in some ways, empower the regime, but it also may pose constraints, such as limiting the potential for military options in Ukraine. Public opinion could shift due to economic changes, major war, or deteriorating internal stability. Such shifts may also contribute to different defense policies; for example, internal strife could lead the regime to reprioritize its resources toward developing and using the security forces to curb social protest. Or public support for a more liberal or pro-Western policy may increase. Given the past views and patterns of public opinion indicated here, however, there is little to suggest any such radical changes in public opinion will emerge.

[1] See Vladimir Ryzhkov, "The Absurd World of Russian Public Opinion," *Washington Post*, February 25, 2015; Olga Oliker, et al., *Russian Foreign Policy in Historical and Current Context: Reassessment*, Santa Monica, Calif.: RAND Corporation, PE-144-A, 2015; Eduard Ponarin and Boris Sokolov, "The Russian Elite's View of Global Politics," *Russia in Global Affairs*, December 18, 2014.

Recent History and Trends

Support for Vladimir Putin and the Current Regime

Putin is believed to be the principal driver of Russia's current approach to its military and foreign policy, both as a function of his role as the country's president and because of the tremendous concentration of power he has amassed.[2] Putin's ascent to power in 1999–2000 signified the beginning of, or a return to, "strong hand leadership,"[3] both in relation to domestic issues and, increasingly over time, foreign policy.[4] With Putin at its helm, Russia has seen a violent and, ultimately, successful crackdown on separatist aspirations in its territories, the return of government control over resource industries, a significant narrowing of individual rights and freedoms, growing instances of political persecution and oppression, and grave deterioration of independent media.[5] At the same time, under Putin's leadership Russia has been increasingly unapologetic and firm, through both rhetoric and action, in its determination to maintain its sphere of interest in the near abroad, to resist NATO expansion, and to regain its status as a global superpower.[6] To sustain these internal and external vectors, Russian authorities have exerted great efforts at strengthening Russia's internal security forces and the military.[7]

The extent to which Putin's government needs to reckon with public opinion is an open question. Putin appears to be concerned about public opinion, and both Putin personally and his approach to governing Russia have been largely popular among Russians. Through nearly two decades of his leadership as Russia's president or prime minister, Putin has, for the most part, enjoyed high levels of public support, as shown in Figure A.1. Even at the time of the lowest approval point in 2011–2013, his ratings exceeded 60 percent. Following the Ukrainian crisis and annexation of Crimea in early 2014, Putin's approval rating resurged and has stayed above 80 percent.[8] The Russian public seem to disproportionately credit him with

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[2] Alfred B. Evans, "Power and Ideology: Vladimir Putin and the Russian Political System," *The Carl Beck Papers in Russian and East European Studies*, 2008, p. 43.

[3] In the Russian context, a "strong-hand leader" is most often discussed as a strong and powerful leader who controls the majority of the decisionmaking. For example, see definitions used in "Responsibility for Successes and Challenges" ["*Otvetstvennost' za uspekhi y problem*"], Levada Center, December 11, 2017.

[4] William Taubman, "Why Gorbachev Likes Putin More Than You Might Expect," *Washington Post*, September 12, 2017; Fyodor Lukyanov, "Putin's Foreign Policy: The Quest to Restore Russia's Rightful Place," *Foreign Affairs*, Vol. 95, 2016, p. 30; Andrei Tsygankov, "Vladimir Putin's Last Stand: The Sources of Russia's Ukraine Policy," *Post-Soviet Affairs*, Vol. 31, No. 4, 2015, pp. 279–303.

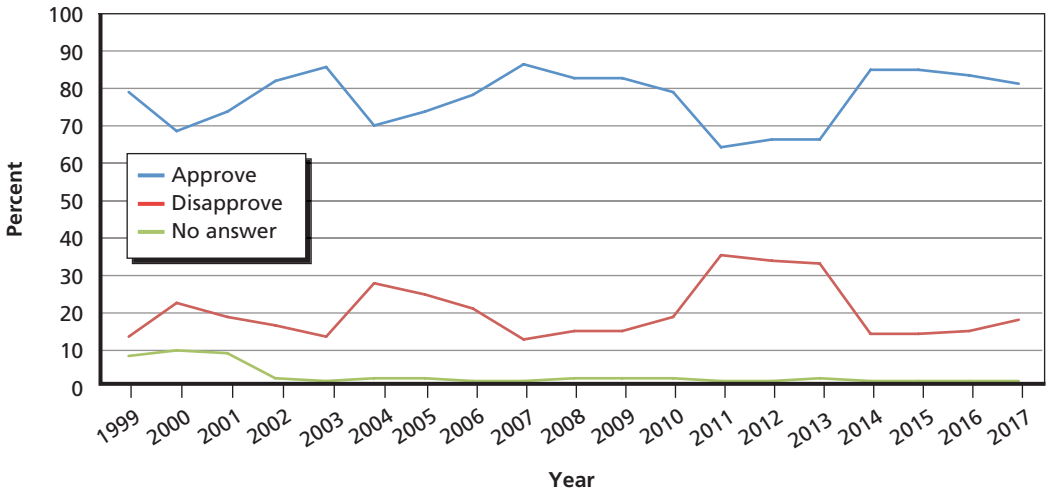
[5] Harley Balzar, "Managed Pluralism: Vladimir Putin's Emerging Regime," *Post-Soviet Affairs*, Vol. 19, No. 3, July–September 2003, pp. 189–227; Richard Sakwa, "Putin's Leadership: Character and Consequences," *Europe-Asia Studies*, Vol. 60, No. 6, 2008, pp. 879–897; Daphne Skillen, *Freedom of Speech in Russia: Politics and Media from Gorbachev to Putin*, London: Routledge, 2016.

[6] Jeffrey Mankoff, *Russian Foreign Policy: The Return of Great Power Politics*, Vol. 295, No. 10, Lanham, Md.: Rowman & Littlefield, 2009; Ingmar Oldberg, "Russia's Great Power Ambitions and Policy Under Putin," in R. E. Kanet, ed., *Russia: Studies in Central and Eastern Europe*, London: Palgrave Macmillan, 2007.

[7] "*Vladimir Putin: Otnosheniye I Otsenki*" ["Vladimir Putin: Attitude and Evaluations"], Levada Center, April 4, 2017.

[8] "*Optimizm rossiyan snizhayetsya, reyting Putina—poka net*" ["Russians' Optimism Is Waning—But Not Their Support for Putin"], *Deutsche Welle*, September 24, 2015; "*Deyatelnost gosudarstvennyh institutov*" ["Functioning of the State Institutions"], *VTsIOM*, undated.

Figure A.1
Vladimir Putin Approval Rating Over Time



SOURCE: "Putin's Approval Ratings," Levada Center, November 2017.

the country's positive accomplishments while distributing any blame to other institutions and politicians or to external powers.[9]

Russians appear to approve of Putin's performance because they see him as responsible for economic growth and for providing security and stability. A majority of Russian respondents claim that Putin is largely responsible for the economic growth that Russia experienced during his first two presidential terms and that his strong-hand leadership improved social stability and security in the country.[10] Most Russians also believe that the country is on the right course.[11] Only 12 percent of Russians think that a future Russian president should pursue more liberal approaches to governance, and over 70 percent are either content with the current style of governance or think it should be harsher (see Figure A.2). Putin reaps the benefits of the mythology of his early success, as many Russians hope he will lead the country toward economic prosperity and overall stability again.[12] Further, after

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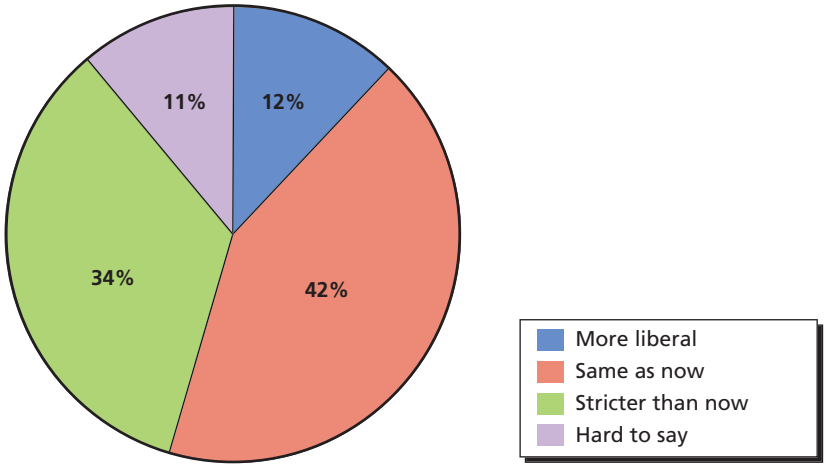
[9] "Responsibility for Successes and Challenges," 2017; "Indicators," Levada Center, undated; Lyubov Chizhova, "*Net Putina—net Rossii*" ["Without Putin There Is No Russia"], *Radio Svoboda* [*Radio Liberty*], November 16, 2016.

[10] "Almost 80 Percent of Russians Saw the Need in Strong-Hand Leadership in Russia," *Interfax*, December 11, 2017; Hilary Appel, "Is It Putin or Is It Oil? Explaining Russia's Fiscal Recovery," *Post-Soviet Affairs*, Vol. 24, No. 4, 2008, pp. 301–323; Edward Lucas, *The New Cold War: Putin's Russia and the Threat to the West*, London: Palgrave Macmillan, 2014; Daniel Treisman, "Presidential Popularity in a Hybrid Regime: Russia under Yeltsin and Putin," *American Journal of Political Science*, Vol. 55, No. 3, 2011, pp. 590–609; Vladimir Putin reminded of the economic recovery he has ushered in after the struggles of 1990s in his December 19, 2017, speech to the All-Russia Public Front: "Indeed, the situation was very difficult—even critical at times—but we not only preserved Russia's territorial integrity and sovereignty, not only successfully passed through the renovation stage, but took real breakthrough steps in the most important directions of our development."

[11] "*Soltsial'no- konomicheskiye Indikatory*" ["Socio-Economic Indicators"], Levada Center, December 2017; "*Indeksy Sotsial'nogo Nastroyeniya*" ["Social Mood Index"], *VTsIOM*, 2017.

[12] "*Ekonomicheskiy krizis*" ["Economic Crisis"], Levada Center, February 24, 2016; "The Head of WCIOM Discussed Russians' Attitudes toward Putin," *Mir24.tv*, October 11, 2017.

Figure A.2
What Political Style Should the Future President Adopt in Relation to Domestic Policies?



SOURCE: "*Prezident 2018*" ["President 2018"], Levada Center, May 7, 2017.

the socio-political and economic upheaval of the 1990s, many Russians grew to associate the democratic opening of that time with grave uncertainty, chaos, and lack of a clear path toward a better future.[13] Because of this, many Russians may be willing to justify the narrowing of individual freedoms that has accompanied Putin's regime as the necessary price to pay for Russia's greater prosperity and stability, or they may be willing to entrust strong leaders such as Putin with extensive authority to achieve economic progress.[14] Putin's regime has capitalized on these sentiments through reiterating the promise of better socio-economic future and reminding the public of the chaos of the "freer" 1990s.[15]

Putin also benefits from his reputation as the strong leader who was able to "lift Russia off its knees"; that is, give it back its dignity on the global stage.[16] Russians' heightened perceptions of external threat[17] and Putin's perceived bold actions in response to perceived threats have added to his image as the defender of Russia's honor and the protector against Western

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[13] Alexander Lukin, "Russia's New Authoritarianism and the Post-Soviet Political Ideal," *Post-Soviet Affairs*, Vol. 25, No.1, 2009, pp. 66–92; M. W. Svolik, "Learning to Love Democracy: Electoral Accountability and the Success of Democracy," *American Journal of Political Science*, Vol. 57, No. 3, 2013, pp. 685–702.

[14] "*Bolshinstvo Rossian predpochitayut demokratii poryadok*" ["Majority of Russians Prefer Order to Democracy"], Levada Center, April 15, 2015. However, we would not argue that this implies that Russians necessarily have an inherent preference for autocracy over democracy as understood in the West. Instead, as Henry Hale has argued, perhaps they are willing to grant "a great deal of latitude" to elected leaders, such as Putin. See Henry E. Hale, "The Myth of Mass Russian Support for Autocracy: The Public Opinion Foundations of a Hybrid Regime," *Europe-Asia Studies*, Vol. 63, No. 8, 2011, p. 1368.

[15] "*Bol'shaya press-konferentsiya Vladimira Putina*" ["Vladimir Putin's Large Press Conference"], *Kremlin*, December 14, 2017.

[16] Rodric Braithwaite, foreword, in D. Cadier and M. Light, eds., *Russia's Foreign Policy Ideas, Domestic Politics and External Relations*, London: Palgrave Macmillan, 2015, pp. vii–x.

[17] "*Neprivlekatel'naya Kartina Budushchego*" ["Unattractive Image of the Future"], Levada Center, April 19, 2016.

encroachment.[18] Many Russians consider Putin's primary accomplishments to be the strengthening of Russia's global standing and improvement of the Russian military force.[19] The regime has fostered both this image and the perceptions of threat and has capitalized on them to help sustain public support.[20]

Putin's popularity reinforces the stability of the regime, but other factors play a role in maintaining that stability as well. Many Russians are apathetic about politics, with 80 percent of respondents indicating they want to know nothing about political dealings.[21] Russians may also choose to disengage from active political life because they feel there is little "regular" people can do to change the course of the country.[22] Russians who might be inclined to protest face major barriers, especially regime crackdowns and restrictions on freedom of speech and assembly.[23]

It is worth observing, however, that notable protest activity, while rare, has occurred in recent years.[24] Political protest activity seems to have grown over the course of 2017, most visibly manifested in Russia-wide anticorruption protests in March and June 2017.[25] Although these events attracted the greatest numbers of participants since the mass protests of 2011–2012, they are unlikely to signal a serious immediate challenge to the current regime, as the protesters represent a vocal and educated middle-class minority among the Russian youth and Russians more generally.[26] A great majority of Russians say they would not participate in protests and do not seem to share the protesters' views or their antigovernment zeal.[27]

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[18] "Almost 80 Percent of Russians Saw the Need in Strong-Hand Leadership in Russia," 2017; "*Putin vernul Rossii status velikoy derzhavy, zayavil Tuleyev*" ["Putin Brought Back Russia's Status as the Great Power"], *RIA Novosti*, December 7, 2017.

[19] "*Vladimir Putin: Otnosheniye I Otsenki*," 2017.

[20] Robert Person, "Balance of Threat: The Domestic Insecurity of Vladimir Putin," *Journal of Eurasian Studies*, Vol. 8, No. 1, 2017, pp. 44–59. In his speeches, Putin often evokes the idea that Russia is under siege from both external and internal forces. Most recently, he reiterated the need to stay firm in the face of the threats in his speech to the All-Russia Popular Front in Moscow: "Today we must protect our statehood and freedom, and stability and harmony in society." "Vystupleniye Vladimira Putina na forume ONF" ["Putin's Speech at ONF Forum"], *RIA Novosti*, 2018.

[21] Chizhova, 2016; "*Optimizm rossiyan snizhayetsya, reyting Putina—poka net*," 2015; "*Massovoe Sozanie Rsooiyan Otkazyyvas Rossiyan Otkazyvaetsya ot togo, Chtoby Videt' Budushhee*" ["The Russians' Mass Consciousness Refuses to See the Future"], Levada Center, June 16, 2016.

[22] "*Rossiyanye Snyali s Sebya Otvyetstvyennost' za Svoyu Stranu*" ["Russians Do Not Feel Responsible for Their Country"], Levada Center, July 13, 2016.

[23] Horizontal social trust, an important ingredient for protest activity, has also waned in the years since the end of the communist rule. In 1991, a great majority of Russians (63 percent) felt they could trust most other people; by 2007, only 50 percent of people felt the same way. A Pulse of Europe survey, conducted by the Times Mirror Center for the People & the Press, a predecessor of the Pew Research Center for the People & the Press; Douglas Rutzen, "Civil Society Under Assault," *Journal of Democracy*, Vol. 26, No. 4, 2015, pp. 28–39; Daria Skibo, "Five Years of Russia's Foreign Agents Law," *Open Democracy*, August 14, 2017; see also "*Lyudi Privykayut K Nasiliyu*" ["People Are Getting Used to Violence"], Levada Center, January 18, 2017.

[24] See Yevgenia Kuznetsova, "Center for Economic and Political Reform: Protests on Rise in Russia," trans. *The Russian Reader*, *RBC*, July 10, 2017.

[25] In March, around 60,000 people came out to protest in 80 Russian cities and tens of thousands of people (exact numbers vary) came out to protest in June. The majority of protesters have been youth, as young as high school students. Denis Volkov, "*Chto Osobennogo v Novoy Volne Protestov v Rossii*" ["What Is Special about the New Wave of Protests in Russia?"], *Moscow Carnegie Center*, April 6, 2017a; Denis Volkov, "*Ottsy i Deti: Problema, s Kotoroy Stolknulsya Naval'nyy 12 Iyunya*" ["Fathers and Sons: The Problem Navalny Faced on June 12"], *RBC*, June 18, 2017b.

[26] It appears that Russian youth are less likely to want changes than the Russian population in general; see "Do We Want Changes?" ["*Hotim li My Peremen*"], Levada Center, December 28, 2017.

[27] "*Protestnyj Potencial*" ["Protest Potential"], *VTsIOM*, January 15, 2017. However, due to the pressures to respond in a socially desirable way, some of these numbers could be inflated; see Chizhova, 2016.

Russia's economic prosperity appears to be closely associated with public opinion. Since 2014, with rising poverty levels and a diminished focus on Crimea, demand for economic improvements has grown more urgent.[28] A greater-than-before number of respondents claim that personal economic well being is more important to them than the political system, and they name economic prosperity as the defining factor in what makes a country a great power.[29] Economic protests have also become more frequent in the last two years, and an increasing number of people believe such protests will continue, although these protests tend to be directed against local authorities or the government/prime minister, and rarely—if ever—question trust or express disapproval for Putin.[30]

Given Putin's popularity and the other factors shaping Russian attitudes, support for Putin and his regime is unlikely to wane drastically in the near term. In late 2016, only a quarter of Russians believed that a viable alternative to Putin will emerge before 2018 presidential elections.[31] In a similar vein, nearly 80 percent of elite respondents believe that Putin and the United Russia (Russia's main political party) will continue to dominate Russia's political landscape (Figure A.3). Indeed, it is widely expected that Putin will be elected for a new six-year term in the presidential elections of 2018. A recent Levada poll showed that 63 percent of Russians would like to see Vladimir Putin as Russia's next president,[32] while the December 2017 VCIOM poll cited nearly 84 percent of respondents who plan to vote for Putin.[33] The rigged electoral system and procedures will likely contribute to his win, in part by preventing Putin's opponents from participating in the elections or from attaining adequate publicity.[34] Putin's popularity and the perceived longevity of his leadership and regime indicate a stability in Russian governance structures.

Support for Russia's "Great Power" Foreign Policy

Russian popular views of foreign policy and the West may not be determinative of the government's policy. But they do indicate that popular sentiment generally supports the security policy goals described in Chapter 2, including concern about a threat from the West and the conviction that Russia is and should remain a great power. A recent study of public opinion in 2011–2012 finds that foreign policy, and increasing Russia's international status specifically, is

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[28] "*Vladimir Putin: Otnosheniye I Otsenki*," 2017; Viktor Khamraev, "*Ekonomika Uvodit Rossiyan Ot Kryma*" ["Economy Is Pulling Russians Away from the Crimea"], *Kommersant* [*The Businessman*], April 3, 2017, press release 3407, *VTsIOM*, June 29, 2017.

[29] "*Obraz Budushchego V Predstavlenii Ekspertnogo Soobshchestva Obshcherrossiyskogo Grazhdanskogo Foruma*" ["The Image of the Future as Imagined by the Representatives of the Expert Society of the Russian Civic Forum"], Levada Center, December 12, 2017.

[30] "*Polozheniye Del v Strane*" ["The State of the Country"], Levada Center, November 2017.

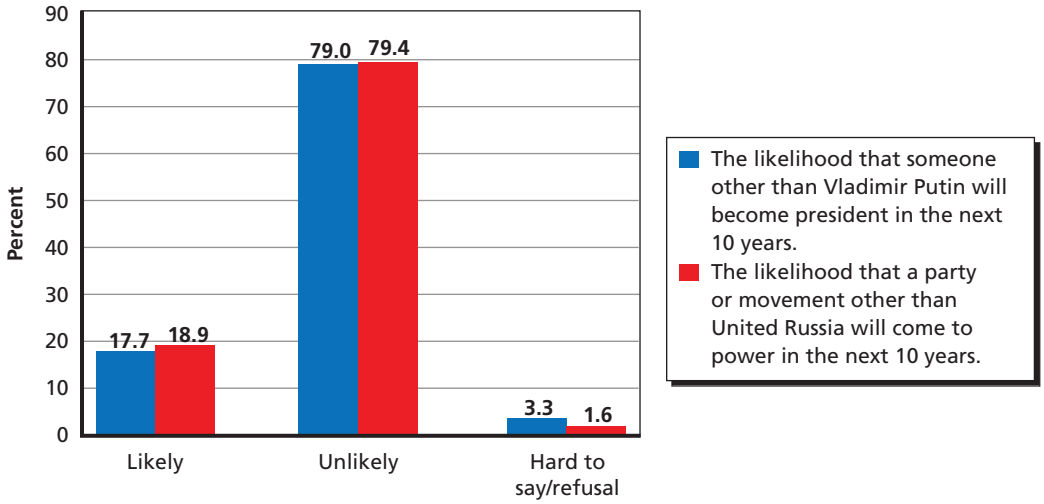
[31] "*Alternativa Vladimiru Putinu*" ["Vladimir Putin's Alternative"], Levada Center, November 16, 2016.

[32] Among those who are committed to participating in the upcoming elections, 75 percent plan to vote for Vladimir Putin; notably, in 2012 only 34 percent of Russians wanted to see Putin win the elections in 2018. See "*40% Rossiyan Ne Knotyat Videt' Putina Prezidentom Posle 2018 Goda*" ["40% of Russians Want To See Putin as the President after 2018"], Levada Center, October 26, 2012.

[33] "*Vybory 2018*" ["Elections 2018"], *VTsIOM*, December 2017.

[34] On the manipulation of the 2011 elections, for example, see Vladimir Kara-Murza, "Russia's Election Was Rigged—And This Time It's Official," *World Affairs Journal*, June 6, 2017.

Figure A.3
Expectations Regarding Vladimir Putin and United Russia



SOURCE: "The Russian Elite 2016: Perspectives on Foreign and Domestic Policy," 2016 Hamilton College Levitt Poll, *Hamilton.edu*, May 11, 2016, p. 4.

viewed as among the biggest successes of the Russian government.[35] The annexation of Crimea further fueled these tendencies, with Russians reporting high levels of support for the state approach to foreign policy.[36] These attitudes are striking giving the major controversial foreign policy actions since 2014, including the annexation of Crimea, opposition to the new government in Kyiv, resistance to Western demands and sanctions, and the campaign in Syria. These actions, accompanied by state-aligned media messaging, appear to have reinforced patriotic sentiment, including perceptions of national strength, pride for their country, and clarity about Russia's role in the world as a great power.[37] Popular support likely reflects Russians' vision of a continuing threat from the West in addition to local threats such as terrorism. While military conflict may, at times, coincide with an increase in the popularity of Russian leaders (note the spike in Putin's approval rating in 2014 shown in Figure A.1), Russians support for war is by no means guaranteed.[38]

Russia Is and Should Be a Great Power

A great majority of Russians believe Russia should pursue and uphold its status as a great power, both in terms of its military might and its global influence (see Figure A.4). Related

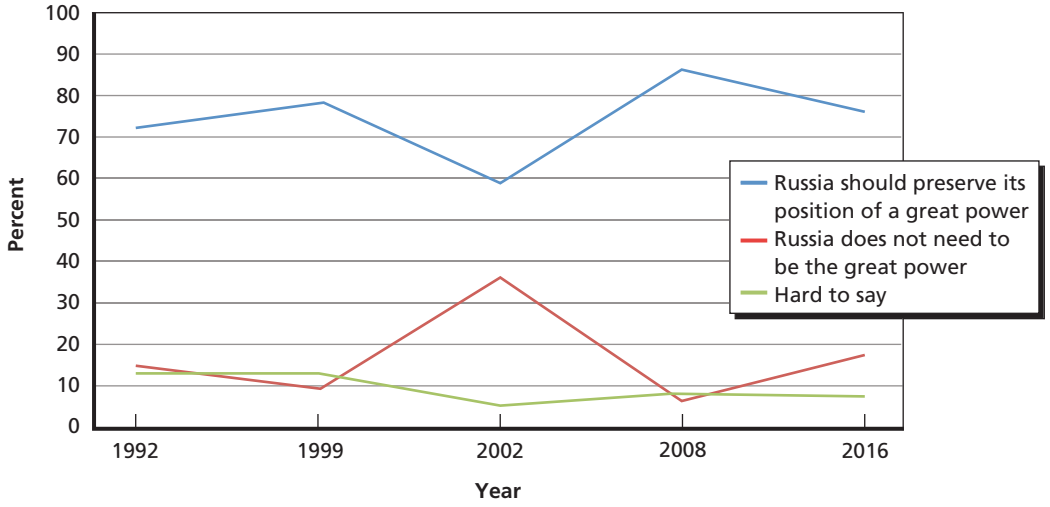
[35] Theodore Gerber writes, "Foreign policy is by far the area for which Russians give most positive credit to their current government. Putin's concerted efforts to re-establish Russia as a global power and to challenge the United States appear to have reaped benefits in terms of domestic public opinion, with 41 percent pointing to 'strengthening Russia's role in foreign affairs' as one of the main accomplishments of the government." Gerber, "Foreign Policy and the United States in Russian Public Opinion," *Problems of Post-Communism*, Vol. 62, No. 2, No. 98-111, 2015, DOI: 10.1080/10758216.2015.1010909, p. 100.

[36] "*Otsenka Vlastey*" ["Assessment of the Authorities"], *VTsIOM*, undated.

[37] "*Gordost', patriotizm i otvetstvennost*" ["Pride, Patriotism and Responsibility"], Levada Center, December 7, 2015.

[38] See also Olga Oliker, et al., Russian Foreign Policy: Sources and Implications, Santa Monica, Calif.: RAND Corporation, MG-768-AF, 2009.

Figure A.4
Should Russia Be a Great Power?



SOURCE: "Russia's Image on the Global Stage," 2016.

to this, roughly half of Russians (48 percent) believe it is natural for Russia to be an empire.[39] Further, a majority of Russians (67 percent) believe Russia's influence in the world has grown over the past few years, and an increasing number of Russians feel proud of Russia's political impact on the world and consider it a great power (see Figure A.5). Russian students of top universities—arguably, Russia's future leaders—prioritize seeing their country as a great power and are most proud of its military victories.[40]

Russians view a nation's international status in the world as a function of several factors, especially economic processes, but also military might (see elite views in Table A.1 and regular citizens in Table A.2).[41] Military might appears increasingly important over time, and many Russians believe that others' fear of Russia has also led to global respect for its strength.[42] Russia's opposition to the world's most powerful alliances is seen as another sign of Russia's growing strength and influence.[43] At the same time as military and economic factors seem more important to perceptions of Russia's position as a great power, a declining number of Russians associate their country's "greatness" with its heroic past and geographic vastness.[44] Further, the

[39] Pew Research Center, "Confidence in Democracy and Capitalism Wanes in Former Soviet Union," *pewglobal.org*, December 5, 2011. By contrast, in 1991, during the final months of the USSR, significantly fewer (37 percent) thought it was natural for Russia to have an empire, while 43 percent disagreed.

[40] "*Ukroshcheniye Stroptivogo: V Rossii Proiskhodit Total'noye Uproshcheniye Massovogo Soznaniya*" ["Taming of the Shrew: Russia's Total Simplification of Mass Consciousness"], *Vedomosti* [*The Record*], February 15, 2017.

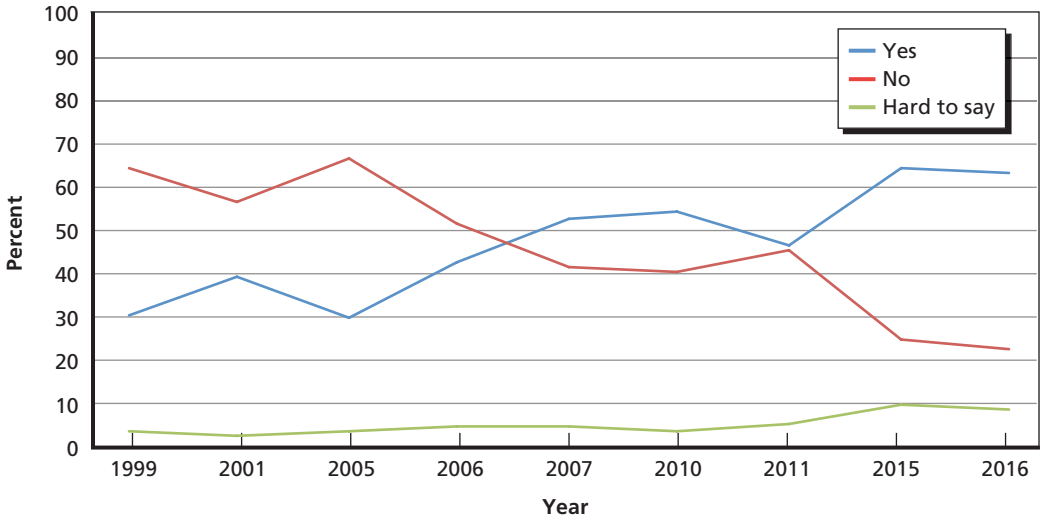
[41] "*Obraz Budushchego V Predstavlenii Ekspertnogo Soobshchestva Obshcherrossiyskogo Grazhdanskogo Foruma*," 2017.

[42] "*Otnosheniya K Rossii V Mire Glazami Rossiyan*" ["How Russians Perceive Attitudes Toward Russia in the World"], Fund for Public Opinion, January 16, 2015.

[43] "*Velichiye Vmesto Demokratii: Kak Rossiya Dognala SShA V Umakh Svoikh Lyudey*" ["Greatness Instead of Democracy: How Russia Became a Peer to the USA in the Minds of its Citizens"], Levada Center, February 4, 2016.

[44] "*B Rossii Vyroslo Chislo Tekh, Kto Predpochitayet Llichnoye Blagopoluchiye Velichiyu Strany*" ["The Number of Those Who Prioritize Personal Well Being to the Country's Status Has Grown in Russia"], *RBC*, December 12, 2016.

Figure A.5
Is Russia a Great Power Today?



SOURCE: "*Derzhavnost' I Osobyy Put' Rossii*" ["Russia's Special Power and Special Path"], Levada Center, December 12, 2016.

Table A.1
What Determines a State's Role in the World?

Respondents' Year of Birth	Military Force, % (n)	Economic Potential, % (n)
≤1950	76.9 (10)	23.1 (3)
1951–1960	52.8 (28)	45.3 (24)
1961–1970	54.5 (54)	45.5 (45)
≥1971	44.7 (34)	52.6 (40)

SOURCE: "Russian Elite 2016," 2016, p. 18.

number of people who believe that military power and nuclear arsenal make a country a great power continues to grow, as well.[45]

Russians will likely maintain the view that Russia's status as a great power is important, even in times of economic challenges. The Levada Center's analysis of its own polling also suggests they are willing to sacrifice economically (e.g., due to sanctions) to maintain Russia's position as a great power.[46] Even when survey respondents are confronted with the economic burden imposed by the annexation of Crimea, more than 80 percent of respondents still approve of it and consider it a step toward Russia's greatness.[47]

[45] "*B Rossii Vyroslo Chislo Tekh, Kto Predpochitayet Llichnoye Blagopoluchiye Velichiyu Strany*," 2016.

[46] "Russia and the West: How Russians Think the West Views Them," Levada Center, June 26, 2015; "*Velichiye Vmesto Demokratii: Kak Rossiya Dognala SShA V Umakh Svoikh Lyudey*," Levada Center, February 4, 2016.

[47] For many Russians, Crimea's annexation signified Russia's evolution into one of the global powers that is potent enough to disregard international norms. "*Velichiye Vmesto Demokratii,*" 2016.

Table A.2
What Determines a State's Role in the World?

	Mar-99	Jul-08	Sep-12	Nov-14	Nov-15	Nov-16
High welfare of its citizens	63	66	61	60	64	64
Economic and industrial potential	64	57	55	60	58	58
Military might and nuclear power	30	37	44	44	51	50
Great culture and advanced science	31	31	27	23	25	23
Respect of other countries	35	24	19	19	20	18
Wealth of natural resources	14	19	21	20	18	17
Rights and freedoms	15	16	17	13	15	11
Heroic past	7	10	10	13	9	10
The vastness of the country	4	8	10	16	9	10
Population size	2	5	5	6	5	5
Other	1	1	1	1	1	<1
Hard to say	4	2	2	2	1	1

SOURCE: "*Derzhavnost' i Osobyy Put' Rossii*," 2016.

Patriotic Sentiment

The "Crimea hype" and beliefs that Russia has regained its position as a great power have become the foundation of and ushered in high levels of patriotism. A majority of Russians report feeling proud of their country (see Figure A.6) and their Russian citizenship.[48] Eighty-five percent of Russians say they would prefer Russian citizenship to any other, and almost 60 percent consider Russia to be better than other countries. It appears, however, that the contemporary Russian patriotism is rather "blind." Close to 60 percent believe that one should support their country even if it is wrong, and few agree that Russia's admission of mistakes would make the world a better place.[49]

Threat Perceptions

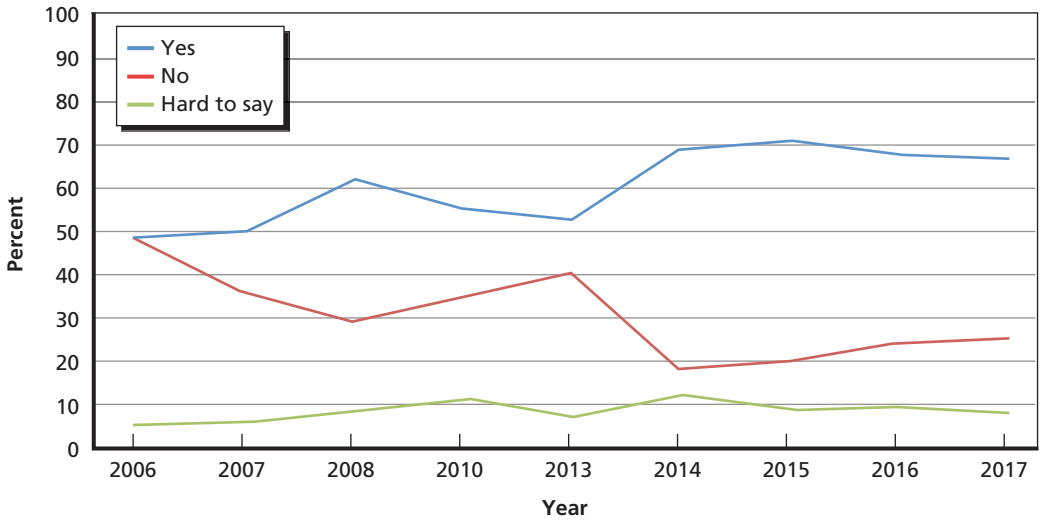
In recent years the number of Russians who believe Russia is facing a military threat has also increased (see Figure A.7). Related to this, many Russians consider war one of their top fears; they deem it likelier today than in the 1970s but see Russia's actions as efforts to mitigate the risk of war.[50] Further, in line with Soviet activity, the government has capitalized on external threats to mobilize support or discredit opposition by presenting them as instigated by foreign agents working for their homeland's defeat. Under these conditions, speaking against Russian military efforts has borne the consequence of being cast as immoral and unpatriotic. In part

[48] "*Natsional'naya gordost'*" ["National Pride"], Levada Center, May 4, 2017.

[49] "*My Vsegda Pravy: Gibridnyy Podkhod K Istorii*" ["We Are Always Right: A Hybrid Approach to History"], Levada Center, May 12, 2015.

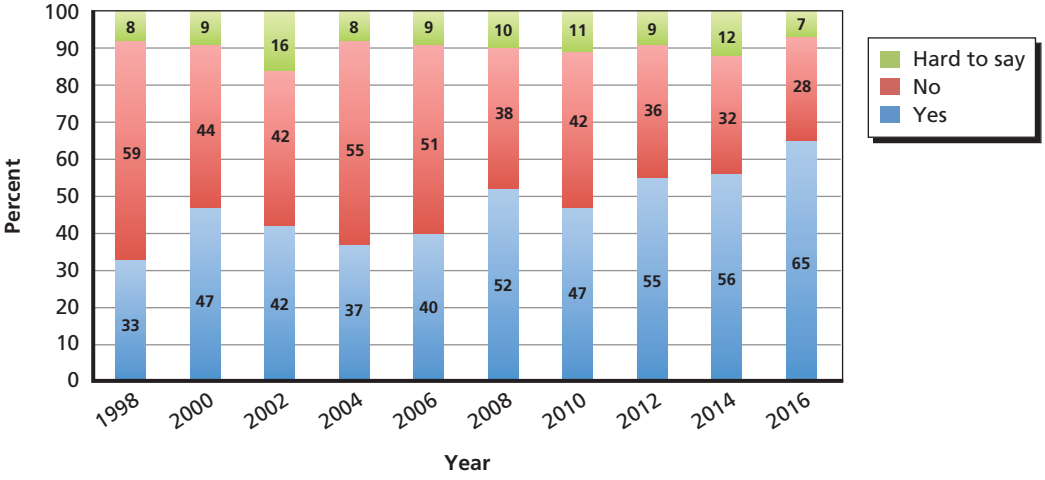
[50] "Fears," Levada Center, December 11, 2017; "The Threat of War: Is There a Threat of War Between Russia and NATO and Does Russia's Policy Increase or Reduce That Threat?" *Public Opinion Center*, November 8, 2016.

Figure A.6
Are You Proud of Russia Today?



SOURCE: Levada Center.

Figure A.7
Is There a Military Threat to Russia Today?



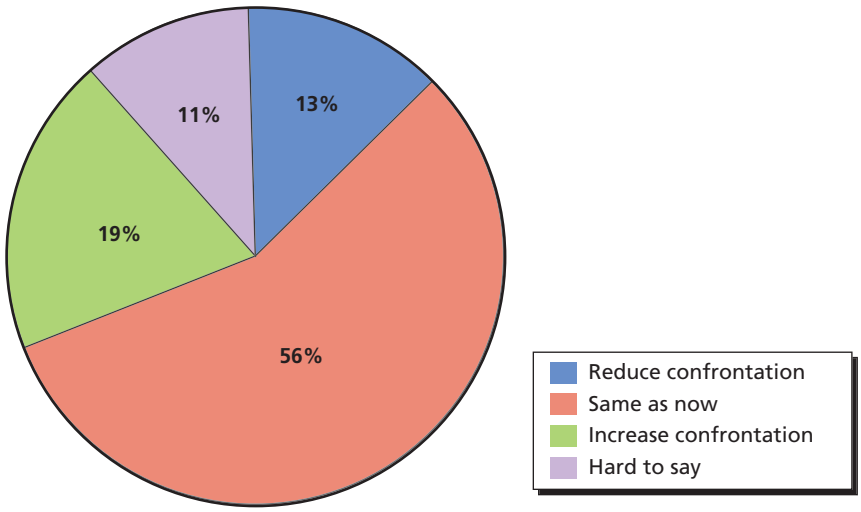
SOURCE: Levada Center.

because of this, a majority of Russians have supported or failed to scrutinize Russia's militaristic adventures of the recent years.[51]

A majority of Russians see insecurity in the face of their country's resurrection as a powerful global player as the reason for the West's hostility toward Russia and expect that the

[51] "*Khotyat Li Russkiye Voyny. Voyna I Terror B Vospriyatii Rossiyan*" ["Do Russians Want Wars: War and Terror in the Perception of the Russians"], Levada Center, March 23, 2016.

Figure A.8
What Political Style Should the Future President Adopt in Relation to the West?



SOURCE: Levada Center.

relationship between Russia and the West will continue to deteriorate.[52] Russians' attitudes specifically toward the United States have been riddled with suspicion; at multiple points of the post-Soviet timeline, Russians viewed the United States as the most or one of the most hostile countries toward Russia. This sentiment has gained significant strength since the start of the Ukrainian crisis.[53] Today, Russians view the United States and the NATO alliance as threats and are increasingly concerned about the possibility of a large-scale war.[54] Additionally, over 80 percent of Russians believe that the United States and Western countries are conducting information warfare against Russia.[55]

Today more than half of Russians believe it would be best to continue the current type of relationship with the West, whereas 19 percent think an even greater confrontation with the West is in order (see Figure A.8).[56] Even though some polls indicate that a growing number of Russians want a closer relationship with the West,[57] it seems unlikely that Russians will begin to accept the West as friendly toward Russia in the near- or even medium-term future. Even if the current crisis is resolved, the memory of prolonged confrontation and the history of failed

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[52] "*Reaktsiya Zapada Na Politiku Rossii: Kritika, Vrazhdebnost', Sanktsii*" ["The West's Reactions to Russia's Policy: Criticism, Animosity, Sanctions"], Levada Center, November 2, 2015.

[53] "*Rossiya—velikaya derzhava*" ["Russia—The Great Power"], Russian Public Opinion Research Center, press release 3327, March 15, 2017.

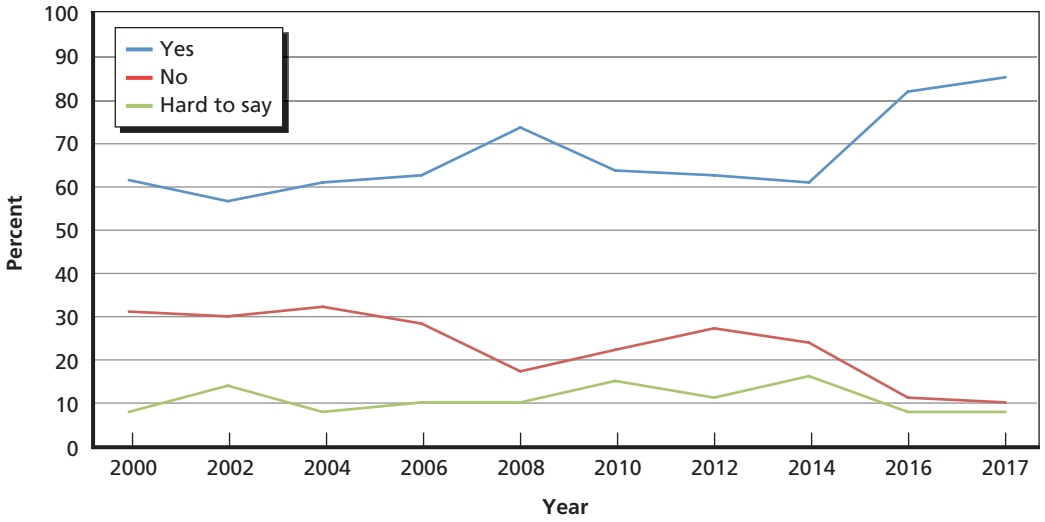
[54] "*Otnosheniya vlasti I naroda v Rossii, sotrudnichestvo s mezhdunarodnimi organizatsiyami*" ["Relationship Between the Government and the People in Russia, Collaborations with International Organizations"], Levada Center, press release, July 4, 2017; "Most NATO Members in Eastern Europe See It as Protection," *Gallup*, February 10, 2017.

[55] "Information War: Whom Are We Fighting and Defeating?" Levada Center, June 1, 2017.

[56] "*Prezident 2018*," 2017.

[57] "Russia's Relations with the West," Levada Center, January 9, 2017.

Figure A.9
Is the Army Capable of Defending Us in the Case of Real Military Threat?



SOURCE: Levada Center.

expectations of global integration will likely ensure that the lingering suspicion toward the West will persist beyond the current regime. This enduring suspicion will ensure that their ability to resist Western pressures (as long as the West is viewed as a formidable opponent) will remain an important aspect of Russians' view of their country's greatness.

Views about War

In recent years, Russian authorities have invested great effort into reinstating and further developing the mythology of war. One part of the mythology is that Russia's military actions are just, defensive, victorious, and preventative. Drawing on the sanctity and recent commemoration of the Great Patriotic War (WWII), Russian propaganda efforts have portrayed all Russia's recent military campaigns as the descendants of this war.[58]

Although the linkage between domestic political concerns and military operations is uncertain and probably variable, in part based on Russia's actions in Crimea, analysts believe Russian military operations are constrained and influenced by the Russian leadership's domestic political calculus.[59] At a minimum, Putin considered domestic popular support in formulating his policy on Crimea in 2014. In his postannexation speech, Putin mentioned Russians' and Crimeans' overwhelming public support for the union as the basis for the decision and observed that "the people are the ultimate source of all authority."[60] One report also suggests that Putin made the decision to annex Crimea based on declining popularity at home, implying that Russian foreign

[58] "*Khotyat Li Russkiye Voyny. Voyna I Terror B Vospriyatii Rossiyan*," 2016.

[59] See, for example, Kimberly Marten, "Crimea: Putin's Olympic Diversion," *Washington Post*, March 26, 2014; "The Microfoundations of Diversionary Conflict," *Security Studies*, 2017.

[60] Putin explained, "The most recent public opinion surveys conducted here in Russia show that . . . 86 percent of our people see Crimea as still being Russian territory and part of our country's lands. And . . . almost 92 percent of our people support Crimea's reunification with Russia." Address by President of the Russian Federation, Kremlin, March 18, 2014.

policy may be more broadly determined by domestic political priorities.[61] Dmitri Gorenburg proposes a scenario for a possible Russian intervention in Kazakhstan in the midst of a domestic crisis "to boost the regime's popularity through another injection of militarized patriotism."[62] However, it is not clear that Putin originally intended to annex Crimea when he initiated a military operation to seize the territory, nor is there reason to believe that the operation to seize Crimea was motivated by public opinion rather than other foreign policy objectives, such as protecting the navy base or seeking to undermine the new Ukrainian government.[63] Instead, Putin may have only made the decision to annex the territory once he was cornered by his own nationalist rhetoric and concerns about outbidding.[64] Whatever Putin's intentions and motivations, the annexation of Crimea boosted support for Putin, the regime, and Russians' pride in their homeland.[65]

Indeed, war carries substantial risk to the government, and Russian public support for military conflict is by no means guaranteed. Past support for military campaigns might be because none of the recent conflicts with Russia's military involvement took place in Russia. Since the direct involvement of the Russian soldiers has been formally presented as either nonexistent or limited, most Russians do not perceive the wars of recent years as "real" or "big" and see them more as a virtual act discussed on TV.[66] Notably, the costs of Russia's involvement in both Ukraine and Syria have been relatively low, including in terms of human lives.[67] A costlier military adventure is likely to enjoy lower public support. The lack of support for a direct intervention in Ukraine is particularly telling given the Russian interests in Ukraine. In July 2014, polls found that only 5 percent to 10 percent of respondents support Russian military intervention in Ukraine, and later surveys found that only 13 percent of respondents believed Russia should send troops even in the case of a NATO intervention.[68] Thomas Sherlock, a professor at West Point, similarly found: "The evidence of numerous recent surveys suggests that a clear majority of Russians are against the intensification of the conflict, a fact that has likely restrained the Kremlin up to now."[69] Levada surveys on Syria also found declining support for continuing its military operations from 2016 to 2017.[70] Further, respondents indicated a real, albeit diminishing, concern that Russian involvement in the Syrian conflict would develop

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[61] See John W. Parker, "Understanding Putin Through a Middle Eastern Looking Glass," Institute for National Strategic Studies, July 2015, No. 19, p. 35.

[62] Dmitri Gorenburg, "Russian Military Intervention in Kazakhstan," American Enterprise Institute, January 17, 2018, p. 2.

[63] See, for example, Daniel Treisman, "Why Putin Took Crimea," *Foreign Affairs*, May/June 2016. Some analysts also emphasize that Russian foreign policy is motivated by domestic factors. Discussion with European analysts, Washington, D.C., June 2017.

[64] Boris Barkanov, "How Putin's Domestic Audience Explains Russia's Behavior," *Washington Post*, March 13, 2014; Samuel Charap and Timothy J. Colton, *Everyone Loses: The Ukraine Crisis and the Ruinous Contest for Post-Soviet Eurasia*, IISS, Adelphi Papers, Vol. 56, 2016, pp. 128–129.

[65] Parker, 2015, p. 35.

[66] "*Khotyat Li Russkiye Voyny. Voyna I Terror B Vospriyatii Rossiyan*," 2016.

[67] See, for example, Ruslan Pukhov, "Russia's Unexpected Military Victory in Syria," *Defense News*, December 10, 2017.

[68] Harley Balzar, "The Ukraine Invasion and Public Opinion," *Georgetown Journal of International Affairs*, March 19, 2015.

[69] Thomas Sherlock, "Putin's Public Opinion Challenge," *The National Interest*, August 21, 2014.

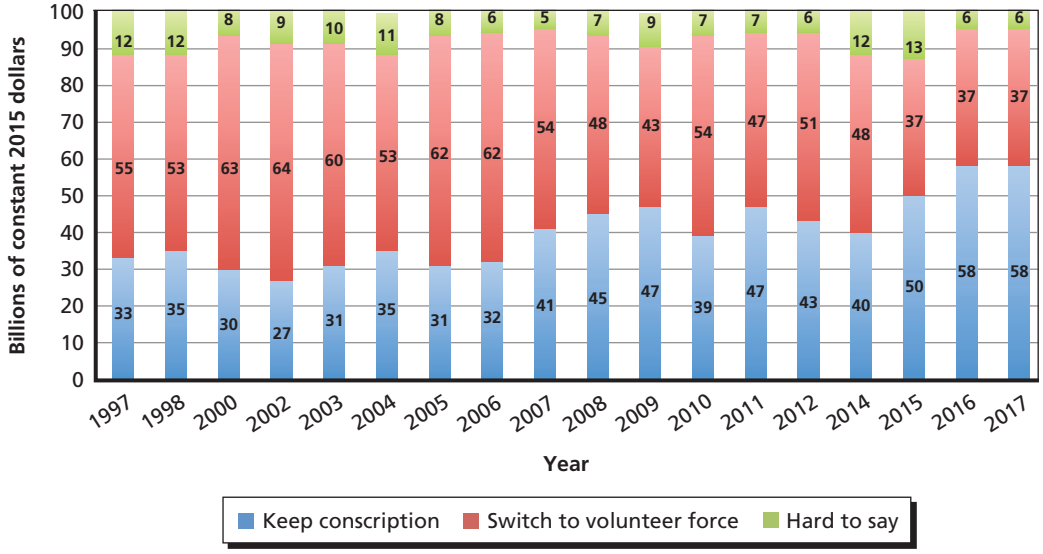
[70] "Syria," Levada Center, September 26, 2017; "Conflict in Syria," Levada Center, December 2, 2016.

"into a 'new Afghanistan.'"[71] While Russians may support the Putin administration's general foreign policy, support for a future war is likely contingent on the specific circumstances. The ability of the regime to portray Russia as on the defensive and likely to be victorious may be particularly important to determining future public support for military actions.

Support for the Military

The Army (which refers to all military services in Russia) has been one of Russia's most trusted institutions (see Figure A.9)[72] and one that an overwhelming majority of Russians view with pride (see Table A.3).[73] In fact, the armed forces are the third most frequently named reason why Russians are proud of their country, preceded only by Russia's natural resources and history.[74] High trust in the Army, support for conscription, and a willingness to support defense spending likely indicates the relative sustainability of Russia's investment in its military and its ability to field forces in the future. Russians' confidence that the Russian Army can defend the country from external military threat has been consistently increasing since early 2000, but has grown especially sharply since 2014, reaching 84 percent in 2017.[75] This latest boost is likely due to the post-2008 reform, the greater visibility of the Army and its capabilities during the

Figure A.10
Do You Think Russia Should Preserve Conscription or Switch to Volunteer Force?



SOURCE: Levada Center.

[71] "Syria," 2017.

[72] "Institutional Trust," Levada Center, October 13, 2016.

[73] "*Gordost', patriotizm i otvetstvennost'*," 2015.

[74] "*Natsional'naya gordost'*," 2017.

[75] "*Sluzhba V Armii I Voyennaya Ugroza Rossii*" ["Military Service and the Threat to Russia"], Levada Center, February 18, 2016.

Table A.3
How Proud Are You of the Russian Armed Forces?

	1996	2003	2012	2015
Very proud	13	13	22	40
Somewhat proud	27	27	37	45
Not very proud	24	29	23	8
Not proud at all	26	22	11	3
Hard to say	11	9	7	5

SOURCE: Levada Center.

annexation of Crimea and Russia's intervention in Syria, and continuous flows of propaganda about the strength and virtue of the Russian Army.

Views of the Army's capabilities have improved at the same time as Russians voice an improving view of service in the military. Perceptions of the conditions of service in the Army were poor until recent years, as most feared and preferred to evade Army service, even though they continued to recognize the symbolic value and the need to invest in the military.[76] Perceptions of service have improved, thanks to the shortened, one-year conscription term, reduction in hazing, the drastic increase in volunteer/contract forces, and overall higher levels of patriotic sentiment, as discussed in Appendix D.[77] A growing number of people support the preservation of the compulsory Army service for all men (58 percent in 2017 versus 47 percent in 2011). Most people would also support their relative's conscription (61 percent in 2017 versus 46 percent in 2011), with fewer respondents preferring that their relative evade the service (23 percent in 2017 versus 41 percent in 2011).[78] At this time, Russians believe the military function should belong only to the state and do not support commercial/private companies, contrary to the increasing activity of private military companies as discussed in Appendix L on internal security forces.[79]

Perhaps in part due to improving public views of the military, after years of steady 36 percent to 39 percent of people thinking defense spending should be a priority, in June 2015, more than 50 percent of Russians supported an increase in defense spending, even if it came at the expense of the country's economic development.[80] Since then, the numbers of those who thought defense spending should be a priority have returned to regular levels, at 36 percent in 2016.[81]

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[76] "*Otnosheniya K Deystvuyushcheny Sisteme Prizyva Na Sluzhbu*" ["Attitudes toward the Current Conscription System"], *Fond Obshchestvennoye Mneniye* [*Public Opinion Fund*], 2011, p. 105.

[77] "The Prestige of the Armed Forces Increases," Levada Center, February 20, 2017.

[78] "*Rossiyskaya Armiya*" ["Russian Army"], Levada Center, February 20, 2017.

[79] "The Prestige of the Armed Forces Increases," 2017.

[80] "*Ekono Mika I Oborona*" ["Economy and Defense"], Levada Center, July 21, 2015.

[81] "*B Rossii Vyroslo Chislo Tekh, Kto Predpochitayet Llichnoye Blagopoluchiye Velichiyu Strany*," 2016.

With regard to domestic security services, a majority of Russians have confidence that Russia's internal forces and special services serve the greater good and will be able to protect the country from future terrorist attacks.[82] Trust in state security services (except for the police), and particularly the Federal'naya Sluzhba Bezopasnosti (Federal Security Service, FSB), has also increased in the recent years.[83] When it comes to the recently established National Guard, a majority of those Russians who know about it are not yet sure about its purposes or whether to trust it. About a quarter of those who know about the National Guard believe counterterrorism was the primary motivation behind its establishment, while almost 40 percent believe the National Guard was established to stave off popular protests or a potential uprising, reflecting concern about the threat of internal instability.[84] Even so, a great majority of Russians (74 percent) think media should be extremely careful in reporting on the work of the National Guard and should not disclose details about it.[85] Low trust and confidence in local authorities and police also may encourage people to welcome a federal security presence in their regions, which may further spread internal militarization. Still, although there is concern about the internal security forces, there is little to indicate that popular distrust will lead to major protest against them in the near future.

Outlook

The observed trends in public opinion of Putin and the current regime, Russian foreign policy, and the military indicate there is solid support for current Russian policy. Not only does public opinion generally agree with the current regime's policy in many areas, but state control of information and coercion against political opponents of the regime make large-scale organized resistance to the regime and Russia's policies unlikely in at least the near term. This survey of public opinion, therefore, indicates the likely stability and consistency of defense and security policy. Still, the variation in views on issues such as confidence in the military, support for the conflict in Syria, and support for defense spending indicates that public opinion is subject to change.

Several changes or trends seem most likely to alter current views. In particular, economic collapse, war casualties, or a negative shock to domestic stability (e.g., because of terrorist attacks) could create a more hostile social environment for the current regime. While the regime could use a combination of propaganda and oppression to reduce public protests from these events, an increasing number of Russians could voice their frustration with the status quo, potentially leading to a cascade of public opposition that could bring down the regime.[86]

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[82] "*Terakty V Bryussele I Strakh Teraktov V Rossii*" ["Terrorist Attacks in Brussels and Fear of Terror in Russia"], Levada Center, April 5, 2016; "Attitudes to the Russian Security Forces," Public Opinion Fund, January 28, 2018.

[83] "Institutional Trust," 2016.

[84] "Creation of Russia's National Guard," Levada Center, April 28, 2016.

[85] "VTsIOM: Most Russians Do Not Know Who Controls Rosgvardia," *BBC*, December 19, 2016.

[86] See Andrey Zubov's discussion of the trajectory of fall of the Soviet Union: Chizhova, 2016.

In the near-term, any such turn of events seems highly unlikely, especially as Putin seems likely to easily win reelection in the March 2018 presidential elections, as already discussed. Nevertheless, the regime appears concerned about the outcome of the election. In particular, it has taken legal action to prevent Aleksei Navalny, an anticorruption activist, from running from President, even though only 2 percent of poll respondents indicated a desire to vote for him.[87] Such concern may reflect a recurring perception in the Kremlin that the current regime is vulnerable to mass protest, whatever its current popularity.[88]

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[87] Andrew Higgins, "Putin May Be Re-Election Shoo-in but He's Taking No Chances," *New York Times*, December 26, 2017.

[88] For example, Gleb Pavlovsky, a former advisor to Putin, explained in 2012, "In the Kremlin establishment, ever since Yeltsin's 1993 attack on the Parliament, there has been an absolute conviction that as soon as the power centre shifts, or if there is mass pressure, or the appearance of a popular leader, then everybody will be annihilated. It's a feeling of great vulnerability." Gleb Pavlovsky, interviewed by Tom Parfitt, "Putin's World Outlook," *New Left Review*, No. 88, July–August 2014.

APPENDIX B

Russian Defense Spending

Matthew Povlock, Andrew Radin, and Clinton Reach

Russia's concerted efforts to modernize its armed forces have been made possible by a substantial increase in the country's military expenditures, beginning in the early- to mid-2000s. As described in Chapter 2, rising hydrocarbon prices and structural reforms in that period spurred growth in Russia's GDP, providing its government with the financial resources necessary to carry out an overhaul of the country's military. That overhaul manifested itself perhaps most notably in Russia's various SAPs' long-term procurement plans designed to increase the share of modernized military equipment in the country's armed forces. The current SAP, running to 2020, was initiated in 2011 and was unprecedented in its scale, allocating close to 20 trillion rubles for the procurement of new and upgraded systems. Though not the only cause of increased military expenditures, the SAP-2020 typifies a trend of recent prioritization of defense spending in the Russian federal budget.

However, by 2016–2017, it appeared that the accelerated pace of defense spending could soon level off. Russia's recent economic troubles have translated into budgetary pressures that will likely constrict its ability to maintain high levels of defense spending. The latest Russian budget, which was passed in December 2016, will dedicate fewer resources to the MOD than in the past. Meanwhile, though no final decisions have been made regarding the next SAP's financing, it is likely to be less ambitious than its predecessors. Meanwhile, spending on military operations, such as those in Syria and eastern Ukraine, have not represented a major portion of total defense spending and are not likely to do so in the future. In addition, Russian officials have signaled that the defense industry, which has enjoyed significant political and financial support as a key sector of the Russian economy, may see curtailed assistance in the future. As such, we expect Russian defense spending to stabilize in the near term.

Recent History and Trends

Before reviewing the recent trends in Russian military expenditures, it is helpful to describe briefly the budgetary structure with relation to defense spending. Current Russian budgets feature 14 top-line categories, one of which, "National Defense," represents the majority of spending on the MOD. When the Russian government discusses defense spending, it typically refers to the amount under this heading. This practice creates a discrepancy with international military expenditure measurement conventions (such as those used by NATO, Stockholm International Peace Institute [SIPRI], and International Institute for Strategic Studies [IISS]),

because the different methodologies do not include the same set of spending categories. The most obvious is the "National Security and Law Enforcement" category, which covers expenditures for internal security forces such as the FSB, or Rosgvardia. In addition, Russian MOD spending on military pensions falls under the "Social Policy" category, not under National Defense. SIPRI's definition of military spending would include these and other expenditures, such as military housing, health care for service members, and MOD educational programs. In turn, some subcategories within "National Defense" related to economic mobilization and decommissioning of armaments would be excluded by SIPRI. Naturally, these different methodologies result in different figures for Russian defense spending as a percent of GDP and of overall government spending.[1] For this report's discussion of defense spending trends, we use the Russian conception of defense spending, though we present both measures to demonstrate the discrepancy in later figures.

In addition, our analysis considers defense spending in Russian rubles, rather than U.S. dollars. This is for two reasons. First, Russia purchases the majority of its equipment from internal suppliers using its own domestic currency. Second, a measure of defense expenditures in U.S. dollars would include fluctuations in exchange rates and would, therefore, not accurately reflect Russia's true costs. To adjust for inflation, we use the World Bank's GDP deflator for Russia, which estimates the impact of inflation in Russia. We also provide estimates of the U.S. dollar equivalents using yearly exchange rates from the World Bank's Development Indicators. For "constant" dollar equivalents of inflation adjusted rubles, we use the yearly ruble-to-dollar exchange rate to convert GDP deflator-adjusted rubles to dollars, thereby taking into account exchange rate variation in the value of the ruble. This methodology means that our constant U.S. dollar graph differs from other estimates, such as the chart found in the Defense Intelligence Agency's (DIA) "Russia Military Power."[2]

In 2000, Russia had allocated a fairly high percentage of its budget to National Defense—18.63 percent—but two years later, this proportion began to decline (see Figure B.1). After hovering between 14 percent and 16 percent in the mid-2000s, defense spending fell to a low of 12.3 percent in 2009. National Defense's share of the federal budget began to grow sharply in the 2010s, eventually reaching a peak of 23 percent in 2016 before likely leveling off to around 17 percent in the next budget. The magnitude of this most recent reduction is due in large part to an 800 billion ruble one-time debt repayment in 2016, which we will discuss later. Without that one-time expenditure, spending on National Defense is a little over 18 percent, making the reductions in the next budget less stark.

In terms of National Defense's share of GDP, the years 2000 and 2010 show less variation (with that category floating around 2.5 percent of GDP) than its proportion in the budget (see Figures B.1 and B.2). However, a similar growth trend can be seen from 2011 onward. In 2011, National Defense was 2.54 percent of GDP and rose to 4.4 percent by 2016. The 2017–2019 budget, passed in late 2016, will see National Defense occupy close to 3.3 percent of GDP in 2017 and a little under 3 percent the next two years.

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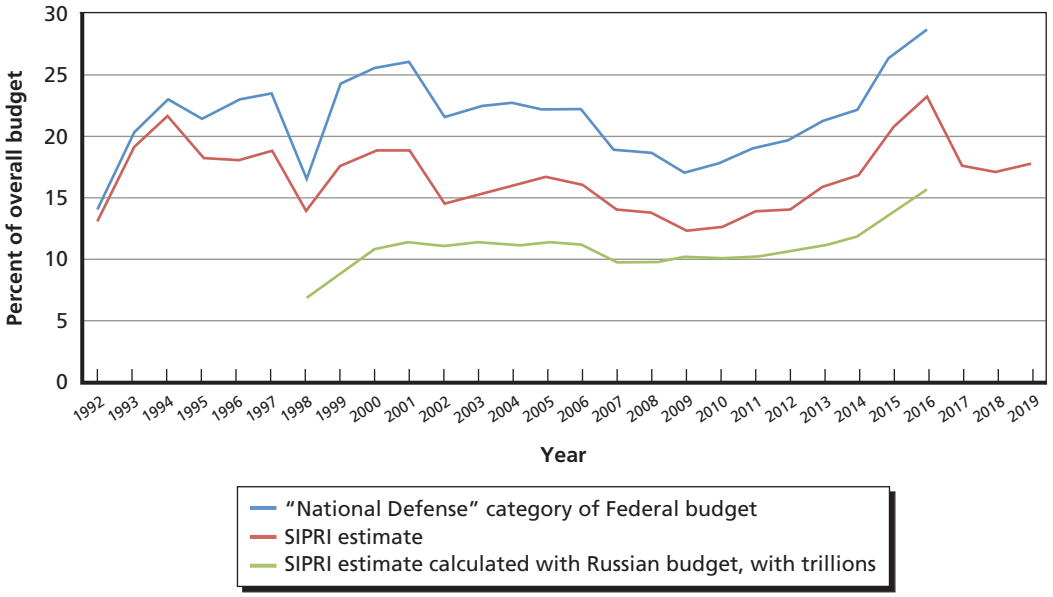
[1] Julian Cooper, *Russian Military Expenditure: Data, Analysis, and Issues*, FOI, Stockholm: Sweden, September 2013, pp. 17–24.

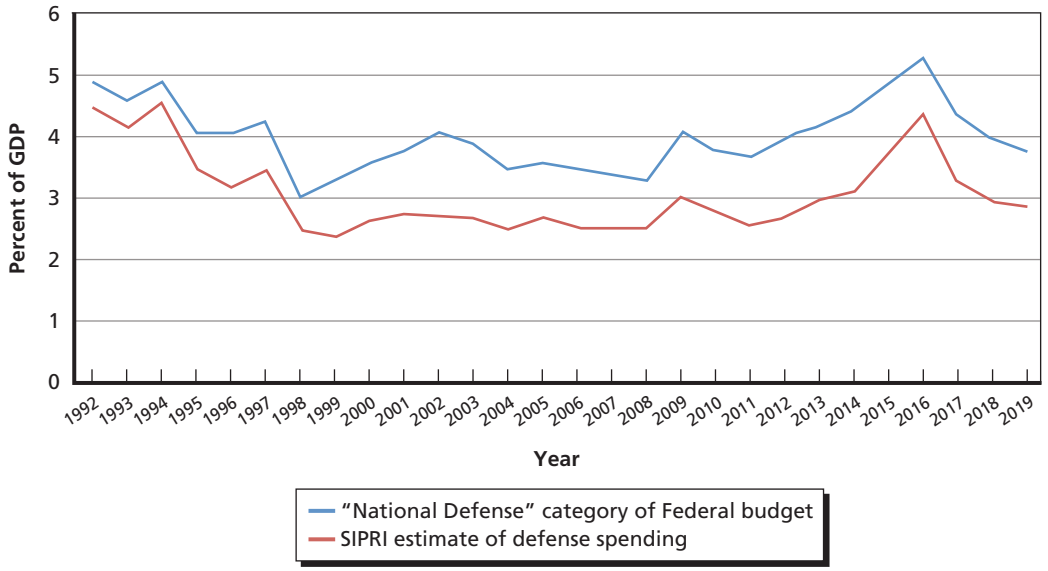
[2] See Defense Intelligence Agency, *Russia Military Power: Building a Military to Support Great Power Aspirations*, DIA-11-1704-161, 2017, p. 19.

Figure B.1
Russian Defense Spending as a Percent of the Federal Budget



SOURCE: "National Defense" from official Russian executed budgets; SIPRI data from SIPRI military expenditure database.

Figure B.2
Russian Defense Spending as a Percent of GDP



SOURCE: "National Defense" from official Russian executed budgets; SIPRI data from SIPRI military expenditure database.

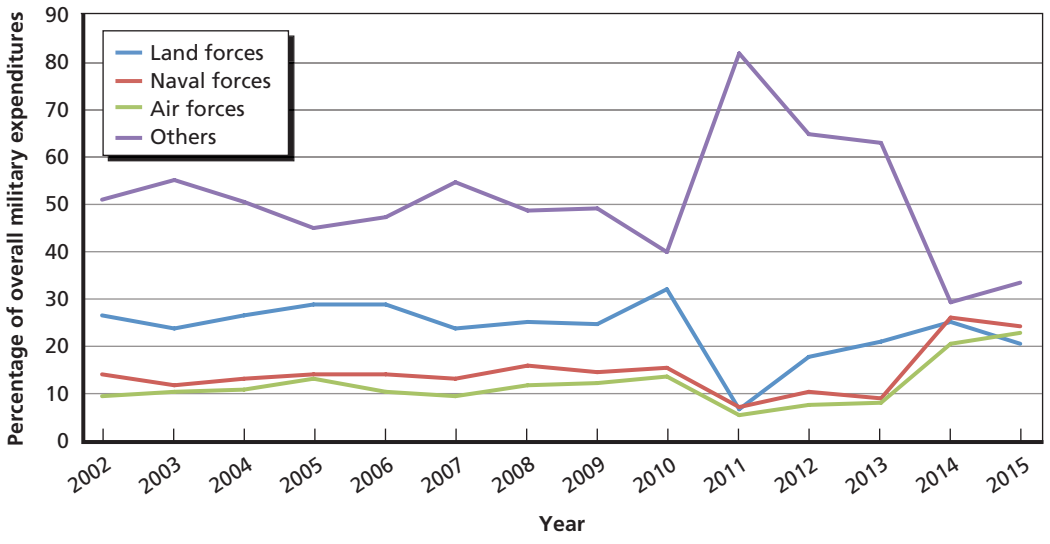
It is also important to delineate what available sources can and cannot tell us about Russia's military expenditures. Despite the methodological differences between official Russian figures and those of military expenditure reporting organizations, there appears to be enough information to establish reasonable estimates of the overall scale of Russian military expenditures. That is not the case, however, when trying to ascertain precisely how funds are allocated under the National Defense umbrella. In its unclassified form, that category does not describe the allocation of funds among the branches of the armed forces, nor does it illustrate the relative share between types of spending (such as personnel or procurement). These amounts ostensibly fall under "Armed Forces of the Russian Federation," but official budgets do not list them openly. The only open source that does provide this level of detail is the United Nations' Report on Military Expenditures, to which Russia has provided information since the early 1990s. While the UN data provide breakdowns of expenditures by activity and service, they are highly problematic due to a number of gaps and their inconsistencies with other sources.[3] Figures B.3 and B.4 show military spending by type and armed forces branch. Note that these figures refer to total yearly spending on each armed forces branch.

To better understand the trends seen in these figures, this section reviews the most important explanatory variables we believe to be responsible for driving military expenditures in Russia.

Russian GDP

Russia's marked GDP growth beginning in 2000 has provided its government with more resources to spend on its armed forces. As discussed in Chapter 2, windfalls from oil and gas

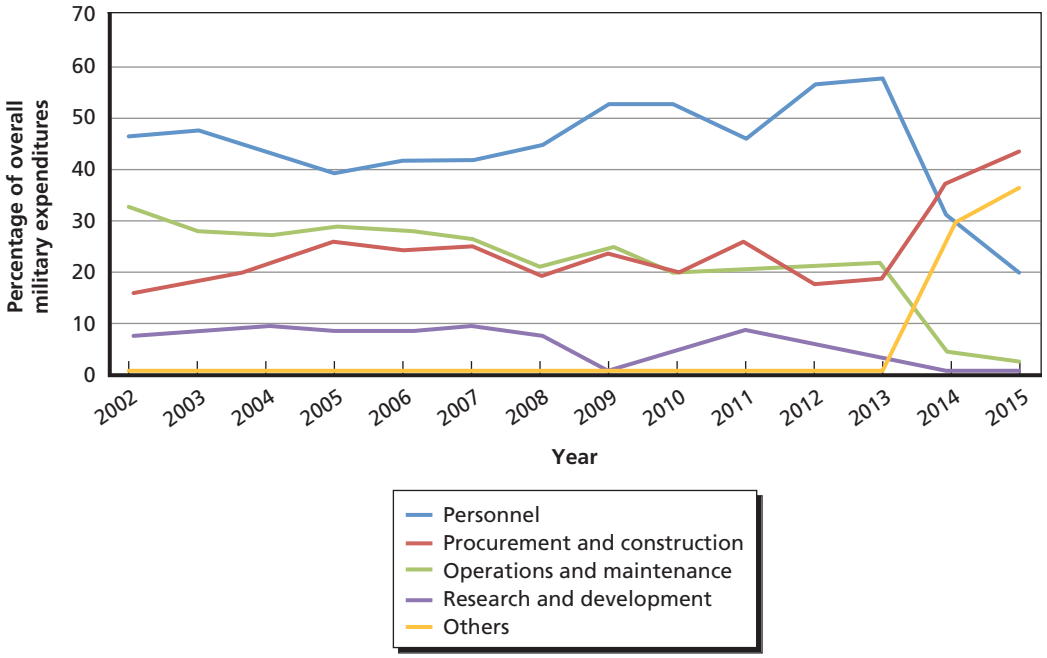
Figure B.3
Share of Russian Military Branches in Overall Expenditures



SOURCE: United Nations Report on Military Expenditures.

[3] Ivan Tkachyov, Svetlana Bocharova, and Oleg Makarov, "*Zasekrechennye trilliony: skol'ko Rossiya na samom dele tratit na armiyu*" ["Secret Trillions: How Much Russia Really Spends on the Military"], *RBC.ru*, July 27, 2016.

Figure B.4
Share of Military Activity Type in Overall Expenditures



SOURCE: United Nations Report on Military Expenditures.

exports, initially promising increases in foreign investment, some structural reforms, and sound macroeconomic management helped spur high GDP growth. This positive trend stalled from 2014–2016 before Russia's economy stabilized, but the preceding period of growth enabled the government to substantially increase its defense expenditures. Figures B.5 and B.6 show the corresponding growth of Russia's GDP and its allocations to National Defense in constant 2015 and current rubles, respectively. Figures B.7 and B.8 show this growth in constant 2015 and current dollars.

The State Armaments Programs and the State Defense Order

The second important structural factor responsible for recent growth in Russian defense spending has been the increase in funding for procurement of modern military equipment. Much of this procurement is carried out through the SAPs.[4] The SAPs establish procurement targets and priorities for the Russian military. There have been four SAPs in the post-Soviet period, with a fifth currently under development. The 2005 SAP (adopted in 1996) and the 2010 SAP (adopted in 2001 with 2.5 trillion rubles in funding) were unable to meet their procurement goals. The 2005 SAP was limited by the generally poor economic situation in the 1990s, a decline in military expenditures, and the 1998 financial crisis. The 2010 SAP, in turn, fell victim to inflation and price increases.[5]

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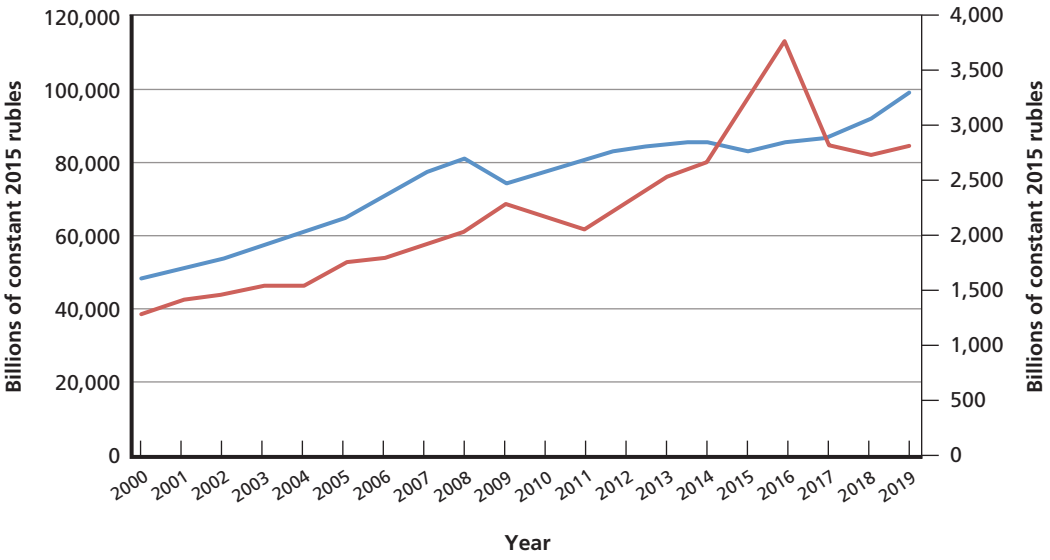
[4] In Russian, *Gosudarstvennye Programmy Vooruzheniya*.

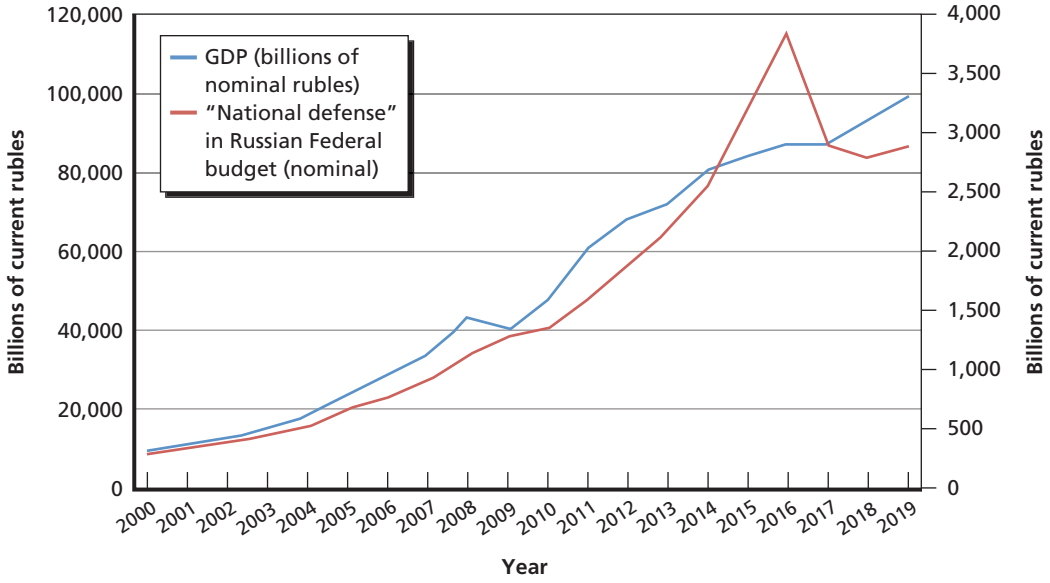
[5] CAST, *Gosudarstvennye Programmy Vooruzheniya Rossiyskoy Federatsii: Problemy Ispolneniya i Potentsial Optimizatsii* [*The State Armaments Programs of the Russian Federation: Problems of Execution and the Potential for Optimization*], Moscow, 2015, pp. 7–8.

Figure B.5
Russian GDP and Spending on National Defense in Constant 2015 Rubles



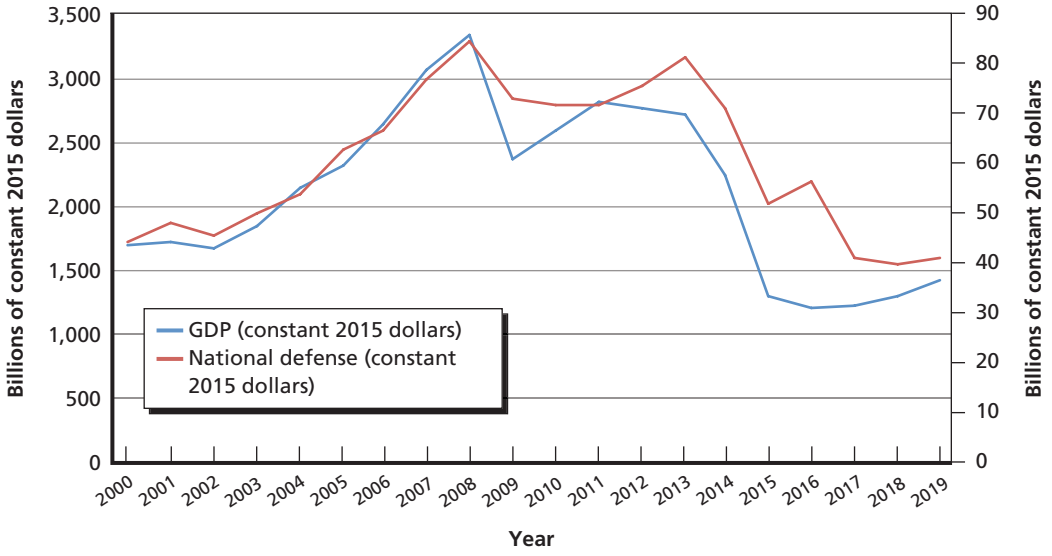
SOURCE: GDP 2000–2015 from World Bank World Development Indicators; GDP 2016–2019 from Cooper, 2017; National Defense from official executed Russian budgets.

Figure B.6
Russian GDP and Spending on National Defense in Current Rubles



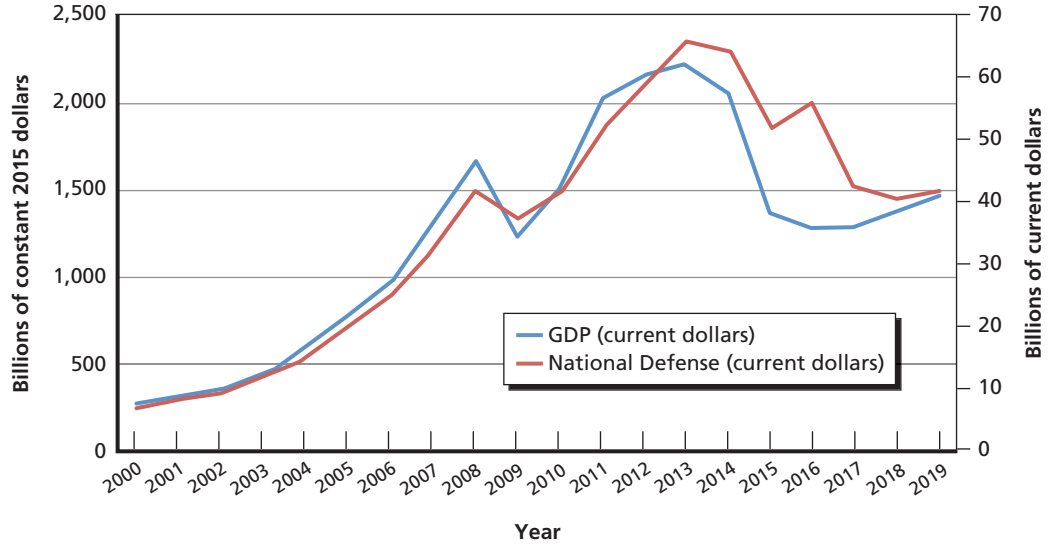
SOURCE: GDP 2000–2015 from World Bank World Development Indicators; GDP 2016–2019 from Cooper, 2017; National Defense from official executed Russian budgets.

Figure B.7
Russian GDP and Spending on National Defense in Inflation Adjusted Dollars



SOURCE: Exchange rates and GDP 2000–2015 from World Bank World Development Indicators; GDP 2016–2019 from Cooper, 2017; National Defense from official executed Russian budgets.

Figure B.8
Russian GDP and Spending on National Defense in Current Dollars



SOURCE: Exchange rates and GDP 2000–2015 from World Bank World Development Indicators; GDP 2016–2019 from Cooper, 2017; National Defense from official executed Russian budgets.

The 2015 SAP (adopted in 2006), though it, too, was not fulfilled entirely, was an improvement over its predecessors thanks to a streamlined procurement planning process in the MOD and a generally improved economic climate in Russia. Five trillion rubles were allocated for the program. By this time, a pattern had developed in the execution of SAPs in which the majority of procurement expenditures were delayed until the second five-year period. In the views of MOD officials, this resulted from incorrect estimates of pricing, inflation, and budget allocations.[6] Meanwhile, among the conclusions drawn from Russia's performance in its 2008 war with Georgia was a realization that serious deficiencies existed in its military equipment.[7]

In light of these issues, the 2020 SAP, instituted in 2011, received a level of financial and institutional support not seen in prior SAPs. Around 20 trillion rubles were allocated and senior Russian leaders, including President Putin, took central roles in its implementation.[8] Complete details of SAP-2020 are classified, but some estimates about its distribution among Russia's armed forces are available from the Center for Analysis of Strategies and Technologies (CAST) and shown in Table B.1. However, a wave of corruption scandals challenged Russia's initial pursuit of the ambitious targets in the 2020 SAP, with the chief military prosecutor stating in 2011 that corrupt officials were "stealing" around 20 percent of the total budget.[9]

Progress on the 2020 SAP's goal of providing the military with 70 percent modernized equipment has been uneven, with some sectors, such as air defense and aircraft, seeing marked improvements while others, such as the Army and Navy, have fared less well. Overall, though, and in spite of other issues such as sanctions and loss of external technological sources, the 2020 SAP has markedly improved Russian military capabilities.[10]

The recent rise in Russian defense spending is to a great extent the product of increased procurement under the 2020 SAP.[11] This is demonstrated by the increase in the SDO.[12] The SDOs are yearly procurement orders through which new systems are purchased, existing equipment is repaired and modernized, and research and development is funded. Yearly implementation of the SAP is carried out by SDOs, though SDOs do include some non-SAP expenditures. Like the SAP, the SDO is classified, which limits analysis of its size. However, in most cases, Russian budgets provide sufficient information to permit some estimation of the SDO.[13]

Figures B.9 through B.12 show the growth of the SDO in absolute terms and its growth in relation to other military spending (in constant 2014 and current rubles). These graphs show

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6 CAST, 2015, p. 8.

7 Jim Nichol, *Russian Military Reform and Defense Policy*, Washington, D.C.: Congressional Research Service 7-5700, August 24, 2011, p. 23; Carolina Vendil Pallin, ed., *Russia Military Capability in a Ten-Year Perspective—2011*, FOI, August 2012, pp. 47–48.

8 CAST, 2015, pp. 8–9.

9 Roger McDermott, "Russia's Defense Ministry: Adrift in a Sea of Corruption," *Eurasia Daily Monitor*, Vol. 8, No. 114, June 14, 2011.

10 Julian Cooper, *Russia's State Armaments Programme to 2020: A Quantitative Assessment of Implementation 2011–2015*, FOI-R—4239—SE, March 2016, p. 52.

11 Brian Taylor, "Kudrin's Complaint: Does Russia Face a Guns vs. Butter Dilemma?" *PONARS Eurasia*, policy memo 254, June 2013; Gudrun Persson, *Russian Military Capability in a Ten-Year Perspective*, FOI, 2016, p. 142.

12 In Russian, the *Gosudarstvennyy Oboronnyy Zakaz*. It is typically referred to by its Russian acronym, GOZ.

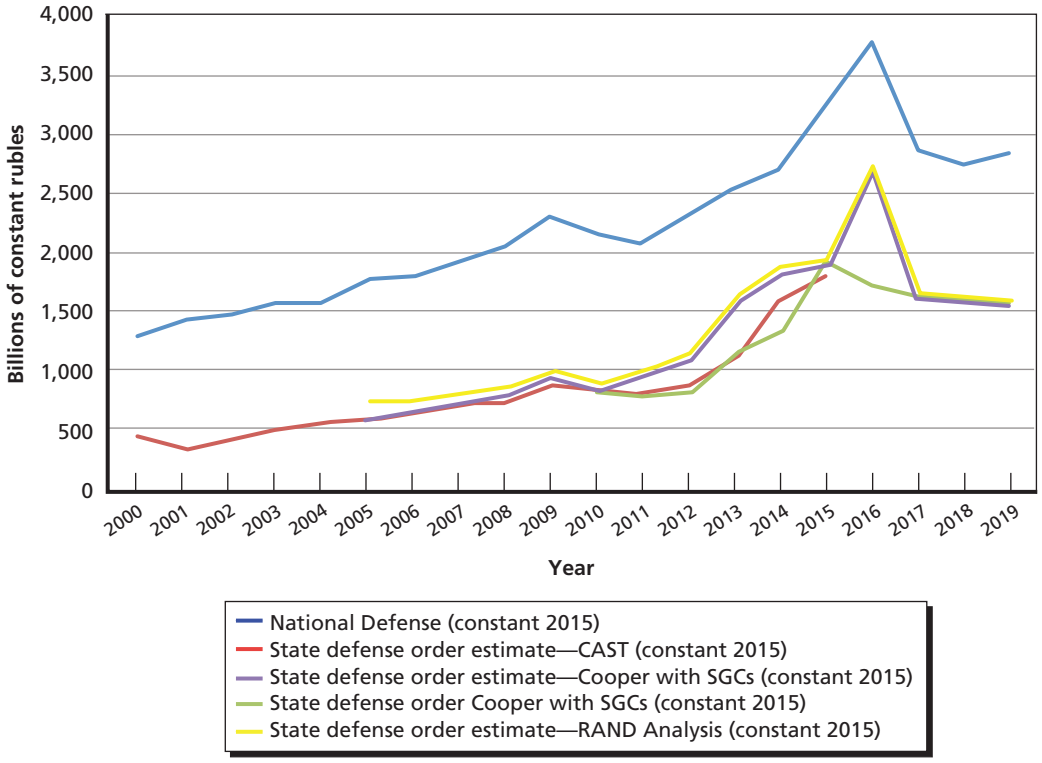
13 For information on the SDO and a method to measure it, see Cooper, 2013, pp. 21–22.

Table B.1
Targets of the SAP-2020

Branch	Size of allocation, trillions of rubles	Percent of total
Ground Forces	2.6	15
Navy	5	25
Air Force	4.7	24
Strategic Missile Forces	1	5
Aerospace Defense Forces	3.4	17
Other and Multiservice	2.7	14
Total	19.4	100

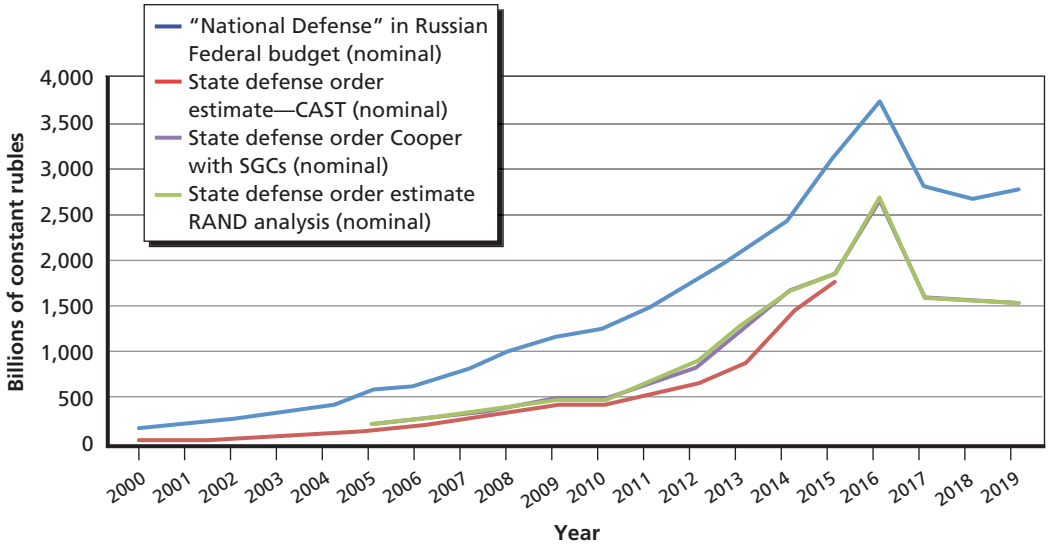
SOURCE: CAST, 2015, p. 23.

Figure B.9
Estimates of the Russian State Defense Order in Constant 2015 Rubles, 2000–2019



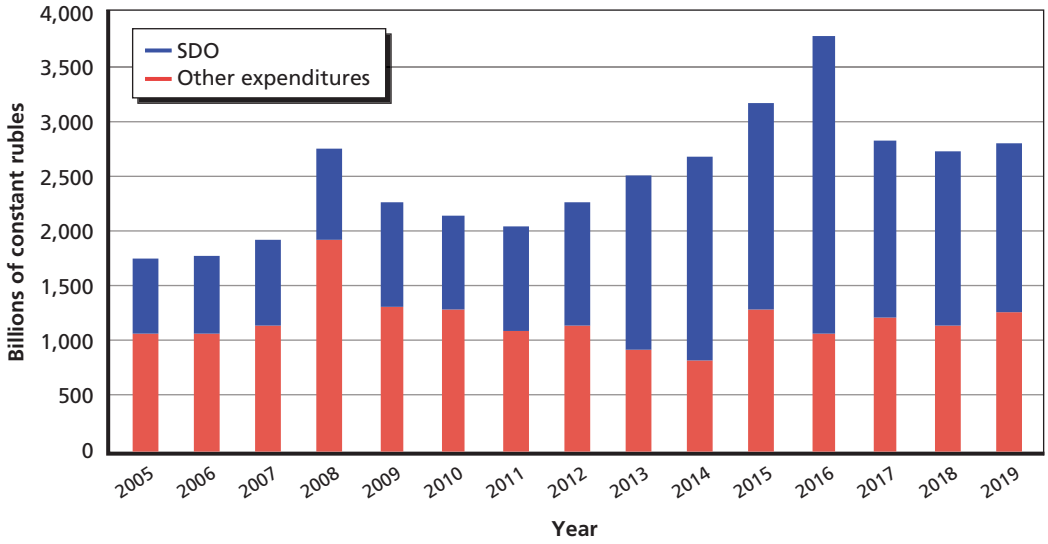
SOURCE: Frolov, 2008–2016; Cooper, 2013, 2016, "Prospects for Military Spending in Russia in 2017 and Beyond," March 23, 2017; National Defense from official executed budgets of the Russian Federation; see end of paper for RAND Analysis/Cooper procedure.

Figure B.10
Estimates of the Russian State Defense Order in Current Rubles, 2000–2019



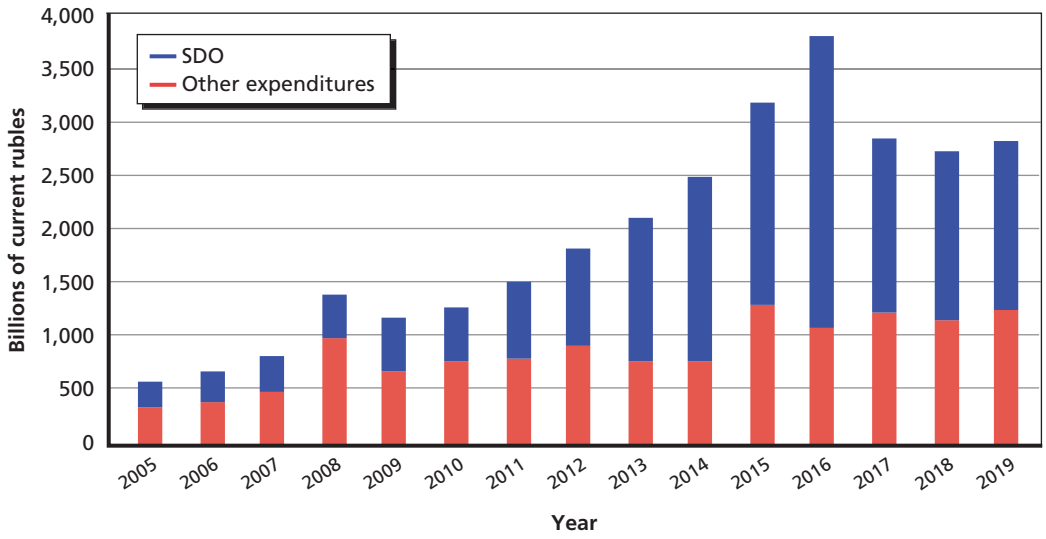
SOURCE: CAST, 2008–2016; Cooper, 2013, 2016, 2017; National Defense from official executed budgets of the Russian Federation; see end of Appendix B for RAND Analysis/Cooper procedure.

Figure B.11
Russian Procurement Expenditures Compared to Other Military Expenditures (2015 Constant Rubles)



SOURCE: RAND Arroyo Center analysis.

Figure B.12
Russian Procurement Expenditures Compared to Other Military Expenditures in Current Rubles, 2005–2019



SOURCE: RAND Arroyo Center analysis.
NOTE: For a similar analysis of the period prior to 2005, see also Vendil Pallin, 2012, p. 49.

an increase in procurement from 2011 to 2016, before a decline and stabilization for 2017 and beyond.[14] In short, the scale of the 2020 SAP led to SDOs of steadily increasing value, which in turn has brought about an overall increase in military expenditures.

Other Operational Expenditure Requirements

Russia's non-SDO expenditures are another important determinant of total defense spending trends, offering some indication of how military operations are impacting the budget. We assume that the "Other Expenditures" measure in Figures B.11 and B.12 includes the costs Russia incurs from military operations, maintenance, personnel, and training. Quantifying the effect of these expenditures on total defense spending is difficult, since it is unclear where they fall within National Defense. Furthermore, there are likely costs associated with Russia's operations in Syria and Ukraine that are not included in National Defense. Still, the magnitude of National Defense's nonprocurement costs offers some indication of how military operations impact the budget. Some estimates have surfaced in media reports for the cost of the Syrian operation in 2015 (33 billion rubles, or 1 percent of the defense budget in 2015) and Russia's involvement in eastern Ukraine in 2014 (53 billion rubles, or 2 percent of the defense budget).[15] If these reports provide a general sense of the scale of Russia's operational costs, it would seem that such costs are not a critical driver of overall defense expenditures.

[14] It should be noted that the sharp rise to 2016's spending levels, and the sharp decline afterward, are influenced by a one-time debt repayment by the Russian government to defense firms. This is explained in greater detail later.

[15] Persson, 2016, pp. 144–145.

For comparison, the United States averaged $61 billion in yearly operational costs within its Overseas Contingency Operations (OCO) funding between 2015 and 2017. As a percentage of overall Department of Defense expenditures during those years, OCO funding was between 10 percent and 12 percent.[16] Russia's nonprocurement expenditures can be sizeable on occasion, such as in 2008 (which may be accounted for by the outbreak of the war with Georgia and associated activities). Mostly, however, such costs have not affected defense spending to the same extent as has procurement. This suggests that Russia's low-intensity interventions do not unduly strain its military budget. This may not be the case for the overall budget, because Russian support to separatists in eastern Ukraine or to the Syrian government, which could fall under different budget chapters, may be substantial.

Prioritization of the Defense Industrial Complex

A fourth driver of military spending is the significant support the Russian government gives to the country's defense industrial complex due to its political and economic importance. That emphasis, at least from an economic perspective, may be misplaced due to the underlying structural issues afflicting the defense sector.

President Putin has often noted the importance of the military-industrial complex as a key pillar of the Russian economy, and he believes the defense industry can be a "driver" to attain the ambitious goals he set for economic development following the 2012 election.[17] In this sense, large-scale investment in major Russian defense firms would allow them to attract investment, privatize, and expand civil production.[18] The ability of the defense sector to catalyze civilian innovation is a central rationale and justification of Russian leadership for the devotion of resources to that sector.[19] This has been the case even in the face of poor performance by defense firms and significant obstacles to integration with civilian industries, as discussed in more detail later.

Accordingly, during debates about the size of the next SAP, advocates for maintaining high defense expenditures cite not only the dangers a reduced program will have for Russian national security, but also the potential harms to the wider Russian economy. Reductions to the SAP will adversely affect "one of the most advanced segments" of the Russian economy.[20] That segment will have difficulty innovating and contributing to civil state programs in a more austere spending environment. In addition, since Russia's 1,400 defense firms are deeply integrated into the economy, cuts in military spending will adversely affect other sectors of the economy. Also threatened will be the Russian import substitution policy and the income received from exports of military equipment.[21] In addition, the political salience of Russia's

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[16] Lynn M. Williams and Susan B. Epstein, "Overseas Contingency Operations Funding: Background and Status," *Congressional Research Service*, February 7, 2017.

[17] Susanne Oxenstierna, "Russia's Defense Spending and the Economic Decline," *Journal of Eurasian Studies*, Vol. 7, No. 2, 2016, pp. 60–70.

[18] Ruslan Pukhov, "*Pushki i tanki ne vsegda protiv masla*" ["Guns and Tanks Are Not Always Against Butter"], *Rossiyskaya Gazeta*, October 10, 2016.

[19] Tor Bukkvoll, Tomas Malmlof, and Konstantin Makienko, "The Defense Industry as a Locomotive for Technological Renewal in Russia: Are the Conditions in Place? *Post-Communist Economies*, Vol. 29, No. 2, 2017, pp. 232–249.

[20] Vasili Burenok, "*Gosprogramma Razoruzheniya*" ["The State Programme of Disarmament"], *Voenno-promyshlennyi Kuryer*, August 31, 2016.

[21] Burenok, 2016.

defense enterprises cannot be discounted. The defense industry, as well as the regions it supports, is a key constituency for President Putin. As a result, the government is content to subsidize defense firms even if they are inefficient and unproductive.[22]

To support the defense sector, the Russian government funds a variety of State Programs and Federal Targeted Programs (FTsP, in its Russian acronym). Adopted in the mid-1990s to insulate important projects from budget fluctuations, these programs deliver long-term financial support to specific areas. Those that are relevant to the defense-industrial complex include state programs for the development of the aerospace and shipbuilding industries; in addition, FTsPs related to the development of Russia's Global Navigation Satellite System (GLONASS) system and the development of the electronics industry have been implemented. Many of these programs have both civilian and military relevance, suggesting they have been designed with Russia's aspirations for dual-use, spin-off technology in mind.[23] Notable among these programs is the "Development of the Defense-Industrial Complex for 2011–2020." This program can be seen as a companion to the SAP-2020 and is designed to improve defense firms' ability to meet Russia's procurement goals through capital investment and technological improvement. Almost two trillion rubles were allocated to the program at its onset.[24] In 2016, this FTsP was subsumed into a larger state program of the same name.[25]

In addition, the defense industry has been sustained by the provision of state-guaranteed credits by the government since the beginning of the 2020 SAP. Realizing that the 2020 SAP's 20 trillion-ruble target would be difficult to achieve without additional financing, the government decided to back credits from Russian banks that would be provided to defense firms.[26] The interest payments on these loans became a problem for the defense industry, however, and prices rose as a result.[27] In 2016, the Ministries of Finance and Defense decided to address the debt issue with a one-time payment between 700 billion and 800 billion rubles (of the total of 1 trillion in state-guaranteed credits distributed to defense firms); the 2016 budget was amended to account for this payment.[28] This caused an obvious distortion in Russia's defense spending trends (as can be seen in previous figures) and led to reports of drastic military expenditure cuts in the 2017–2019 budget. Future spending will be discussed later, but it is important to note that cuts in defense spending were artificially inflated by the debt repayment.[29] Around the same time as this payment the Russian government decided to guarantee all the remaining debt; initially, only 70 percent was backed by the state.[30] The scale of this financing is a clear indication of the government's commitment to the defense-industrial complex in recent years.

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22 Oxenstierna, 2016, p. 63.

23 Cooper, 2013, pp. 26–28; Aleksey Nikolsky, "Russian Defense and Dual-Use Technology Programs," *Moscow Defense Brief*, No. 5, 2015.

24 Cooper, 2016, pp. 28–29.

25 Vasiliy Zatsepin, "*Osobennosti Novoy Gosudarstvennoy Programmy Oboronno-Promyshlennogo Kompleksa*" ["Details of the New State Program for the Development of the Defense-Industrial Complex"], *Ekonomicheskoe Razvitie Rossii*, No. 8, 2016, pp. 70–73.

26 Cooper, 2013, p. 29.

27 Michael Kofman, "The Russian Defense Budget and You," *Russian Military Analysis*, March 17, 2017b.

28 Cooper, 2017.

29 Michael Kofman, "Russian Spetsnaz: Learning from Experience," *The Cipher Brief*, March 15, 2017a.

30 Richard Connolly, "Hard Times? Defence Spending and the Russian Economy," *ETH Zurich Russian Analytical Digest*, No. 196, January 23, 2017.

Despite these initiatives, doubts remain as to the effectiveness of the defense industrial complex as an innovative economic force. Vasiliy Zatsepin, an economist at the Gaidar Institute, argues that entrenched institutional secrecy in Russia prevents the flow of ideas from the defense-industrial complex to the civilian sector. Instead of a driver, Zatsepin considers military expenditures a "brake" on the economy.[31] Little competition, the lack of robust intellectual property rights, and poor connections between defense and civilian companies are other serious barriers to the Russian government's vision for the defense-industrial complex's role in the economy.[32] To date, Russia's approach to bolstering its defense-industrial base has involved more financial support in the form of budget programs and credit than genuine reform.[33] As such, the endemic corruption and efficiency problems of the defense-industrial complex have not been resolved, resulting in substantial price inflation for weapons and equipment.[34] So long as the underlying structural issues of the defense-industrial complex remain unaddressed, such prioritization of the defense sector as has been exhibited by the Russian government will be costly.

Outlook

We do not expect the determinants in Russian defense spending of the last 15 years—Russia's GDP, the SAPs and SDOs, operational expenditures, and the level of support to the defense industry—to change in the near to medium term. Due to more constrained resources, though, the prior trend of steady growth in defense spending caused by substantial economic and political investment in military expenditures is unlikely to continue. A tighter federal budget for 2017–2019 has been passed, indicating that defense spending will be constrained. The next State Armaments Program may escape this emphasis on fiscal restraint, but as of this writing the 2027 SAP has not been finalized. However, the government has signaled to the defense industry that in the future it will not enjoy the same levels of support it had previously.

Russian GDP

In the Economic Performance section of Chapter 2, we outline our expectations for the future of Russia's economy. We expect stagnant GDP growth between 1 percent and 2 percent, given the dependence of Russia's economy on natural resources; the constraints posed by low investment, a poor business climate, state control of the economy, and labor shortages; and the low likelihood of structural reform in the near future. Middling GDP growth will have an impact on government expenditures, a reality reflected in the Russian budget for 2017–2019. The Ministry of Finance's GDP projections on which that budget was based were 0.6 percent in 2017, 1.7 percent in 2018, and 2.1 percent in 2019.[35] The Ministry of Finance's longer-

[31] Alexander Trushin, "*Voennaya nagruzka stala tormozom*" ["The Military Burden Has Become a Brake"], *Kommersant*, October 17, 2016.

[32] Bukkvoll, Malmlof, and Maklenko, 2017, pp. 244–245.

[33] Oxenstierna, 2016, p. 63.

[34] Richard Connolly and Cecilie Sendstad, "Russian Rearmament: An Assessment of Defense-Industrial Performance," *Problems of Post-Communism*, Vol. 65, No. 3, 2018, pp. 1–18.

[35] Ministry of Finance of the Russian Federation, "*Osnovnye Napravleniya Byudzhetnoy Politiki na 2017 God i na Planovoy Period 2018 i 2019 Godov*" ["Basic Directions of Budget Policy for 2017 and for the Planning Period of 2018 and 2019"], CouncilGov.ru, 2016.

term economic projections, published at around the same time as the 2017–2019 budget, are similarly conservative. GDP is expected to grow yearly at 1.6 percent from 2017–2020 and at 2.1 percent from 2021–2025.[36]

The 2017–2019 budget was submitted by the Ministry of Finance to the Duma for consideration in October 2016 and was passed the following December. As a percentage of the overall budget, spending on the military will hover around 17 percent, but it will fall to 3.3 percent of GDP in 2017, 3 percent in 2018, and 2.8 percent in 2019.[37] The cuts from 2016 levels are marked, representing a 7 percent decline (using a spending total that does not include the 800 billion ruble debt repayment) for 2017.[38] In the past, Russia has shown a willingness to insulate its defense spending from cuts and draw on its reserve fund to sustain spending levels.[39] The new budget and the strict parameters the Ministry of Finance used to create it (including low oil price projections) portend a much more conservative fiscal regime in the future under which military spending in Russia will remain steady with GDP growth.[40]

By the middle of 2017, Russia's general economic situation, along with the key indicators the Ministry of Finance uses to formulate budget policy—GDP growth, the price of oil, and the value of the ruble—had improved, resulting in better than forecasted government revenues. As a result, the Russian Duma began deliberations in June 2017 on a revision to the budget that would increase expenditures. This amended budget has not been finalized, but it appears that the military will not benefit from those additional expenditures. Furthermore, the terms of the new budget suggest a greater emphasis by the Ministry of Finance on the reduction of the budget deficit rather than returning spending to prior levels.[41] Deliberations on the 2018–2020 budget, currently underway as well, also suggest that the Ministry of Finance is committed to its fiscally conservative course. The cuts in military spending proposed in the 2017–2019 will continue, social expenditures will increase, and a clear focus on deficit reduction is evident.[42]

The State Armaments Programs and the State Defense Order

While there will be less overall funds available to the Russian government, it is not certain that this will translate to a corresponding decline in military procurement (through a smaller SAP running to 2025) in the near to medium term. Deliberations on the 2025 SAP began in 2012 with the MOD setting an initial funding target of over 50 trillion rubles, but this was adjusted down, first to 30 and then to around 20 trillion. The new SAP was slated to start in 2016, but as the economic situation worsened and optimistic timetables for the previous program were stretched, the 2025 SAP was pushed back to 2018 and is now expected to run

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[36] Cooper, 2017, pp. 22–23, 31.

[37] Dmitry Butrin, Denis Skorobogat'ko, and Vadim Visloguzov, "*Byudzhet mirnogo bremeni*" ["The Budget of the Peace Burden"], *Kommersant*, October 27, 2016.

[38] Kofman, 2017b.

[39] Oxenstierna, 2016, p. 69.

[40] Cooper, 2017, p. 26.

[41] Vadim Visloguzov, "*V Byudzhet Dolili Nefti*" ["They Filled Up the Budget with Oil"], *Kommersant*, June 10, 2017; "*Obnovlennyy byudzhet Rossii: siloviki vmesto sotsial'nykh raskhodov*" ["Russia's Updated Budget: Siloviki Instead of Social Expenditures"], *BBC*, May 29, 2017.

[42] Dmitri Butrin, "*Tabletka rubl' berezhet*" ["Every Pill Counts"], *Kommersant*, June 29, 2017.

through 2027.[43] Based on preliminary reports, it appears the total value of the 2018–2027 SAP will be approximately 20 trillion rubles.[44]

The precise distribution of spending of the new SAP among the major forces is uncertain but most reporting highlights the decreasing share for the Russian Navy. Some analysts describe the new plan as more "balanced," reflecting more immediate challenges that require the involvement of the ground forces rather than building up the surface fleet.[45] Forces associated with long-range strike and strategic deterrence will likely receive a boost, including greater acquisition of conventional long-range strike systems, such as air-launched cruise missiles, and platforms for Russia's strategic nuclear forces.[46] Preliminary reports also expect an increased share to be allocated to the ground forces and *Vozdushno-desantnye voyska* (Airborne Troops, VDV), of approximately 4 trillion rubles (20 percent to 21 percent of total program). This is an increase in the planned approximately 15 percent spending on the ground forces in the previous SAP, but this apparent increase may be a less significant change given that some reports indicated that Russia had increased the relative share of expenditure on ground capabilities over the last few years.[47]

It remains an open question of what new ground systems Russia will be able to buy with this new investment. In line with Russian media reports, Dmitri Gorenburg writes "T-90 and T-14 Armata tanks, Kurganets-25 infantry fighting vehicles and Boomerang armored personnel carriers are all expected to enter the force over the next eight years," as will new Uragan and Tornado-S MLRS systems, although Gorenburg also notes that numbers of T-14s may be limited given their high cost.[48] Russian claims about the expectation of acquiring new platforms that have not yet entered serial production should be taken with a grain of salt, however. Mathieu Boulènge notes that Russian aspirations for "robotization" and next-generation systems will likely be hindered by a decline in R&D investment.[49] The government has repeatedly claimed that it would build these new systems in past SAPs, with little progress. Further, to the extent that new platforms such as T-14 are produced in meaningful numbers and integrated into new combat units (e.g., with a few battalions), it will likely be in the second five-year phase of the SAP, after 2022.[50]

Other Operational Expenditure Requirements

Given the difficulties of assessing past operational spending, it is unclear to what extent these expenditures will drive defense spending overall going forward. We do not expect, though,

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[43] Cooper, 2016, pp. 43–45.

[44] Aleksandra Dzhordzhevich and Ivan Safronov, "*U trillionov dva soyuznika: armiya i flot*" ["Trillions Have Two Allies: Land Forces and Navy"], *Kommersant*, December 18, 2017.

[45] Ivan Safronov and Aleksandra Dzhordzhevich, "*19 trillionov prinimayut na vooruzhenie*" ["19 Trillion to Be Used for Armaments"], *Kommersant*, November 15, 2017.

[46] Leonid Nersisyan, "*Kak budut vooruzhatsya Vooruzhennye sily Rossii v sleduyushchie desyat' let?*" ["How Will the Armed Forces of Russia Be Armed Over the Next 10 Years?"], *Regnum*, November 17, 2017.

[47] Nersisyan, 2017; interviews with Russian analysts, Moscow, July 2017.

[48] Dmitry Gorenburg, "Russia's Military Modernization Plans: 2018–2027," *PONARS Eurasia*, November 2017.

[49] Mathieu Boulègue, "Russia's New State Armament Programme Offers a Glimpse at Military Priorities," Chatham House, November 27, 2017.

[50] Email correspondence with U.S. analyst, December 2017.

operational costs to become a significant driver for defense spending if Russian military operations remain at their current level of intensity. Large-scale conventional conflicts would produce a significant strain on the budget through higher operational costs (as may have been the case in 2008 with Russia's war with Georgia), but small-footprint interventions such as those in eastern Ukraine and Syria will be less burdensome.

Prioritization of the Defense Industrial Complex

We expect that the defense-industrial complex will enjoy a less privileged position in the Russian economy in the near term. President Putin, along with Russian MOD leadership, recently signaled that procurement spending will be leaner once modernization targets are met.[51] Accordingly, in the view of Putin, Deputy Prime Minister Rogozin, and others, defense firms need to bolster their production of civilian goods to sustain themselves in this future environment. Different figures in the Russian government have given different estimates as to when the peak of procurement spending will be passed, but by the early 2020s it seems that procurement will begin to decline.[52] By that time, the SDO will focus on maintenance of the 70 percent equipment modernization share rather than a great bound forward (as the SAP-2020 was designed to be). Rogozin stated that Russia wants its defense firms to sustain themselves during this shift with technologically advanced civilian goods. Those firms have been urged by the government to achieve an even split between military and civilian production by 2030 (currently, the defense industry's production of civilian goods represents 16 percent of their overall output). At the same time, officials have stressed the need to balance defense spending with other budget outlays and to support other sectors of the economy.[53]

Projection of Future Defense Spending

Though military expenditures will not be slashed drastically in the near or medium term, there will be a decrease from prior levels. We expect defense spending (as defined by the National Defense budget category) to remain around 3 percent of GDP and 16 percent to 17 percent of the budget, the general parameters of the 2017–2019 budget. According to Defense Minister Shoigu, in 2018 Russia will spend approximately 2.77 trillion rubles on national defense, or 2.8 percent of projected GDP (16.7 percent of the annual budget).[54] In 2019 and 2020, national defense spending is planned to remain virtually unchanged, at 2.79 and 2.80 trillion rubles, 17 percent and 16.3 percent of the budget, respectively. The Ministry of Finance projects GDP to grow an average of 2.2 percent annually over this period, from 97.4 trillion rubles in 2018 to 110 trillion rubles in 2020.[55]

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[51] Connolly, 2017.

[52] Cooper, 2017, pp. 18–20.1

[53] Cooper, pp. 19, 27–30.

[54] Russian MOD, "*Verkhovnyj Glavnokomanduyushchiy Vooruzhenymi Silami Rossii Vladimir Putin prinyal uchastie v rabote rasshirennogo zasedaniya Kollegii Minoborony*" ["Commander-in-Chief of the Russian Armed Forces Vladimir Putin Participated in the Expanded Session of the Ministry of Defense Collegium"], December 22, 2017.

[55] Ministry of Finance, "*Byudget dlya grazhdan: k proektu federalnogo zakona o federalnom byudzhete na 2018 god i na planovyj period 2019 i 2020 godov*" ["Budget for the People: For the Draft Federal Law on the Federal Budget for 2018 and for the Planning Period for 2019 and 2020"], Moscow, 2017. See also "*Federal'nyj zakon o federal'nom byudzhete na 2018 god i na planovyj period 2019 i 2020 godov*" ["Federal Law on the Federal Budget for 2018 and for the Planning Period of 2019 and 2020"], December 6, 2017.

Methodology for Estimating Russia's State Defense Order

To formulate estimates of Russia's State Defense Order, we used the method described by Julian Cooper in *Russian Military Expenditure: Data, Analysis, and Issues*, 2013. These estimates require the use of Russian executed budgets. In those budgets, there are two appendixes that describe expenditures. Appendix 5 is titled "Expenditures of the Federal Budget for 2015 by Section and Subsection of Classification of Budget Expenditures." This appendix lists the 12 top-line budget categories, including National Defense, along with their subcategories. For the purposes of our estimates, we are interested in the amounts of the subcategories "Armed Forces of the Russian Federation" and "Applied Research and Development in the Field of National Defense."

Appendix 2 is titled "Expenditures of the Federal Budget for X Year by Departmental Structural of Expenditures of the Federal Budget." In this section, the allocations to specific ministries are listed. Under the MOD's allocations is an amount for National Defense, which is smaller than the amount listed in Appendix 5. The difference between the two, according to Cooper's method, is assumed to be the SDO. Allocations for "Applied Research and Development in the Field of National Defense" appear under the MOD and other agencies. Their sum is also smaller than the overall amount in Appendix 5, and the difference is, again, assumed to constitute the R&D section of the SDO.

The sum of those two differences is then used to create the estimate of the SDO for that year. For "Other Expenditures" in the figures above, the GOZ estimate is subtracted from the total MOD estimate.

Russian executed budgets from before 2005 do not provide sufficient detail to use this methodology for prior years.

APPENDIX C

Demographics

Eugeniu Han

The demographic situation in Russia has improved from the population decline following the end of the Soviet Union, but it faces many challenges. According to Russian media forecasts, the population is expected to remain roughly constant over the next 20 years, while international forecasts predict a further decline. On the negative side, Russia faces the legacy of the decline in birthrates following the end of the Soviet Union, although the situation has somewhat improved since 2002, and a high mortality rate compared to developed countries. On the positive side, Russia remains a net recipient of migrants, receiving on average about 300 thousand migrants a year since 2000, mostly from Commonwealth of Independent States (CIS) countries.

These developments will have a number of consequences for the economy and national security of Russia. Declines in the labor force could create shortages in the labor market and put pressure on military recruitment. The increasing number of people over the age of 65 will create additional costs for public health, the pensions system, and social welfare programs.

Demographics could have a wide range of indirect effects on national security through the economy, budgets, and other factors. One direct impact will come in the next five years as the available pool of conscripts is expected to diminish by about 10 percent from 2018 levels, making it more difficult to meet recruit targets. While this may make military recruitment more expensive and could contribute to ongoing labor shortages (see also Appendix D), it is unlikely to mean that Russia will face an absolute lack of personnel for military service.

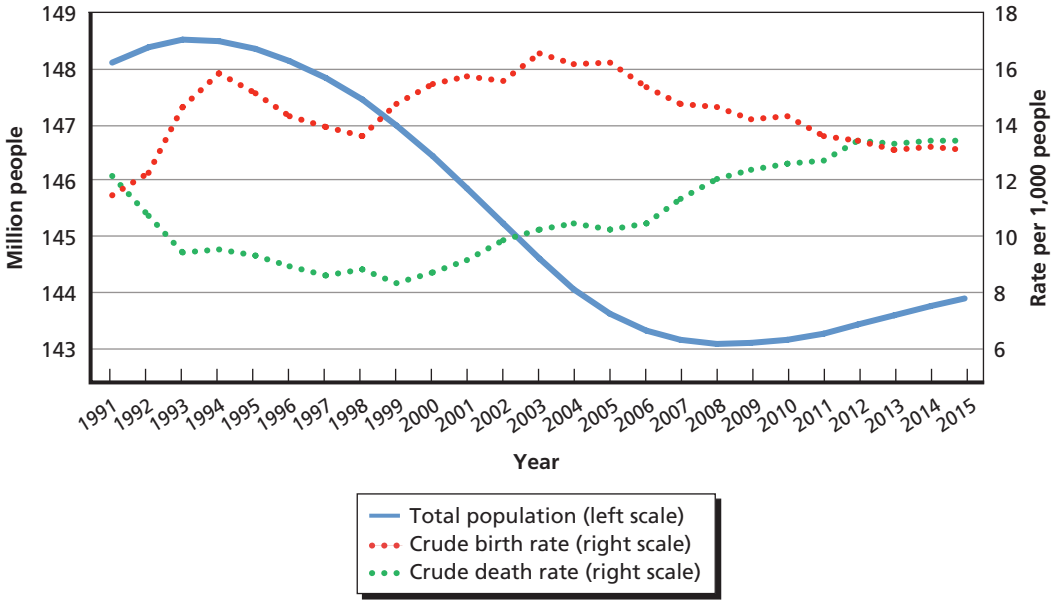
Recent History

The demographic processes in Russia have been affected by a number of extreme exogenous shocks during the twentieth century. These shocks included wars, mass repressions, and famines. The most recent shock occurred in the 1990s, precipitating a negative demographic trend for the next two decades, when a sharp economic downturn was complemented by rapid spread of unhealthy lifestyles and increased psychological stress, leading to lower life expectancy.[1]

Figure C.1 maps out Russia's population trend from 1991 to 2015. Russia's total population reached its historical maximum of 148.4 million in 1993. During the following 15 years, it declined by 5.3 million, reaching its lowest point in post-Soviet history of 143 million in 2008.

[1] Elizabeth Brainerd and David M. Cutler, "Autopsy on an Empire: Understanding Mortality in Russia and the Former Soviet Union," *The Journal of Economic Perspectives*, Vol. 19, No. 1, 2005, pp. 107–130.

Figure C.1
Dynamics of Crude Birth and Death Rates and Total Population of Russia



SOURCE: United Nations, *World Economic Situation and Prospects*, New York: United Nations, 2017; World Bank, *Global Economic Prospects: A Fragile Recovery*, Washington, D.C.: World Bank, 2017.
NOTE: In this section, we mainly rely on data from UN Population Division, World Bank, and Rosstat for our analysis. The differences between data sources are a result of different methodologies and assumptions about the future (in the case of forecasts). Most important, Rosstat has fully incorporated the population of the annexed territories of Crimea and Sevastopol in its statistics, 2.3 million in 2014, which raised the total population of Russia to over 146 million.

Beginning in 2009, the total population modestly increased due to slower natural decrease and stable and positive net migration.

Despite significant migration gains, the unfavorable dynamics of birth rates and death rates between 1991 and 2012 led to a natural decrease in the total population. The decline was precipitated by the economic woes of the 1990s that led to a sharply diminished quality of life for most Russians as well as a grim outlook on the future.[2] In turn, increased poverty lowered fertility rates among women and likely contributed to higher mortality rates among men. The decline in the number of women between 20 and 30 years old also contributed to fewer births during the period. The deep causes of the fertility decline are still debated in the literature, suggesting that the economic distress explanation may not be enough to explain Russia's case.[3]

[2] Brainerd and Cutler, 2005, find that high consumption of alcohol, the associated external causes of death (such as suicide, accidents, and homicide), and stress associated with poor outlook for the future were the most important factors behind the dramatic increase in mortality in the 1990s.

[3] For example, John C. Caldwell and Thomas Schindlmay suggest that fears of unemployment and the associated uncertainty explain the fertility decline in Eastern Europe during the 1990s. On the other hand, Hans-Peter Kohler and Iliana Kohler find that there is no negative association between labor market uncertainty (or labor market crisis) and low fertility, and frequently there is a positive association. Kohler and Kohler, "Fertility Decline in Russia in the Early and Mid 1990s: The Role of Economic Uncertainty and Labour Market Crises," *European Journal of Population* [*Revue européenne de Démographie*], Vol. 18, No. 3, 2002, pp. 233–262. Caldwell and Schindlmay, "Explanations of the Fertility Crisis in Modern Societies: A Search for Commonalities," *Population Studies*, Vol. 57, No. 3, 2003, pp. 241–263.

As fertility rates declined, migration became a critical source of population growth.[4] Net migration between 1991 and 2014 averaged 370 thousand people a year and amounted to 8.5 million people over that period. Overall, migration compensated for about 60 percent of the total natural decline between 1991 and 2013.[5]

Russian authorities have been aware of the demographics catastrophe for many years and undertook a series of policies since 2005 to mitigate this problem. These measures included increased compensation for giving birth to a second child (and subsequent children); investment in health care to reduce smoking, alcoholism, and drug use; and policies to encourage increased immigration from former republics of USSR.

In the 2010s, the natural decrease of the population slowed down, marking a new period of Russia's demographic transition. Moreover, a modest positive natural growth was recorded in 2012 for the first time since the collapse of the Soviet Union, as the average birth rate increased from 1.3 to 1.7 children per woman and the number of births slightly exceeded the number of deaths. Skeptics point out that the rise in birth rates may be attributed to the fact that the modal age of mother at first birth shifted from 21 years in 1999 to 25 years in 2012. Further, there was a historically high number of women aged 25 to 30, up by 20 percent from ten years ago, and 80 percent more than are projected to be alive in 2025. This may indicate that the higher birth rate is not sustainable.[6]

Figure C.2 depicts the population pyramid, showing Russia's current population structure. The irregular shape of the population pyramid bears witness to historical cataclysms such as World War I, the famine in the early 1930s, World War II, and the recent drop in fertility rate during 1990s. For example, the base of the pyramid reflects the evolution of the total fertility rate that came about due to trends in the 1990s, while the shortfall at the top is a distant effect of World War II. The overall shape of the population pyramid with a narrowing base is indicative of low population growth in the years to come.

Explanatory Variables

This section discusses in more detail recent trends in some of the variables that may shape Russia's population structure in the future.

Fertility

The total fertility rate in Russia declined from the beginning of the twentieth century until the 1960s, when it first reached the replacement level.[7] Total fertility rate hovered around

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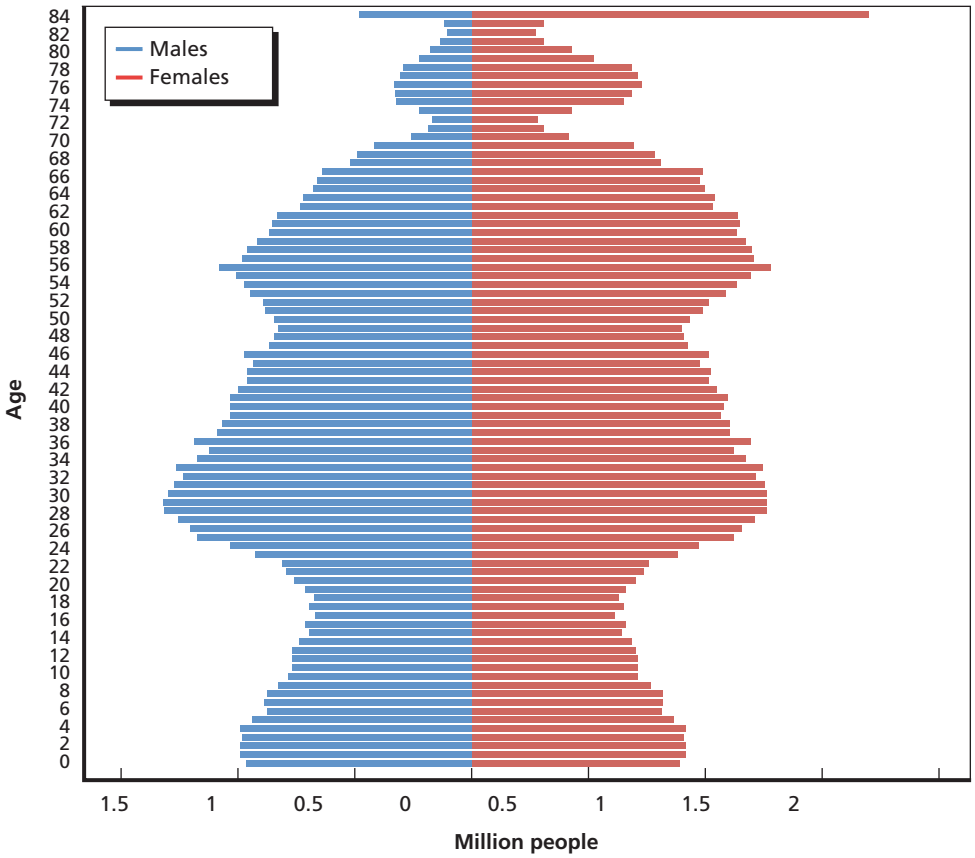
[4] On long-term fertility and population policy in Russia, see Serguey Ivanov, Anatoly Vichnevsky, and Sergei Zakharov, *Population Policy in Russia*, in Graziella Caselli, Jacques Vallin, and Guillaume Wunsch, *Demography: Analysis and Synthesis, Four Volume Set: A Treatise in Population*, Burlington, Mass.: Academic Press, 2005, Chapter 118, Volume 4, pp. 407–414.

[5] Rosstat, "*Mezhdunarodnaya migratsiya*" ["International Migration"], 2017.

[6] Sergey Aleksashenko, *The Russian Economy in 2050: Heading for Labor-Based Stagnation*, Washington, D.C.: Brookings Institution Press, 2015.

[7] Replacement level is defined as the average number of children born per woman at which a population replaces itself from one generation to the next, without migration. The replacement level is achieved when total fertility rate reaches about 2.1 children per woman.

Figure C.2
Population Pyramid in 2017 (Estimate)



SOURCE: Rosstat, 2016.
NOTE: The highest age group including all people aged 85 and higher.

2.1 children per woman until the collapse of the Soviet Union.[8] As shown in Figure C.3, the decline intensified in the 1990s, reaching the lowest point in 1999 at 1.15 children per woman. Postponing starting a family and increased use of contraceptives were listed among the factors that contributed to the decline.[9]

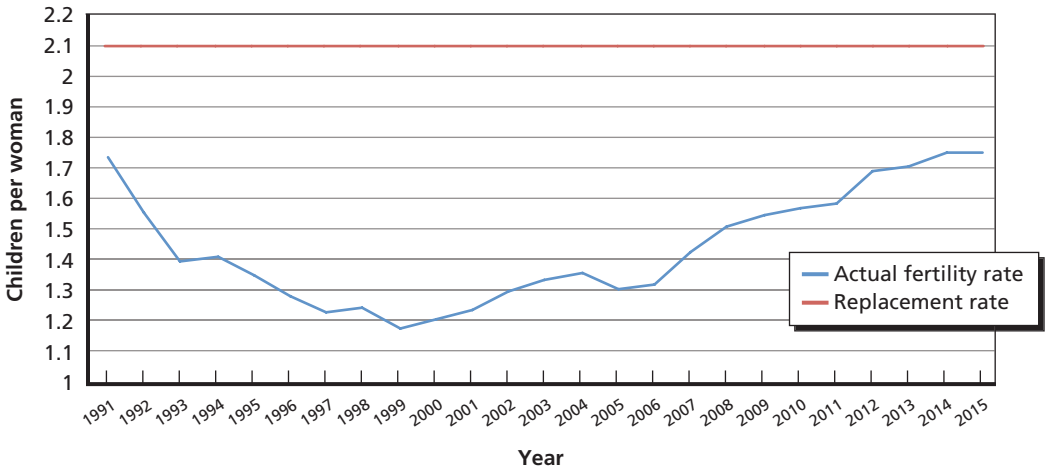
The fertility rate started growing again in 2000 and gradually reached 1.75 in 2015, still below replacement rate. The low fertility in Russia is not dissimilar to other urbanized societies in Europe and elsewhere.[10] In fact, the fertility rate in the Northwestern, Central, and Southern Federal Districts follows larger European trends at the level of 1.57, 1.47, and 1.64,

[8] Anatoly Vishnevsky, "Family Fertility and Demographic Dynamics in Russia: Analysis and Forecast," Santa Monica, Calif.: RAND Center for Russian and Eurasian Studies, 1996, pp. 1–35.

[9] Elizarov Valeriy and Victoria Levin, "Family Policies in Russia," World Bank working paper 2015.

[10] Anatoly Vishnevsky and Sergey Bobylev, "National Human Development Report, Russian Federation, 2008; Anatoly Vishnevsky and Sergey Bobylev, "Russia Facing Demographic Challenges," United Nations Development Programme (UNDP), 2009.

Figure C.3
Total Fertility Rate



SOURCE: World Bank, 2017.

respectively.[11] On the other hand, the predominantly Muslim regions of Russia maintained a high fertility rate. For example, the total fertility rate in the Chechen Republic was estimated at 2.62, in Dagestan at 1.98, and in North Ossetia at 1.89 in 2016.[12]

In 2007, the Russian government implemented several policy measures in an attempt to stimulate the birth rate. These policies included additional benefits and subsidies for multiple-child families. The main program, called "maternity capital," provided a subsidy equivalent to $10,000 (in 2007) for a family at the birth or adoption of the second child and each child thereafter. The policy stated that the subsidy could be spent only on the purchase of a residential property, a mortgage payment, children's education, or mother's retirement pension. Other policies included increased benefits for taking care of children and lower qualifications requirements.[13]

The effectiveness of these government programs is still a matter of debate. However, the fertility rate went up from 1.31 in 2006 to 1.69 in 2012, a 30 percent increase in just five years after the policies were introduced. The largest increases were recorded in 2007 and 2008, the first two years after implementation. In part because the proportion of older women having second and third children increased, one World Bank report attributed the increase in fertility to Russia's pro-natalist policies. However, the report also noted that "the effect of these measures seems to be fading out," as the overall age of childbearing increased, and many survey respondents indicated that pronatalist policies influenced the timing when they decided to have children rather than inducing them to have more children.[14] Using a similar argument, the Ministry of the Economic Development of the Russian Federation proposed

[11] The total fertility rate in EU-28 reached 1.58 children per woman in 2015 (Eurostat, Total Fertility Rate, 2017).

[12] Rosstat, 2017.

[13] Vishnevsky and Bobylev, 2009.

[14] Elizarov and Levin, 2015, p. 6, pp. 23–26; Anatoly Vishnevsky, "The Challenge of Russia's Demographic Crisis," *Russia. Nei. Visions*, Vol. 41, 2009.

the termination of the "mother's capital" program because it was too expensive.[15] In the end, the government decided to keep the benefits; however, the effectiveness of these programs is far from certain.

Health and Mortality

High mortality has been the second main driver of the population dynamics of Russia. In addition to the end of the war, mortality in the Soviet Union decreased considerably after World War II due to improvements in health care such as the introduction of antibiotics, vaccination, and improved sanitation. Loss of life from infectious diseases was slowly superseded by chronic illnesses such as cardiovascular diseases and cancer as main causes of death. However, these improvements were far from enough to close the gap with advanced Western economies. In the 1970s, life expectancy in Russia dropped to 61.5 years for men and 73 years for women. The anti-alcohol campaign in the last years of the Soviet Union increased the life expectancy of men to 63.7 years in 1990.[16]

As shown in Figure C.4, these gains were erased in the 1990s and early the 2000s, when male life expectancy dropped to a new low of 58.1 years in 1995. A new trend of improvement started in 2005, leading to a steady increase from 58.9 in 2005 to 66.5 in 2016. Despite the significant successes in reducing male mortality, the average life expectancy in Russia is significantly lower than in the Western countries, and this gap may be difficult to close in the years to come.[17]

High economic inequality, widespread drug, tobacco, and alcohol use, high crime rates, and inadequate quality of medical care contribute to the low life-expectancy rate and the high mortality rate.[18] According to WHO estimates, over half of Russian males smoke tobacco, and the alcohol per capita consumption rates also remain rather high.[19] Cardiovascular diseases remain the primary cause of death and premature death in Russia, causing economic losses of roughly 3 percent of GDP.[20] Mortality from injuries and poisoning, which may be linked to alcohol abuse, have been the second main driver in premature mortality in Russia.[21] Other widespread diseases include cancer, diabetes, and tuberculosis.[22] The latter is particularly pernicious; in almost half of all cases, patients were diagnosed with multidrug-resistant

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[15] "*Minekonomrazvitiya predlozhilo otmenit' materinskiy capital*" ["Ministry of Economic Development Proposed to Abolish Maternity Capital"], Lenta.ru, October 1, 2014.

[16] Ivanov, Vichnevsky, and Zakharov, 2005, pp. 414–418.

[17] For example, the life expectancy in the United States for someone born in 2015 is 76.3 years for men and 81.2 years for women (World Bank Development Indicators, 2017). For a recent discussion on the evolution of mortality in Russia, see, for example, Pavel Grigoriev, et al., "The Recent Mortality Decline in Russia: Beginning of the Cardiovascular Revolution?" *Population and Development Review*, Vol. 40, No. 1, 2014, pp. 107–129.

[18] Vladimir Arkhangelsky, et al., "Critical 10 Years. Demographic Policies of the Russian Federation: Successes and Challenges," Moscow: Russian Presidential Academy of National Economy and Public Administration, 2015, pp. 6–8.

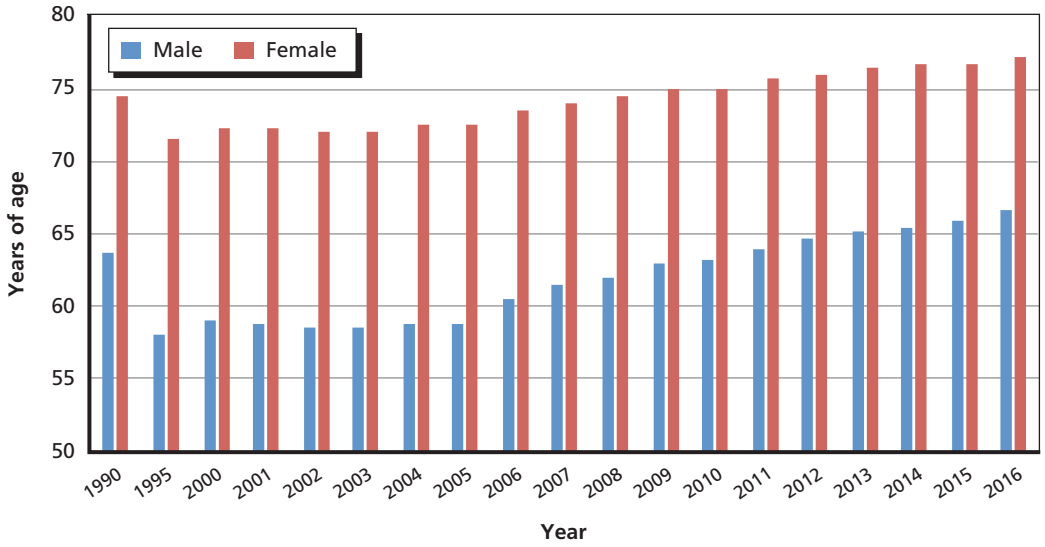
[19] World Health Organization—Noncommunicable Diseases (NCD) Country Profiles, 2014.

[20] Anna Kontsevaya, Anna Kalinina, and Rafael Oganov, "Economic Burden of Cardiovascular Diseases in the Russian Federation," *Value in Health Regional Issues*, Vol. 2, No. 2, 2013, pp. 199–204.

[21] Nicholas Eberstadt, *Russia's Peacetime Demographic Crisis: Dimensions, Causes, Implications*, National Bureau of Asian Research, 2010.

[22] Rosstat, 2017.

Figure C.4
Life Expectancy at Birth



SOURCE: Rosstat, 2017.

tuberculosis, and the peak incidence of tuberculosis is in males between ages 25 and 34.[23] Russia is also affected by a serious HIV/AIDS epidemic, with over 1 million people officially diagnosed with the virus. The real number may be as high as 1.5 million, or over 1 percent of Russia's population. Over half of the cases were linked to drug use.[24] The national health situation affects recruitments into the armed forces. Over a third of conscripts were deemed unfit for service in every year over the past decade.[25] A stagnant economy and a political system that prioritizes expenditure on internal security and defense over health care and education make a revolutionary change in the health care system in the near term rather unlikely.

Migration

Migration is the third most important factor that has influenced the demographic processes in Russia over the last century. In the aftermath of World War II, the Soviet authorities focused on distributing labor to areas of the USSR with labor shortages, including the non-Russian republics.[26] This policy, which led to massive population flows to the eastern and northern

[23] S. Olson, et al., "The New Profile of Drug-Resistant Tuberculosis in Russia: A Global and Local Perspective, Summary of a Joint Workshop," *National Academy of Sciences*, 2011, pp. 1–123.

[24] A. Osborn, "Russia at AIDS Epidemic Tipping Point as HIV Cases Pass One Million—Official," *Reuters*, January 21, 2016.

[25] Another third of males of conscription age obtain waivers due to enrollment in institutions of higher education. Iurii Gavrilov, "*Kazhdyi tretii—ne dlya stroya*" ["A Third of Recruits Deemed Unfit"], *Rossiiskaya Gazeta*, N6819, November 2, 2015, p. 248.

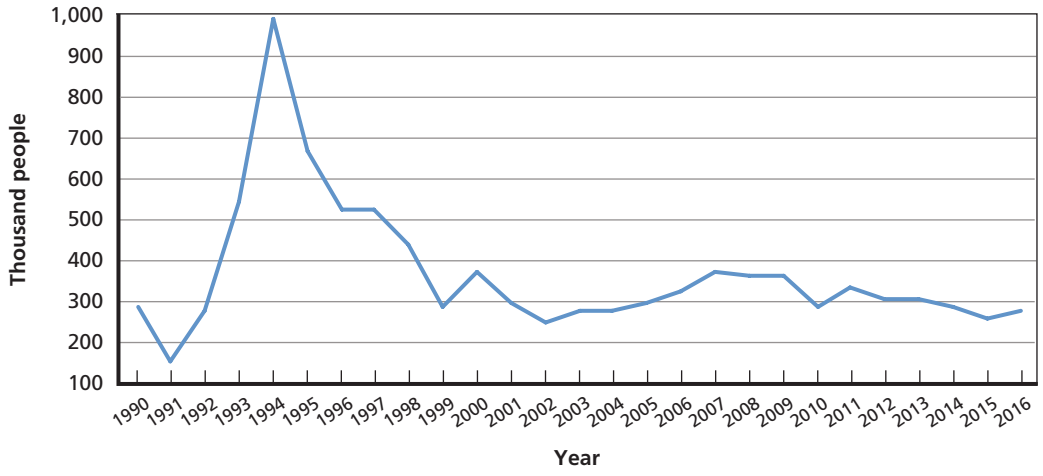
[26] For a comprehensive discussion of migration patterns and policies in USSR, see, among others, Ira N. Gang and Robert C. Stuart, "Mobility Where Mobility Is Illegal: Internal Migration and City Growth in the Soviet Union," *Journal of Population Economics*, Vol. 12, No. 1, 1999, pp. 117–134; Mervyn Matthews, *The Passport Society: Controlling Movement in Russia and the USSR*, Boulder, Colo.: Westview Press, 1993.

regions of the country, was mainly driven by two state-mandated goals: forced industrialization and the development of peripheral regions. At the same time, authorities feared losing control over migrations and instituted strict bureaucratic controls. The flow of people out of Russia reversed in the 1970s, when Russia became a net recipient of a low but steady stream of migrants from other Soviet republics. The Soviet leadership understood the perils of the natural population decrease in Russia and discussed plans to increase the flow of migrants from regions of USSR that had excessive labor force.[27] These policies included higher salaries for workers in the northern regions, more days off, higher pensions, etc. These measures were relatively successful and managed to increase the population of the far east regions to 12.6 million people in 1989.[28]

Following the end of the Soviet Union, Russia has experienced significant in-migration, especially during the early 1990s (see Figure C.5). One source of migrants was "repatriation," meaning the migration to Russia of former Soviet citizens whose nationality differed from the majority in the newly independent former Soviet republics. In particular there was a large in-migration from Kazakhstan through the late 1990s, which petered out in the early 2000s, as shown in Figure C.6.[29]

A second source is economic migration from the poorer former Soviet republics. Migration from CIS hit a low point in 2003, likely through diminished repatriation, followed by a steady increase led by economic migration from Ukraine and Uzbekistan in the following years driven by the economic boom brought by higher oil prices. While economic migration

Figure C.5
Net Migration



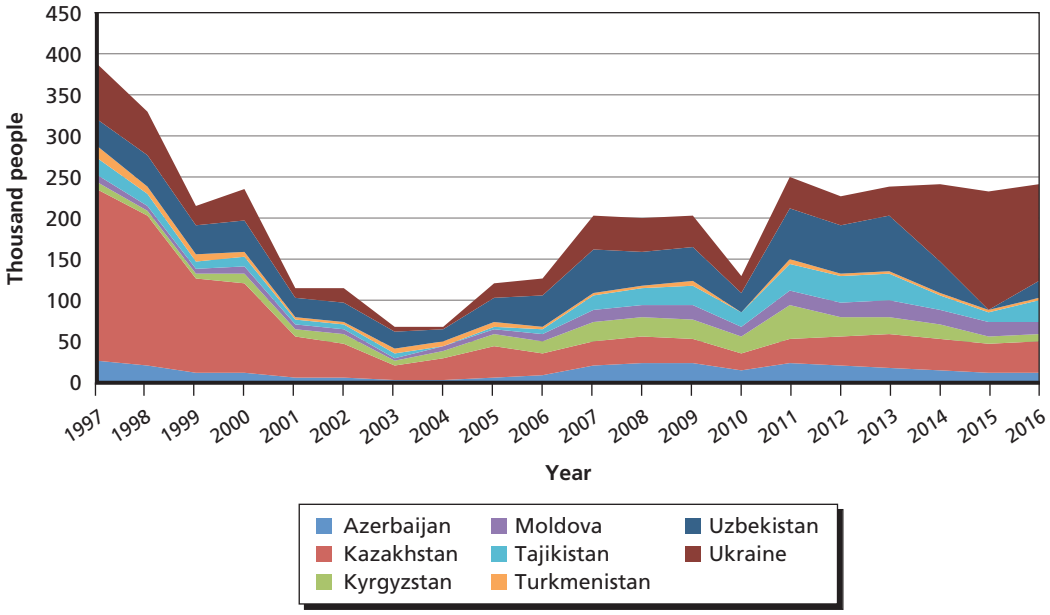
SOURCE: Rosstat, 2017.
NOTE: In its latest update in July 2017, Rosstat does not provide migration data for 2014. For illustrative purposes, the data point for 2014 was computed as an average between 2013 and 2015.

[27] Vishnevsky and Bobylev, 2008.

[28] Ivanov, Vichnevsky, and Zakharov, 2005, p. 425.

[29] About 80 percent of migration gain between 1989–2007 is accounted for by "repatriation" migration. For details, see Vishnevsky, 2009, p. 22.

Figure C.6
Net Migration by Country of Origin



SOURCE: Rosstat, 2017.
NOTE: In 2015, the net migration from Uzbekistan became negative, reaching a net outflow of 20,000 people. Net migration is computed as the difference between the number of people that arrived from a country and the number of people that left that country in a given year.

is usually understood as a temporary presence of guest workers in the Russian labor market, the natural decrease of the population prompted Russian authorities to consider policies that would allow some of these migrants to stay permanently. The 2007 "Concept for Demographic Policy of the Russian Federation for the Period up to 2025," for example, explicitly mandates that net migration should reach 300,000 people per year in 2025.[30] However, the recorded statistics likely miscount migrants, since many temporary or illegal migrants may have been left out of official figures, and there were changes in statistical methodology.[31]

A third source of migrants has been conflict in Ukraine since 2014. As noted in Chapter 2, aside from an increase in population due to the annexation of Crimea, there are substantial numbers of Ukrainians who have traveled to Russia since February 2014. Formally, approximately 1.1 million have registered as refugees, but one official estimated that the total number of Ukrainians, including those who did not register, at approximately 2.5 million.[32]

[30] Russian Federation, "*Koncepcija demograficheskoj politiki Rossiiskoi Federatsii na period do 2025 goda*" ["Concept of Demographic Policy of the Russian Federation for the Period Up to 2025"], *Kremlin*, 2012.

[31] For example, until 1997, every person who changed their place of residence for more than 45 days was considered a migrant, and only temporary migrants who registered for nine months or more were included in official counts. One report notes that "nine times more people left Russia between 2011 and 2013 than official emigration statistics reflect" given destination country statistics. Olga Chudinovskikh and Mikhail Denisenko, "Russia: A Migration System with Soviet Roots," Migration Policy Institute, May 18, 2017.

[32] UN High Commissioner for Refugees, "Ukraine: UNHCR Operational Update, 14 May–10 June 2016," The UN Refugee Agency, 2016, p. 2, and interview with Russian official, Moscow, July 2017.

Perhaps the main takeaway from the recent history is that Russia has been and will likely remain a major recipient of migrants, primarily economic migrants from the CIS. Immigration can lead to increased competition in the labor market, problems related to cultural adaptation, and potential social tensions. Russia's ability to manage this challenge is a critical area for further study, especially since it will play a major role in determining its future competitiveness.

Outlook

Despite the recent increases in fertility rates and life expectancy, the demographic crisis is not over, and Russia will be facing a number of serious challenges in the coming years. The consequences of the dramatic collapse in birth rates that happened in the 1990s will be increasingly more severe, as fewer and fewer people will enter the labor force in the following years. This will lead to various challenges for the economy and the armed forces, as the competition for a smaller pool of people will intensify.

Aging will bring additional strains on the social safety net and require an increased share of the government budget to maintain the level of benefits sufficient to achieve a comfortable level of support for the ruling elites.

Migration will become the most important factor that will influence the dynamics of the Russian population. The relative performance of the Russian economy will determine its attractiveness for economic migrants from CIS countries and beyond in the years to come. In addition, the patterns of migration will likely shift to incorporate a large share of less educated migrants who might not speak Russian, posing a number of challenges related to cultural adaptation and potential social tensions.

Fertility

According to the most recent Rosstat projections shown in Figure C.7, the total fertility rate is expected to remain well below replacement level for the foreseeable future.[33] Low fertility is not unique to Russia; industrialized countries from Europe are experiencing the same trend. For comparison, the UN Population Division predicts an average total fertility rate (TFR) in Eastern Europe to reach 1.65 in 2020–2025, 1.68 in 2025–2030, and 1.72 in 2030–2035 in its medium variant projections.[34] As discussed, the positive impact on birth rates from government policies may be diminishing, since the most recent data indicate a slight reduction in the total fertility ratio from 1.77 in 2015 to 1.76 in 2016.[35] It is important to note that Rosstat assumes higher total fertility rates than Eurostat and the UN Population Division for each corresponding forecast scenario (low, medium, and high), leading to diverging total population forecasts.

Uncertain Migration Prospects

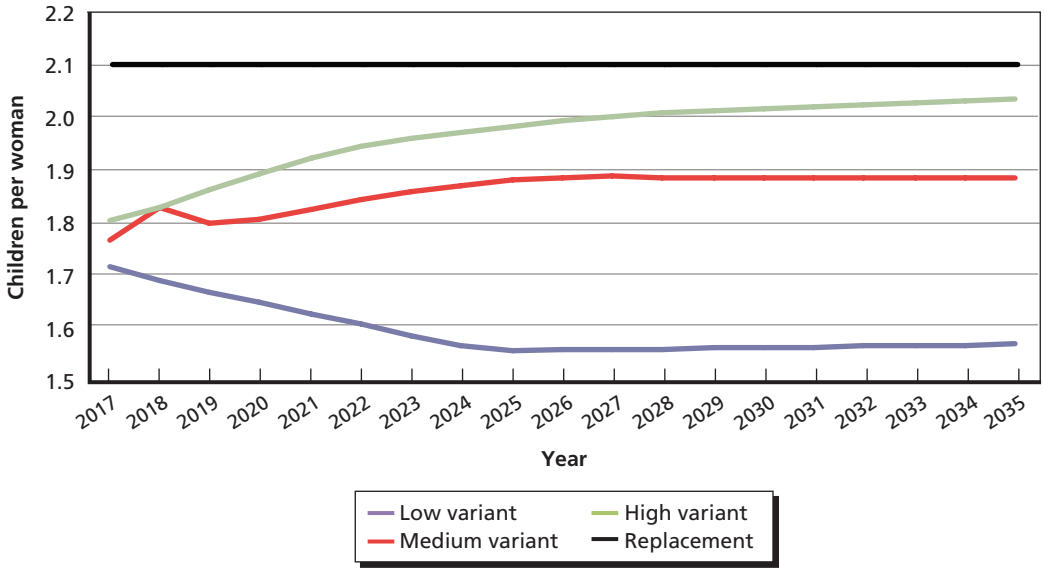
Economic migration is expected to be a key driver in Russian population dynamics in the next several decades, especially since Russia's population is expected to remain roughly constant

[33] According to Rosstat forecasts updated in May 2017.

[34] Medium variant is usually considered the most likely or expected. Data from United Nations, Department of Economic and Social Affairs, Population Division, 2017. World Population Prospects: the 2017 revision; data acquired via website.

[35] Rosstat, 2017. Based on total fertility ratio data updated on 13.07.2017; Mikhail Denisenko, "Russia's Population until 2025," in Maria Lipman and Nikolay Petrov, eds., *Russia 2025: Scenarios for the Future*, New York: Springer, 2013, p. 86.

Figure C.7
Forecast of Total Fertility Rate (2018–2036)



SOURCE: Rosstat, 2017.

despite lower than replacement birth rates. According to Rosstat, the low growth scenario of the population forecast assumes that the net annual migration gain will decline from 256,000 in 2018 to 119,000 in 2035. In total, this scenario predicts a net natural decline of 8.6 million people, partially compensated by a net migration gain of 3.1 million people between 2018–2035.

The medium growth scenario assumes an average migration of 288,000 per year until 2035, with a total migration gain of 5.2 million people between 2018–2035, barely enough to compensate for a total natural decline of 5.4 million.

The high growth scenario assumes an even higher increase in net migration to 451,000 per year by 2035 and a minimal net natural decline over the period. These assumptions result in the cumulative gain of 6.2 million between 2018–2035.

However, based on assessing the main sources of migrants, it appears Russia will have difficulty attracting sufficient numbers of migrants to make up for its natural population decrease. According to Rosstat data in 2015, about 90 percent of all migrants came from countries comprising the CIS.[36] The top contributors of working-age migrants are Ukraine, Uzbekistan, Kazakhstan, and Tajikistan. Of those, Ukraine and Kazakhstan are sources of most educated migrants with a good command of the Russian language, while migrants from Uzbekistan and Tajikistan are relatively less educated.[37]

Given the demographic challenges of Ukraine and strained political relations between the two countries, it is unlikely that Ukraine will provide increasingly large amounts of migrants

[36] Rosstat, 2016.

[37] Based on data from Rosstat, 2016. In 2015 there were 96,631 migrants with higher education degrees from CIS, including 49,127 from Ukraine and 14,826 from Kazakhstan. By contrast, only 8,393 migrants from Uzbekistan and 4,142 migrants from Tajikistan had a university degree.

in the following years. In addition, Ukraine's increasing integration with Europe could direct some migrants who might have otherwise gone to Russia to European countries, although such dynamics remain uncertain.

Of the likely sources for migration to Russia, Uzbekistan has perhaps the most favorable demographic situation. However, the number of ethnic Russians, which make up 95 percent of all permanent Uzbek migrants to Russia, decreased significantly over the last decade. The same can be said about Kazakhstan,[38] where the proportion of ethnic Russians has fallen from 40 percent of the total population in 1991, to 20 percent nowadays. In addition, Uzbekistan and Kazakhstan benefit from large reserves of natural resources and closer ties to China, providing ample job opportunities. While both countries will likely remain significant sources of migrants to Russia, it is rather unlikely that current migration levels will increase by 50 percent or more to satisfy the optimistic scenario of Russian policymakers.[39] Tajikistan will likely remain a key supplier of labor to Russia. For example, today, every other Tajik male already works in Russia. However, this implies that the opportunities for marginal growth in migration to Russia may be limited.[40] A recent report by a group of researchers from the Russian Presidential Academy of National Economy and Public Administration (RANEPA) concurs with this finding, suggesting that "compensating for Russia's projected fertility and mortality-based population losses through even extremely active promotion of immigration will be almost impossible: all CIS countries (the main demographic donors of Russia) are increasingly facing their own 'demographic holes' associated with a sharp decline in their birth rates in the 1990s."[41]

There are other possible sources of migrants, such as China, India, Vietnam, Pakistan, and Bangladesh. However, migrants from these countries rarely have a good command of Russian and will likely lead to increased social pressures within Russia, especially given the nationalist rhetoric that dominates the official ideology in recent years.

Aging and the Declining Labor Force

The dynamics of the labor force is another factor that will have important implications for the economy and society of Russia. The working age population has been declining both in absolute numbers and as a share of the total population since 2010. According to Rosstat projections shown in Figure C.8, this trend will continue over the next seven to eight years and likely beyond. The working age population will decline by 2.5 million people in the most optimistic scenario, or 3.9 million people in the current trends scenario, between 2018 and 2025. While there is considerable variation between the three scenarios regarding the dynamics of the labor force between 2025 and 2035, a decline in the next seven years appears quite likely.

Furthermore, according to the Rosstat forecast, the decline in the working age population will be complemented by a significant increase in the population above working age. See Figure C.9. The low growth scenario predicts that the population above working age (65+)

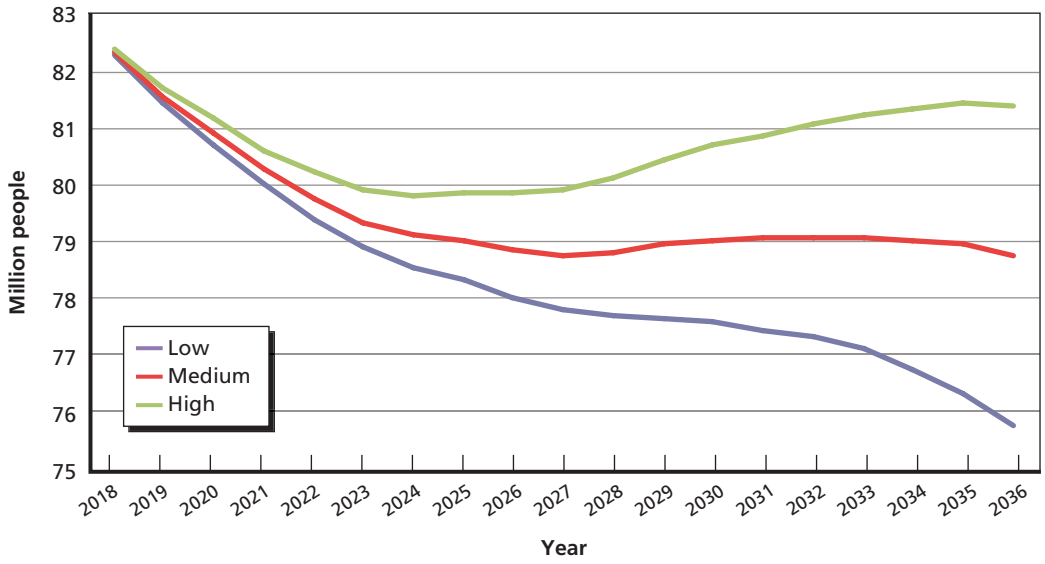
[38] M. Casey, "Why Are Russians Leaving Kazakhstan?" *The Diplomat*, February 23, 2016.

[39] Assuming that the composition of migrants will not change.

[40] Aleksashenko, 2015.

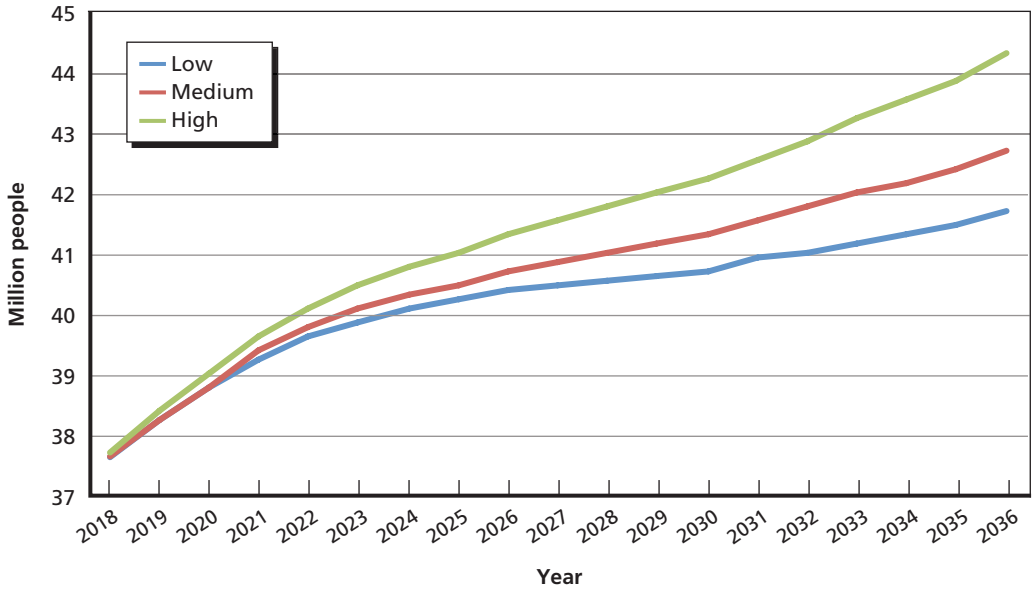
[41] Arkhangelsky et al., 2015, pp. 6–8.

Figure C.8
Forecast of Working Age Population



SOURCE: Rosstat, 2017.

Figure C.9
Forecast of Population Above Working Age



SOURCE: Rosstat, 2017.

will increase by 4.2 million in 2036 relative to 2018. The medium growth and high growth scenarios predict increases of 5.1 and 6.7 million, respectively.

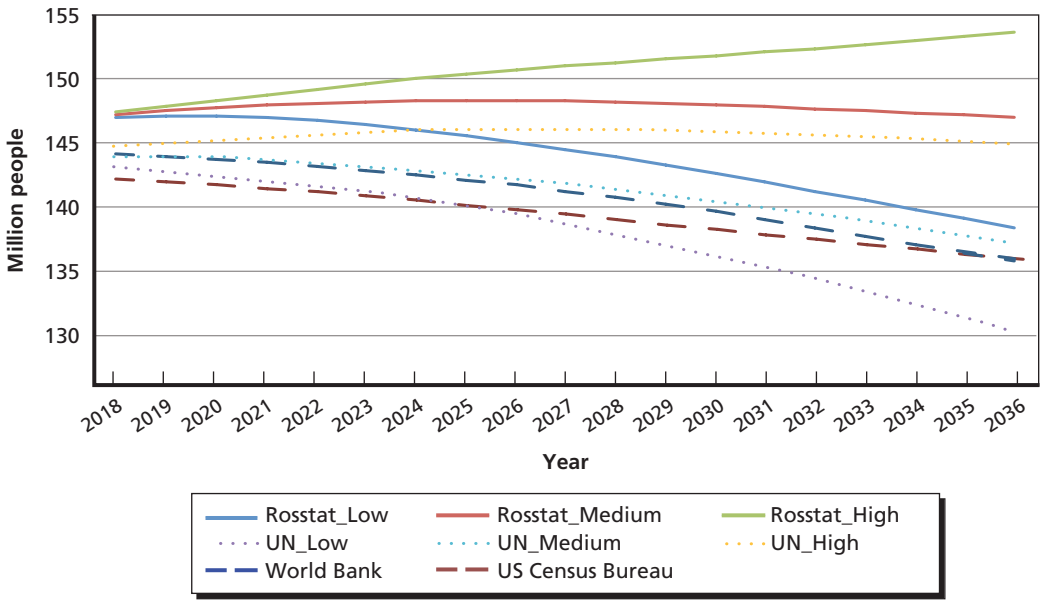
The rise of the above working age population will be partially offset by the decline in the number of young people aged 1 to 14. Nevertheless, the dependency ratio will rise in the coming years, leading to an increase in demand in the labor market.[42] The magnitude of the impact on the real economy also will be affected by dynamics of productivity growth and development of a flexible labor market that will allow seniors to participate in the labor market after they reach the retirement age.

Likely Trajectories

Four agencies routinely conduct population forecasts for Russia: Rosstat, the United Nations Population Division, the World Bank, and the U.S. Census Bureau. Despite the different assumptions about the evolution of fertility rate, life expectancy, and the age distribution of mortality and migration, most forecasts predict a declining population between 2018 and 2036. As shown in Figure C.10, only the high variant forecast from Rosstat predicts a significant population increase.

The general assumption behind all forecasts is that improvements in health, technology, and life expectancy will continue to rise. Migration remains the most volatile and hardest to predict, since it depends on many exogenous factors, such as relative economic performance,

Figure C.10
Population Projections to 2036



SOURCE: Rosstat, 2017; World Bank, 2017; U.S. Census Bureau, 2017; UN, 2017.

[42] The dependency ratio is an age-population ratio calculated by dividing the number of people not in the labor force (0–14 and 65+) by the number of people of working age (15–64). It measures the number of young and old dependents as a share of the population of working age.

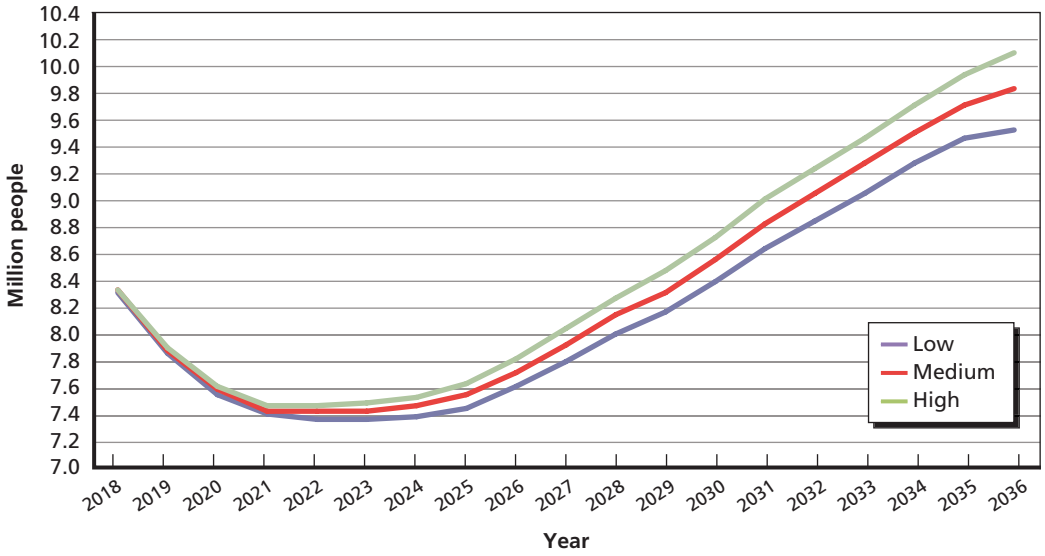
domestic politics in Russia and the CIS countries, and relations between countries. Notably, the UN and World Bank project a net positive migration on the level of 50,000 per year between 2005 and 2050, while Rosstat projects an average of 175,000 per year in its low scenario, 288,000 in the medium scenario, and 401,000 in the high scenario between 2018 and 2036.

Implications for Other Factors

Military Personnel

One critical implication of Russia's future's population pyramid for national security is the declining number of conscription age (18–27) males. As a consequence of the fertility decline in the 1990s, the number of males in the conscription age will decrease dramatically through about 2022 and then likely rebound between 2025 and 2036. See Figure C.11. In particular, there is expected to be a 10 percent to 11 percent decrease in the size of the pool of potential conscripts over the next five years. This problem has been recognized at the highest levels of the military. General Vasiliy Smirnov, the head of the Mobilization Directorate of the General Staff, admitted in 2015: "the task of recruiting enough young men fit to serve in the armed forces is being hampered by the unfavorable demographic situation and other difficulties."[43] We discuss Russia's approach to recruitment further in Appendix D on military personnel policy.

Figure C.11
Forecast of Number of Males of Conscription Age (18–27)



SOURCE: Rosstat, 2017.

[43] Cited by M. Lukanin in "Demographics vs. the Russian Army," CAST, 2015.

Economy

The size of Russia's overall and working age population will likely have a direct effect on its economy. Given relatively high employment rates, any decline in the size of the working age population may impose a heavy limitation on growth, absent a rapid increase in total factor productivity.[44] In addition, a decline in the working age population may lead to an upward pressure on wages, which could in turn increase Russia's dependence on migrant labor.[45] The increase of the above working age population may also put increasing pressure on Russia's health care and pension systems, although Russia will likely still prioritize maintaining defense spending given past trends.

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[44] According to official figures, unemployment in 2016 stood at 5.5 percent (Rosstat, 2017). For a discussion about the future economic growth in Russia, see Alexey Kudrin and Evsey Gurvich, "A New Growth Model for the Russian Economy," *Russian Journal of Economics*, Vol. 1, No. 1, 2015, pp. 30–54.

[45] Vladimir Gimpelson, et al., "*Rossiiskii rynok truda: tendentsii, instituty, strukturnye izmeneniya* [The Russian Labor Market: Trends, Institutions, and Structural Changes"], Moscow, 2017.

APPENDIX D

Military Personnel Policy

Dara Massicot

The Russian military manning system is stabilizing into a combined conscription and contract soldier system after 20 years of debates and false starts. For the first time in history, in 2016, professional enlisted soldiers outnumbered conscripts in the Russian military.[1] The MOD has shown an ability to learn from previous mistakes from the late 1990s and early 2000s, and executed a variety of defense policies to improve conscription and contract service alike. The military's personnel goals include increasing proficiency and agility, incorporating new technologies and operational concepts across the services, reducing draft evasion, and increasing contract service retention. Russian personnel policies and increased defense spending have led to a demonstrable improvement in military service conditions and enhanced soldier proficiency across many key competencies. Russia's combat performance in Ukraine and Syria have also contributed to raising the prestige of military service, while military salaries are now fairly competitive due to a combination of targeted federal funding and depressed civilian wages.

Although it appears that Russia will be able to sustain the current mixed manning system for the foreseeable future, the Russian manning system is not without significant challenges ahead. As of 2017, Russia essentially has two armies: a competent, combat-experienced group of professional enlisted and 12-month conscripts who are able to master only basic military skills. While some service branches, like the Air Force and Airborne Troops, have lower percentages of conscripts, in general, 30 percent to 50 percent of enlisted personnel are conscripts. This mixed system limits how Russia will conduct combat operations. Most Russian units (particularly within the ground forces), are only able to produce one battalion tactical group of professional soldiers, and in the past the MOD has been forced to put together subunits from across Russia into task forces during a campaign.[2]

Demographic projections indicate that Russia has entered a new period of contraction in draft-age males, as discussed in Appendix C. Demographic pressures will probably constrain the authorized active-duty billeting of the Russian military to current levels of 1 million and place greater demands on the available draft pool and reserve base. Russia should be able to maintain current manning levels through this period of contraction if it implements highly efficient draft procedures and maintains contract service personnel spending at 2017 percentages.

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[1] IISS, *The Military Balance*, New York: Routledge, 2017, pp. 183–236.

[2] Igor Sutyagin and Justin Bronk, *Russia's New Ground Forces: Capabilities, Limitations and Implications for National Security*, RUSI Whitehall Papers, Vol. 89, No. 1, 2017, pp. 32–42.

As the Russian labor pool write large contracts over the next decade, the military (and the defense industry) will face increasing pressure to attract the best and brightest into career military service. Competition will be especially fierce for skilled technical labor capable of working with sophisticated electronic or other highly technical equipment with implications for the defense industry and technical fields within the military branches of service.

Russian leadership has adopted several personnel policies and spending programs to improve combat proficiency, reduce draft evasion, and encourage contract service recruitment and retention. The MOD is improving pay, social benefits, training programs and service conditions, and revising their recruitment procedures to reduce waste and corruption and recruit specific technical specialties.

Recent History and Trends

At the end of the Soviet Union, the Russian Federation inherited a mass-mobilization and conscript-based military, a force size of 2.7 million (of the former 4.5 million Soviet military), and a large reserve base.[3] Russia gradually halved the military's size to around 1.2 million by 2008. In 2003, the Kremlin decreed that conscription would shorten to 18 months, and then 12 months in 2007.[4] In the post-Soviet period Russia has made several attempts to move toward a more professional or contract military because of changing perceptions of the international environment and requirements for modern warfare.

Russia's mixed manning system contains professional enlisted personnel, 12-month conscripts of eligible 18–27 year old men, and a reserve mobilization base.[5] Russia's total allocated force size as of 2017 is 1,013,628 active duty billets and a presumed 890,000 reserve billets.[6] As of 2016, the Russian military contained a total of approximately 961,000 active duty personnel, including an estimated 220,000 officers, 50,000 warrant officers, 384,000 professional enlisted (contract soldiers), and 307,000 conscripts.[7] Russia's military personnel system is a network of military hospitals, health resorts, military universities, conscription centers or commissariats, mobilization departments, and contract service recruitment centers. The General Staff and MOD work in tandem to generate overall force structure requirements, run biannual cycles of conscription, contract service recruitment, maintaining social services and other material support requirements for the forces, and other tasks. A range of other social organizations and nongovernmental organizations (NGOs) that facilitate the draft process

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[3] Central Intelligence Agency, "Soviet Military Manpower: Sizing the Force," August 1990, declassified in 1999; Rod Thorton, "'There Is No One Left to Draft': The Strategic and Political Consequences of Russian Attempts to End Conscription," *The Journal of Slavic Military Studies*, Vol. 26, No. 2, 2013, pp. 219–241.

[4] Thorton, 2013.

[5] "Putin Does Not Have Enough Soldiers—What Has Caused Latest Increase in Number of Servicemen in Russia," *Svobodnaya Pressa*, March 29, 2017; Thorton, 2013.

[6] "Putin Does Not Have Enough Soldiers," 2017. The federal authorization was worded somewhat ambiguously as "1,903,051, with 1,013,628 servicemen." Russian pundits attempted to parse these two numbers. The additional 889,423 billets likely refer to reserve billets.

[7] Oxenstierna, 2016; IISS, 2017; "*Raspirennoe Zacedaniye Kollegii Ministerva Oboronii*" ["Full Address to the MOD Collegium"], official Kremlin press release, December 22, 2016.

and allow for a token level of engagement between Russian leadership and the population supports this system.

Conscription

Just as in the Soviet period and earlier, Russia holds two biannual draft cycles, occurring from April through July and from October through December. Alternative civilian service is a choice available to all called up for the draft, although this two-year option remains unpopular among most draft-age men. Alternative service positions are sometimes pejoratively referred to as "dishwashers" or "mailmen."[8] There are multiple types of exemptions and deferments to the draft, such as pursuing a higher education, health problems or behavioral issues, or family status (see Table D.1). For example, in 2017, 22 percent of those called up for military service received full medical deferments, which is an improvement from the early post-Soviet period.[9] Those conscripts with a full or partially completed college degree are selected to perform their service in technical positions or within "scientific battalions" attached to select defense industries.[10] This program is designed to be a win-win: Moscow potentially injects new workers into defense industries, and the soldiers themselves earn on-the-job experience and avoid being sent to a brigade or elsewhere.[11] As of 2017, 20 percent of

Table D.1
Draft Deferments and Exemptions (2017)

Deferment	Exemption
• Temporarily unfit for service • Care of incapacitated relative not on full government support • Custodian of underage sibling • Single father two+ children • Disabled child less than three years of age • Child and pregnant wife in second trimester • Employer-provided deferment • Service in Duma or other elected official for duration of civil service • Office seeker for federal or local election • Education (high school, full time university, postgraduate school, vocational school) • Presidential decree	• Already completed military or alternative service • Father or brother killed in military service • Convicts serving sentence or awaiting trial • Medically unfit for all military service • Medically fit for limited service only

SOURCE: Russian MOD official website.

[8] "On the Dot. Innovations to the Spring Draft into the Army: What the Conscript and His Parents Need to Know," *Rossiyskaya Gazeta*, April 12, 2017.

[9] "More Than 470,000 People Receive Deferment or Exemption from Draft During Fall Draft Campaign," interview with the Chief of the Main Organization-Mobilization Directorate of the Russian Armed Forces' General Staff, *TASS*, January 11, 2017.

[10] "More Than 470,000 People Receive Deferment or Exemption," 2017.

[11] "Wanted: An Increase in the Share of Professionals in the Troops," *Krasnaya Zvezda*, May 11, 2017; "Shoygu Discussed the New Contract Servicemen Recruiting Procedures," *Rossiyskaya Gazeta*, May 2, 2017; "Two Years for One. For the First Time, Conscripts Given Right to Turn Down Draft Service Immediately and Sign Two-Year Contracts," *Izvestiya*, February 26, 2016.

Russian conscripts have higher education (in 2001 this number was only 3 percent), according to official statements.[12]

Russian NGOs focused on soldiers' rights, such as the Committee of Soldiers' Mothers, or Citizen and Army, have always had a fraught relationship with the Kremlin and have, in recent years, seen their influence or other lobbying capabilities restricted even further.[13] Many of these NGOs were formed by concerned family members of conscripts who were abused, injured, or killed during their conscription period. It is Russian policy that conscripts will not serve in combat zones—barring general mobilization. Pressure from NGOs and public outcry during the Chechen wars led to the adoption of policies prohibiting untrained conscripts from serving in combat zones abroad or in internal "hot spots" after unprepared conscripts were sent into combat in Chechnya with disastrous results.[14] Although Russia adheres to the spirit of that policy, Russian NGOs have documented multiple occasions when conscripts were injured or killed fighting in combat inside Georgia or Ukraine (which Moscow denies). In 2014 and 2015, some conscripts were pressured by their superior officers to sign contracts to legally fight in Ukraine.[15] Currently no lobby or NGO is devoted specifically to contract service personnel's rights.

Improving Service Conditions

Russian defense leadership has been made to realize the impact of poor service conditions upon high rates of draft dodging and poor contract service retention. Since the New Look reforms, Russia has instituted a variety of improvements to active duty military life that have made conscription less odious than before. For example, parents can now attend draft selection panels and accompany their children directly to their unit or processing center. Conscripts are able to keep their cell phones (in most cases; reports of cell phone confiscation during sensitive training or combat operations exist), and garrisons have a Skype-like capability to connect with family members at preset times. Conscription law was revised and now allows conscripts to serve in locations close to their homes so their families can visit and verify their health (earlier in the Soviet period and 1990s when conditions were poor, conscripts served in another part of Russia, far from their families, to reduce desertion rates). The military has largely outsourced in-garrison mess hall duties to civilian catering companies to improve the quality and taste of food. Malnutrition and underweight conscripts remain a problem for the military, so the

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[12] "Ordered To Fall In!: Military Draft Campaign Begins 1 April," interview with Colonel General Vasiliy Tonkoshkurov, Chief of Russian Federation Armed Forces General Staff Main Organization-Mobilization Directorate, *Krasnaya Zvezda*, March 31, 2017.

[13] "Two Years for One," 2016. In November 2012, Russia passed legislation requiring any NGO that received foreign funding to be classified as a foreign agent and subject to greater scrutiny. Since that time, several regional Committees of Soldiers' Mothers have been classified as foreign agents. "Soldiers' Mothers Group Declared 'Foreign Agent,'" *Sputnik*, April 14, 2013.

[14] By presidential decree, conscripts cannot be deployed into conflict prior to completing basic training in four months. However, it is Kremlin and General Staff policy that conscripts will not serve in combat abroad or domestically. "*Voyenosluzhasiye po Prizivu ne Budut Uchastvovat' v Boyevikh Destviykh*" ["Conscript Servicemen Will not Serve in Combat Conditions"], *RIA Novosti*, February 14, 2013.

[15] Nadja Douglas, "Civil-Military Relations in Russia: Conscript vs. Contract Army, or How Ideas Prevail Against Functional Demands," *Journal of Slavic Military Studies*, Vol. 24, No. 4, 2014, pp. 511–532.

MOD has incorporated high caloric weight-gaining food into meals, and weight lifting exercises to add bulk.

Revised Training Programs

Russia has revised training manuals, training regimens, and proficiency requirements since the end of the Georgia war in 2008 and New Look defense reform program. Since that time, the military increased flight and at-sea hours, introduced more complex operations into training programs, and ordered hundreds of no-notice deployment exercises to boost readiness. Within the garrison, the military has extended the duration and intensity of training and education, with less downtime or time spent on noncombat tasks. This change is designed not only to increase combat proficiency in a compressed conscription cycle or contract term but also to raise the prestige of military service through word of mouth when conscripts and *kontraktniki* can claim they are doing meaningful combat training (rather than peeling potatoes, for example). Finally, a more rigorous training program is intended to reduce the available time and energy for hazing or other abuses of power within units. Noncombat tasks like catering, laundry, maintenance, and groundskeeping have been eliminated for active duty personnel and largely outsourced to civilian firms.[16]

Although the MOD has taken prudent steps to improve combat proficiency in a 12-month conscription cycle, limitations remain. For example, four of twelve months are spent in basic training (six months of training for more complex specialties), leaving little time for the development of true combat proficiency.[17] Assuming that many ground force units are only able to muster a battalion tactical group of purely contract personnel (some may have higher rates), that leaves the remaining battalions constantly cycling through conscripts.

Contract Service

Regarding contract service, Russian officers sign contracts in five-year increments, and warrant officers, sergeants, and privates can serve in two- or three-year contracts. In 2016, Russia created a short-term extension for renewal contracts (for up to 12 months) to offer flexibility to those who might not want to commit to a full second contract, and also to extend service times for those units who were fighting abroad in Syria.[18] Most contract soldiers are recruited from the conscription pool. Interested conscripts who pass fitness tests are able to enlist after six months of conscription, although in recent years, draftees have been allowed to enlist directly into contract service for two years without being a conscript first. The typical contract soldier is in his twenties, and many are married or starting families and want family housing. Some services are more professionalized than others, like rapid reaction forces (Airborne Troops, naval infantry, and Spetsnaz units), or in highly technical services like the Strategic Rocket Forces (SRF), Air Force, and portions of the Navy.[19] The ground forces typically have the highest numbers of conscripts.

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[16] "On the Dot. Innovations to the Spring Draft into the Army: What the Conscript and His Parents Need To Know," 2017.

[17] Thorton, 2013.

[18] "Putin Signs Law on Short-Term Contracts for Counterterrorism Operations," *RIA Novosti*, December 29, 2016.

[19] "Putin Signs Law," 2016; Anton Lavrov, "The Airborne Forces Have 50–75 Percent Professional Enlisted and Generally the Highest Caliber of Conscripts," *Moscow Defense Brief*, Vol. 1, No. 51, 2016a; Anton Lavrov, "Towards a Professional

Reserves and Mobilization

The military is currently authorized 889,423 reserve billets, although the number of discharged former servicemen who have served in the last decade is over 3 million.[20] A large reserve mobilization system is useful for defending Russian borders or large ground operations abroad in a large-scale war. The reserve and mobilization system has historically been a key supporting component of the Russian military, although the New Look reforms of the 2010s have left the reserve system in a suspended state of disarray. Prior to the New Look reforms in 2008 onward, low-readiness units and a skeleton crew of officers and conscripts to support the mobilization system and annual reservist call-ups maintained garrisons. Once those units were disbanded by 2010, most of the equipment was sent to long-term storage depots, reallocated among the permanently ready units, or scrapped. Mobilization of strategic reserves remains an important—if diminished in size—component of Russian military strategy. Since 2010, however, Russian military leaders have likely moved this portfolio to the backburner while tackling other pressing structural issues, like the posture and composition of the active force, managing two conflicts in Ukraine and Syria, and grappling with inflation, sanctions, and defense budget cuts since 2014.

Russian attempts to maintain the reserve mobilization system include storing equipment together in sets at select storage facilities across Russia, creating a small number of Territorial Defense Battalions staffed by paid reservists, although current numbers are small (two battalions and a regiment), and establishing a small professional reserve cadre. Territorial defense battalions appear to be intended more for civil defense purposes (guarding specific installations), and there is ongoing disagreement about their future role. Russian leaders have expressed a desire to establish a professional reserve similar to the U.S. National Guard. However, despite repeated presidential orders and funding to create small groups of 4,000 to 5,000 professional reservists, the program has seen little progress since 2012.[21] Russia has sporadically conducted traditional reservist drills since the New Look reforms began, most successfully in 2016 during a nationwide snap national mobilization exercise, but the overall numbers of actual reservists was around 5,000, and it appeared that reserve mobilization was a very small component of the overall event.[22] All in all, however, there is scant evidence since 2010 that Russia is training its larger available reservist cadre. Recent activities have been more focused on civil-military integration rather than traditional mobilization call-ups from the reserves.

Since 2013, the reserves and mobilization policies have been integrated into the larger concepts of territorial defense or national (whole of government) mobilization. The renewed focus on national mobilization is a likely vehicle by which the military reserve program could be resuscitated over the next five to ten years. It seems highly likely that Russia will eventually return to the question of training and maintaining a larger reserve mobilization base when more resources are available. Given the lack of meaningful training of the strategic reserves for eight years now, it would be highly unpredictable for Moscow to activate and use the reserves for a large-scale conflict with NATO in the near term.

Army," *Moscow Defense Brief*, Vol. 1, No. 51, 2016c.

[20] "Putin Does Not Have Enough Soldiers," 2017.

[21] "*V Rossii Nachalas' Masshtabnaya Proverka Mobilizatsionnoy Sistemy*" ["In Russia a Large-Scale Verification of the Mobilization System Began"], *Vedomosti*, June 15, 2016.

[22] Roger McDermott, "Moscow Tests National Mobilization and Reservist System," *Eurasia Daily Monitor*, June 21, 2016.

Explanatory Variables

The development of Russia's current personnel system is shaped by several different factors.

Historical Legacies and Trends

As has been discussed, by 1991 Russia inherited a military manning system that predated the Soviet era, based on conscription and mass mobilization. Key characteristics of this system included a large standing army, no professional enlisted cadre beyond warrant officers, entrenched organizational corruption, vicious and ritualized hazing (*dedovshschina)*, a relationship between officers and conscripts resembling that of master and serf, and a rigid, highly centralized planning and command philosophy. After the collapse of the Soviet Union in the 1990s, Russia recalled its groups of forces abroad and terminated international basing agreements as it shed a force structure designed for global ideological competition. Much of the equipment from these recalled forces was sent into long-term storage in Siberia and the Far East, or rusted quietly pier-side. These units became low-strength or cadre units when the authorized strength of the Russian military was halved between 1991 and 2008. By the beginning of Russia's New Look reforms, only 13 percent of Russian units could be considered "permanently ready" (the highest readiness designator), according to then Chief of the General Staff Nikolay Makarov.[23] Russian discomfort with force reduction is also a legacy of its Soviet inheritance; many Russian strategists believe that Russia would lose its defensive capability if the authorized number of soldiers falls below 1 million, given Russia's size and array of potential threats.[24] As a result, authorized force size for the Russian military is likely to stabilize around the 1 million mark for the long term, although yearly fluctuations may only reach 85 percent to 90 percent of authorized manning.

Military Reform Requirements and the Future of Warfare

As the Russian military deals with its historical legacies, it must also cope with twenty-first-century security challenges. Russia's military personnel decisions, like the rest of ongoing defense reforms, are heavily influenced by the transition away from the Soviet military that existed for a different set of threats and global strategic competition. Gone is the global Russian military with its network of overseas bases and forward stationed armies, in favor of a regional power with a small, yet potent, global strike capability. Russia has reduced the military's size, shifted its orientation away from a mobilization-based enterprise to a rapid-reaction force, and revised (or is attempting to revise) the military's culture to include greater initiative and a new command approach vis-à-vis professional enlisted troops.

Beginning in the early 2000s, Russian civilian and defense leaders concluded that the nature of modern warfare has shifted sharply away from slow-building, mass-mobilization style conflicts of World War II and the Cold War. Instead, they believe that war will be a rapidly escalating event, with the center of gravity in modern war shifting to the aerospace domain, precision strike, cyber operations, and asymmetric approaches. Their views about the changing nature of modern warfare and threats Russia will face have directly influenced the military's overall mission, force structure, personnel policies, and rearmament programs in the last decade. As it pertains to personnel, Russian strategists concluded that modern

[23] "Army Reform Increased Number of Soldiers, Sergeants to 726,000," *ITAR-TASS*, February 17, 2010.

[24] Douglas, 2014, pp. 511–532.

warfare requires agility and highly trained personnel to operate complex equipment and perform sophisticated tasks. Only trained professionals are suitable for this task, they concluded. Twelve-month conscripts are not prepared to operate complex and increasingly digital military equipment with proficiency; they simply cannot learn and master the skills in less than one year, and the military cannot be involved in an endless draft cycle of capture, train, and release. As the chief of the Main Directorate for Personnel, Colonel-General Goremykin puts it:

> equipping . . . the troops with high-technology weapon assets and the latest models of military equipment, the development of the infrastructures of the military garrisons and the training component, and the increased intensity of combat training measures require a significant increase in the proportion of military professionals in the troops.[25]

Beginning with the New Look reforms first announced in 2008, Russia has permanently revised its force structure, disposition, and personnel composition. Since that time, Russia has transitioned from a mobilization-based military with a small core group of permanently ready forces (only 13 percent were manned at 85 percent to 100 percent authorized strength and were able deploy within 24 to 48 hours from their garrison), to a smaller force structure where cadre units were eliminated and only permanent ready forces remain.[26] Defense Minister Anatoliy Serdyukov was authorized to restructure the force in a short four-year period (2009–2012) by disbanding cadre units and discharging over half the officer corps (with severance pay) from the military. During this time, enrollment into military academies was suspended as training programs were reconfigured, and the officer cadre was reduced from over 330,000 authorized billets to a more "ideal" 150,000. (Russia did not achieve the 150,000 number, and requirements were quickly revised upward to 200,000–220,000.) Beyond 2020, Russia plans on a military that is one-third conscript (around 260,000) and two-thirds contract (around 520,000) with around 220,000 officers, according to statements by senior Russian defense officials.[27]

Bureaucratic Constraints on Reform

Soviet Legacy and Early Professionalization Attempts

Military reform and defense modernization has not been a smooth or linear process in the post-Soviet era, even with Kremlin support, due to a combination of bureaucratic and ideological factors. The clash between historical and structural legacies and modern warfare requirements has been particularly acute for the military manning system. Since the mid-1990s, Russia made at least three distinct attempts to establish a professional military. For the first attempt, in the mid-1980s, General Secretary of the Soviet Union Mikhail Gorbachev wanted to downsize the military and transition toward a smaller nonconscript army to improve the economy and expand the labor pool. He faced strong opposition from the Soviet officer corps,

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[25] "Wanted: An Increase in the Share of Professionals in the Troops," 2017.

[26] "Army Reform Increased Number of Soldiers, Sergeants to 726,000," 2010.

[27] "Contract Service Begins to Predominate over Draft in Russian Armed Forces," *Vzglyad*, April 28, 2015; Lavrov, 2016c; Vladimir Ostankov, "*Strategicheskih Reservov Nyet*" ["There Are No Strategic Reserves]," *Voyenno-Promyshlenyy Kuryer*, Vol. 10, No. 528, March 19, 2014.

which argued along ideological lines that only capitalist countries used paid volunteer armies and that these "mercenary" troops are inherently less patriotic or committed to homeland defense.[28] Between 1994 and 1996, President Boris Yeltsin signed edicts ordering a complete transition to professional service within a decade, to curry electoral favor. The effort failed from a lack of guidance, military buy-in, and funding. By 2002, only 22,000 servicemen served on contract.[29] The third attempt occurred during the first years of President Vladimir Putin's first presidency. Putin wanted a strong, modern military that would not drain Russian resources and would also be an effective fighting force to resolve new threats to Russian national security. The Kremlin approved Federally Targeted Programs to establish limited numbers of contract-service forces in 2003 and 2007.[30] One of Russia's most elite units, the 76th Guards Air Assault Division based in Pskov, was the first unit selected for conversion to contract service.[31] Despite early enthusiasm for the program, the first contract service attempt from 2003 to 2007 was considered a failure by most in Russia, as was an attempt to reorganize the military's command structure in the mid-2000s under the leadership of then Chief of the General Staff Yuriy Baluyevskiy. At the time, the military effectively failed to differentiate between conscription and volunteer service across multiple categories: pay was not attractive (starting pay was R8,000 for a private at a time when the national salary was R13,000 to R15,000 in 2009),[32] living conditions were only marginally improved, officers treated professional enlisted like conscripts (either because they were not trained to command or interact with professional enlisted, or they were simply unwilling to treat them differently), and there was not a genuine distinction in job duties or status for professional enlisted.[33] Only 20 percent of the initial wave of contract servicemen in units across Russia from the first wave of modern contract service (2003–2007) renewed their contracts.[34]

The postmortem of this contract service pilot occurred in 2007–2008 during a change in defense leadership. Defense leaders recognized that if they marketed contract service as a true profession—whereby one could learn modern soldiering and earn status and financial benefits, as distinct from conscription—the MOD had to follow through on those promises. By 2009–2010, the MOD changed aspects of the military education program to promote a different philosophy of command between officers and professional enlisted. It created policies for appropriate job duties for professional enlisted (i.e., eliminating noncombat tasks like mess hall or laundry duty), improved housing and base accommodations, and raised pay rates. This cultural shift is not insignificant for the Russian military.

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[28] Dale Herspring, *The Kremlin and the High Command*, Lawrence: University of Kansas Press, 2006, pp. 37–38, as cited in Thorton, 2013, pp. 219–241.

[29] Herspring, 2006.

[30] Douglas, 2014, pp. 511–532.

[31] Douglas, 2014, pp. 511–532.

[32] "Contract Service Begins to Predominate over Draft in Russian Armed Forces," 2015; "Army of Unemployed," *Novyye Izvestiya*, January 14, 2009.

[33] These early contract servicemen worked hours well above the legal workweek limit in Russia. Fearing desertion, their commanders were uncomfortable with or reticent to grant them their requisite personal time off or allow them to live with their families, which further negatively affected retention. A. A. Khvostenko, "The Health of Military Contract Service Personnel and Members of Their Families," *Sociological Research*, Vol. 44, No. 3, May 2005, pp. 75–78; Douglas, 2014, pp. 511–532.

[34] Lavrov, 2016c.

Pay and Social Benefits

Since its first attempts at modern contract service in the early 2000s, Russia has passed several laws raising the wages of professional enlisted troops and officers alike. MOD leaders concluded they needed not only to improve pay (at minimum, contract base pay had to be 20 percent higher than the national average salary, according to Russian research)[35] and offer better housing accommodations than the Soviet-style open military barracks that bred ritualistic hazing and other forms of abuse of power, but also make social allotments for older soldiers in their mid-twenties, who were likely to be married with children. According to a survey of contract servicemen conducted by the Sociological Center of the Russian Armed Forces in 2014, 55 percent of respondents indicated that pay and benefits were their primary motivation for enlisting, 18 percent enlisted out of a feeling of civic duty, and 12 percent wanted to "dedicate themselves for national defense."[36] While starting wages remain low for the first year of enlistment, over time, pay increases sharply and bonus pay is available depending on locality, specialty, family status, and combat pay. Pay for conscripts is still quite low, with base pay starting at R2,000 monthly, with bonuses allotted for serving in remote locations or if the conscript has dependents. Officer pay and living conditions have improved dramatically from a decade ago. As of 2008, before New Look reforms, up to 30 percent of field-grade officers (US O4 and below) and warrant officers were living at or below the poverty line.[37] Salaries have doubled or tripled national averages in some fields since that time. For example, in 2016, the average monthly income for a construction worker was R29,887 and in manufacturing R31,000, when a contract service private earned around R30,000.[38] An enlisted squad commander could earn R45,000 when state or local government workers averaged R41,000. Battalion commanders earn R88,000 monthly as of January 2018.[39] Russian military wages have not seen an increase since 2012, but as of late 2018, wages will rise 4 percent annually to 2020. Before electronic wage payments after 2008, wage theft was a significant challenge for the military, as salaries were often dispensed in cash directly to unit commanders to parse out. As part of New Look reforms, Russia created an automated direct deposit system placing wages directly into Russian bank accounts and issued linked credit cards for servicemen to make purchases.[40] This process saves time, reduces graft, and enables the MOD to track funds.

Russia has a new mortgage assistance program for professional enlisted; after the third year of contract service, the MOD will dispense significant funds into a mortgage savings account. In ten years, the money will be dispensed to buy a house or apartment, and the MOD will pay the interest on the remaining mortgage loan.[41] Contract service personnel also will have their higher education degrees paid for.[42] Russia continues to construct new

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35 "Army of Unemployed," 2009.

36 Douglas, 2014, pp. 511–532.

37 According to the Health and Social Development Ministry. "Over One-Third of Russian Junior Officers, Contract Soldiers below Poverty Line," *Interfax*, December 12, 2008.

38 "Russian Military Allows Replacement of Conscription with Contract Service," *RT*, February 26, 2016.

39 Rosstat, 2016; "*Zhalovan'e voennosluzhashchikh I vyplaty otstavnikam vyrosli s yanvarya*" ["Servicemen's Pay and Pensions Increased Starting from January"], *Rossiskaya Gazeta*, January 17, 2018.

40 "Wanted: An Increase in the Share of Professionals in the Troops," 2017.

41 "Two Years for One," 2016.

42 "Two Years for One," 2016.

shared apartment-style barracks for contract soldiers. The smaller apartment-style barracks are designed for smaller groups of around four each, allowing for privacy and reducing the unit-wide hazing that has plagued open-style barracks. Contract service personnel with wives and children also can apply for off-base housing in most locations as a retention tool. While housing backlogs persist, they are not as pronounced as during the early days of contract service. The officer corps is typically provided free housing during and after career military service.

Demography

Demography is also a key factor that influences military personnel structure. The declining availability of military-age males through 2024, as discussed in Appendix C, will likely limit Russia's military strength to 2017 levels of 1 million for the next decade, barring a massive policy shift or deterioration in the geopolitical situation. The Russian military currently is conscripting around 300,000 18- to 27-year-old males annually. Since 2008, between 3.68 million and 3.78 million men have already completed conscripted military service since 2008 (see Table D.2). Russian officials have stated in the recent past that 75 percent of potential draftees were exempted or deferred from military service; as an example, this meant that to draft 152,000 conscripts during the fall 2016 cycle Russia called up 620,000 men.[43] While 300,000 is a mere 3.6 percent of the unadjusted draft pool (8.28 million 18- to 27-year-old males in 2018, according to Rosstat), when factoring in a 75 percent deferment rate and eliminating those who have already served as conscripts in the military (3.78 million since 2008), we estimate that, as of 2018, Russia is calling up 26 percent of its available draft population each year to achieve a 300,000 annual conscription rate (see Table D.2).

We analyzed draft availability for 2024, the projected nadir of Russian demographics for military age males, to assess the projected strain on Russia's military manning system. An annual draft of 300,000 in 2024 represents 3.7 percent of the total 18- to 27-year-old male cohort (7.12 million males according to Rosstat data). However, the available 18- to 27-year-old male draft pool in 2024 is 4.37 million (excluding the approximately 2.74 million males who have already been conscripted since 2015). Factoring current exemption and deferment rates of 75 percent of eligible males, Russia will have to send annual draft summons to 1.2 million males to draft 300,000 annually, or 25.4 percent of the eligible 18- to 27-year-old 2024 draft pool. Surprisingly, this is a similar percentage of summonses to 2018, which can perhaps be explained by the larger number of former conscripts in 2018 (3.7 million) compared to 2024 (2.7 million projected).

Expanding the Draft Pool

Russia has introduced a series of new policies to address significant demographic challenges among current and projected draft-age males. These policies include expanding the eligible draft pool, reducing exemptions from military service, and offering more attractive forms of service, among others. The MOD sensed that some young men were interested in contract service but wanted to bypass conscription. As previously discussed, Russia recently revised laws that make it possible for prospective *kontractniki* to enlist directly without first serving as a conscript. Initially, this policy only applied to those with college educations, but in 2017

[43] "More Than 470,000 People Receive Deferment or Exemption from Draft During Fall Draft Campaign," 2017.

Table D.2
Military Personnel Composition 2008–Present (in Thousands)

Year	Conscripts	Contract Service	Officers	Warrant Officers	Total
2008	352	210	350	50	962
2009	576–625	200	320	50	1,146–1,196
2010	550	130	150–220	0	830–900
2011	354	174	220	0	748
2012	296	186	220	0	702
2013	303–359	220–241	220	0–50 (est)	743–870
2014	308	295	220	50	893
2015	297	352	220	50	869
2016	307	384	220	50	961
2017	339	384	220	50	993
2020 (est.)	260–305	425–450	220	50	955–1,025

SOURCE: "Russian Army to Draft Twice as Many Men Following Switch to 12-Month Service," *Agentstvo Voyennykh Novostey*, January 22, 2008; "Draft Dodging Declining in Russia," *Interfax*, January 28, 2009; "Into the Army on a Competitive Basis: Abolishment of Deferments Led to Surplus of Conscripts," *Novyye Izvestiya*, March 31, 2009; "Russian Army Has 50,000 Contract Service Women, 308 Foreigners," *RIA Novosti*, January 28, 2009; "Russia Has No Money to Make Armed Forces Fully Professional—Minister," *ITAR-TASS*, October 4, 2010; "Russian General Considers Contract Service Personnel Numbers, Changes," *Interfax*, September 30, 2010; Lavrov, 2016c; Oxenstierna, 2016; IISS, 2017, pp. 183–236; "*Raspirennoe Zacedaniye Kollegii Ministerva Oboronii*," 2016; Defense Intelligence Agency, 2017, p. 12; Persson, ed., 2016, pp. 48, 106; "*Pravo Stat Zashitom Rodinii*" ["The Right to Become a Defender of the Motherland"], *Krasnaya Zvezda*, January 10, 2017.

NOTE: This chart does not include cadet numbers. Warrant officers were eliminated in 2010 and restored in 2013. The fluctuations from 2009 to 2012 reflect the disbandment and subsequent reinstatement of warrant officers, and the resetting of officer sizes. Russia was originally to downsize its officer corps from 350,000 to 150,000 between 2008–2012, but revised numbers halfway through to 220,000. The high numbers of conscripts in 2009 is likely reflective of the final transition from two-year to one-year conscripts. The 2010 decline in contract service personnel is possibly explained by a departure of the 2007 contract service three-year cohort coupled with below-target enlistment. Sources: "Contract Service Begins to Predominate over Draft in Russian Armed Forces," 2015; CAST, 2016; IISS, 2017; Russia Ministry of Defense, and others.

Russia relaxed this policy even further and now anyone with a high school education and above who qualifies for contract service has the option to enlist directly for two years.[44] Russia has newer alternative methods to service, such as serving for 18 months in the defense industry or entering a military training center (MTC) or ROTC-like program at civilian universities to become a reserve officer.[45] Graduates of MTCs have a contractual obligation to serve for three years as an officer. MTC graduates are often trained in specialties such as electronics

[44] "Shoygu Discussed the New Contract Servicemen Recruiting Procedures," 2017.

[45] Douglas, 2014, pp. 511–532.

or other high-technology fields.[46] Until recently, conscripts from the North Caucasus did not serve in other parts of Russia. This arrangement has recently been relaxed, and has resulted in the spread of ethnicity-based hazing in several units across Russia.

Because of the demographic pressure it faces Russia requires a streamlined and effective conscription process. To counter waste and corruption, the MOD restructured the conscription process to improve efficiency (reduce evasion, quickly fill units) and reduce corruption (bribes, illegal exemptions or deferment). Each exemption or deferment is subject to higher levels of scrutiny to reduce the instances of bribes, and partial medical deferments still result in military service, although with service limitations. Russia now mandates that local *commissariats* rotate personnel to avoid entrenched local corruption. Russia has introduced a digitized call-up system, the Efficient Army system, that tracks registration, conscription status, service completion, and time in the reserves. This electronic tracking helps eliminate draft evasion and helps the military plan for precise amounts of materiel support to particular units.[47]

Outlook

The most likely course of action to 2030 is a mixed manning system along the lines of what is observed presently, a roughly even divide between conscripts, officers, and professional enlisted. But there are other potential trajectories that could result from changes in the GDP and defense spending. If GDP and defense spending were to increase, Russia could gradually increase its contract service each year, create a small professional reserve base, and move toward an all-volunteer force. If GDP and defense spending were to decrease during an austerity period, the contract service could be reduced to prioritize investments in weaponry for strategic deterrence rather than personnel spending.

Shedding the Soviet Legacy and Transition to Modern Warfare

The last generation of career officers who began their service in the Soviet military will retire by the late 2020s and early 2030s. Although remembrance of history and adherence to traditions are mainstays of Russian military culture, the generational shift will create a new space for experimentation in operational concepts, C2, force structure, and so on.

To undertake the types of asymmetric conflicts or highly technical noncontact wars of the twenty-first century envisioned by military strategists, Russia will require a well-trained force with modern equipment. A massive standing army is not necessarily required for this type of warfare, but a larger military would likely be required for large-scale offensive military ambitions along Soviet lines. If contract service collapses, Russia could partially mitigate the loss to military capabilities by reverting to a familiar model: draft conscripts for less technical jobs and increase the officer corps to perform the duties that professional enlisted would

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[46] According to Russian studies, graduates of MTCs report lower feelings of competence and acceptance by other officers than graduates of academies, which impacts retention. Drawbacks to MTCs include officer candidates receiving truncated indoctrination to military culture and values, as MTCs operate more like civilian universities than military academies. A study concluded in 2013 that only 30 percent of MTC graduates planned to go into service until the maximum age in the military, whereas the number in the academies was 55 percent. E. N. Karlova, "Characteristics of the Social Status of Students at Military Centers," *Russian Education and Society*, Vol. 55, No. 7, 2013, pp. 27–41.

[47] "*Raspirennoe Zacedaniye Kollegii Ministerva Oboronii*," 2016.

do. This option would not be the military's first choice, but it is an option. Signposts of this change would be announced increases to the officer cadre to 30 percent or higher of the overall force size and a large increase of warrant officers.

Bureaucratic and Demographic Considerations

Mixed manning in its current format will likely persist over the next 20 years based on Russian security requirements, demography, and budget constraints. While the ratio of contract servicemen to conscripts may gradually increase over time, so far there are no indications that Russia will completely abandon the idea of conscription before 2030. A fully professionalized military is discussed only in the abstract by defense leadership; Defense Minister Shoygu says that "eventually" the military will become fully professional.[48] If contract service collapses, it will have implications for the quality of the Russian military but also will impose political costs on the Kremlin and will double the strain on military recruiting. While we anticipate that Russia will be able to conscript 250,000 to 300,000 draftees annually, doubling that requirement to 500,000 or 600,000 would likely force Moscow into unpleasant policy decisions, such as increasing the draft age, reducing deferments, or extending the conscription term. Various officials have mentioned these options in the last decade in passing, but the Kremlin has not seriously entertained them. Extending the draft period back to two years after a decade of one-year service would be extremely unpopular, according to Russian NGOs.[49]

The declining availability of military-age males through 2024 will likely limit Russia's military strength to 2017 levels of less than 1 million for the next decade, barring a massive policy shift or deterioration in the geopolitical situation. As discussed in Appendix C, the decline in the draft age cohort will reach its nadir in 2024, and the draft age cohort will not return to 2017 levels until 2030. There are likely to be competing requirements on the demographic pool from 2018 to 2028 (both for civilian labor, military service, and internal security services). However, Russia should be able to meet its conscription goals at current effort levels and force sizes, since the relative proportion of the eligible 18- to 27-year-old draft pool that Russia would need to conscript will remain roughly constant from 2018 to 2024. Based on this analysis, Russia is expected to counter mounting demographic pressure from 2018 to 2026 by maintaining more professional enlisted than conscripts. Increasing the rate of female contract soldiers or even conscripting women into noncombat roles would alleviate pressures on the demographic pool, but to date this has not been seriously considered.

Implications for Other Factors

Military personnel policies are directly influenced by demography, the defense budget, social stability, and Russia's grand strategy. Each factor affects military manning in different but equally important ways. Demography and available defense budget funds have a direct impact on force size and personnel spending, which impacts quantitative and qualitative combat effectiveness trajectories. Russia's strategic assessments about the international order, its role as a regional power center in a multipolar world, and the future of modern warfare have influenced the orientation and force posture of the military, shifting it away from a land-based mass mobilization military into a smaller, swifter military that emphasizes rapid reaction and

[48] Lavrov, 2016c.

[49] "Russian Army Does Not Have Enough Conscripts," *Kommersant*, January 13, 2012.

precision strike capabilities. Finally, a professional military is not possible without social and cultural support such as pride or belief in the military's prestige, successful prosecution of conflicts abroad, the payment of promised social benefits for servicemen, sustained improvement in conscription conditions, and attractive wages that are as high (or higher) than the national average.

In turn, the quality of military personnel directly affects combat effectiveness for all key military capabilities areas described in this report. Highly trained personnel are most pivotal to the air defense, C4ISR, EW, and strategic nuclear forces, because those sectors more than the others use weapons systems or launch platforms that are networked or require technical expertise. Precision fires within the ground forces and navy also require similar specialists. Russia is generally unwilling to allow conscripts to manage these assets.

APPENDIX E

Maneuver Ground Forces

Scott Boston and Matthew Povlock

The Russian Federation inherited a staggering number of armored vehicles from the Soviet Army, and the overwhelming bulk of Russia's current vehicle fleet consists of modernized versions of Soviet-era systems. Despite some efforts to procure more modern clean-sheet designs for its tank, infantry fighting vehicle, and armored personnel carrier fleets, most of Russia's ground combat formations will operate modernized versions of Soviet-designed systems for the foreseeable future.

The following sections discuss the various armored fighting vehicles in service and in development for the Russian military's ground services: the ground forces, Airborne Troops, and naval infantry. The material considered here discusses the following:

- Insights from recent combat operations in Ukraine and Syria
- The armored vehicles currently forming the basis for Russia's ground services' maneuver formations, to include descriptions and capability overviews
- Personnel and training considerations related to maneuver forces
- Doctrine and operating concepts, including the changes in organization to the ground forces associated with the 2009 New Look reform program and more recent organization and force structure developments
- Defense industry trends, including resources devoted to vehicle modernization and new vehicle development, as well as the major defense companies building armored vehicles for the Russian military.

This appendix concludes with a discussion of the potential future trajectory of Russia's ground services with an eye toward their armored vehicle-equipped maneuver forces.

Russia's armored vehicle fleet is a key element contributing to the ability of its ground services to conduct combined-arms maneuver operations. Russia retains the ability to move significant forces around within its borders and regularly exercises the ability to conduct battalion-level combat operations. Owing in part to the numbers of vehicles required to equip a force of 60 or more regiments and brigades, however, Russia has elected, thus far, to find relatively economical incremental upgrades to its existing fleet rather than costly new programs. This emphasis on inexpensive incremental modernizations is nearly certain to remain the case for the foreseeable future.

Recent History

This section considers the current outlook of the Russian ground combat services with an emphasis on ground forces. Much of the current force structure directly results or has evolved from the transition to a brigade-centric permanent-readiness force in the 2009 New Look reforms. The reforms, which consolidated vast chunks of the Russian military, include the reduction to four military districts (MD) from the previous seven, and the elimination of an interim level of command (the division headquarters, though this has been reversed in some cases, as will be described).

Doctrine and Operating Concepts

This section considers the types and roles of ground formations in the Russian armed forces, as well as recent developments, notably including the growth of the ground forces and resulting demand for greater numbers of fighting vehicles, particularly main battle tanks.

Russian armed forces have four basic types of conventional ground combat formations:

- Motor rifle brigades and divisions of the Ground Forces;
- Tank brigades and divisions of the Ground Forces;
- Airborne and air assault brigades and divisions of the Airborne Troops;
- Naval infantry brigades of the Russian Navy.

Russia's current order of battle is in transition from its formerly brigade-centric design to one that consists of a more mixed force with a combination of divisions and brigades in most of its MDs. There is also considerable overlap across these formations in equipment, as main battle tanks are now attached to or part of nearly all ground formations, even in the Airborne Troops. Both brigades and divisions are considered capable of independent operations; the difference is primarily that brigades are somewhat more agile and able to be moved quickly across Russia, while divisions are larger and have greater fighting power but take more time and resources to move.

Several reasons have been advanced to explain the reactivation of divisions in the ground forces. In a 2016 interview, the commander of the Russian ground forces, Colonel General Oleg Salyukov, suggested that the size of Russia and variety of potential scenarios merited a mixed organization of divisions and brigades. He added that the divisional level of command was seen as an opportunity to provide professional growth for commanders as an interim step before assuming command of combined arms armies.[1] It is also possible that the new divisions can serve more effectively to integrate detached battalion tactical groups into operations once they arrive at a conflict area from elsewhere in Russia.[2] Three of the new divisions in the midst of formation: the 3rd and 144th motor rifle divisions in the Western MD, and the 150th in the Southern MD, all appear to be positioned to provide increased ground combat power focused on the Russia-Ukraine border.

The motor rifle units of the Russian ground forces make up the largest portion of Russia's ground combat forces. They are organized as infantry-heavy formations with supporting arms, usually with three motor rifle battalions equipped with infantry fighting vehicles (IFVs) or

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[1] "The Return of Divisions: The Ground Forces Will Reverse the 'Brigade Bias,'" *Voyenno-Promyshlenny Kuryer*, February 8, 2016.

[2] Michael Kofman, "Russia's New Divisions in the West," *Russia Military Analysis* blog, May 7, 2016.

armored personnel carriers (APCs). Most have tank battalions, although a few that are described as "mountain" brigades do not. These are the general-purpose combat forces of the ground forces.

Russia's tank formations consist of a handful of tank brigades and tank regiments (present in both motor rifle and tank divisions, albeit in different numbers); before 2013 only four tank brigades were in active service (about a tenth of the number of combined-arms brigades in the ground forces at the time), but the number has been steadily growing since then. Tank forces are traditionally used for highly mobile operations, as a reserve counterattack force while on the defense or as a forward detachment or exploitation force on the offense.

The airborne and air assault units of the VDV are covered in Appendix H, but to the extent that their equipment differs from that of the ground forces, it is discussed here. The VDV operates special infantry fighting vehicles designed for transport by heavy-lift helicopter and capable of airdrop by fixed-wing transport aircraft.

Russia's naval infantry brigades are equipped with the same armored vehicles as the ground forces, a mix of APCs and IFVs, with some tanks in support. Because of their similarity to the ground forces in this respect, they are included here for completeness but will not be discussed further.

The maneuver formations—brigades and divisions—of the Russian ground forces and VDV tend to be smaller than their Western equivalents, even though many of them have more substantial air defense and artillery complements.

- Motor rifle brigades tend to be 3,000 to 4,500 at most, depending on the variant.
- The two-regiment motor rifle division (such as the 2nd motor rifle division in the Western MD) had about 8,500 personnel (more on this later).
- Tank brigades have about 3,000 personnel, with a two-regiment tank division (such as the 4th, also in the Western MD) having around 6,500 personnel.
- Divisions of the Airborne Troops tend to have about 5,500 personnel.[3]

As will be noted further, the expansion of the divisions will result in larger formations, though the final status of these units is still in flux.

Growth and Evolution of the Ground Combat Services

A variety of important developments relating to organization and force structure suggest growing sophistication and increasing capacity for ground combat since the beginning of the decade. These include the creation of several new major units, primarily in the vicinity of Ukraine, as well as the resurrection of the division as a major combat formation and the increased number of tank formations in the ground forces and VDV.

The formation of First Guards Tank Army in the Western MD in 2015 has received a fair amount of attention.[4] This is the only tank army in the Russian order of battle, and it consists of some of the better units in the ground forces. Historically, a tank army had a higher portion of tank units than a combined-arms army; this holds true in this case, at least in a relative sense. Where most combined-arms armies now have primarily motor rifle formations, this new tank army has an even mix of tank and motor rifle forces (one division and one brigade of each, though this has fluctuated somewhat). Its location in the Moscow area means it can serve

[3] Lester W. Grau and Charles K. Bartles, *The Russian Way of War: Force Structure, Tactics, and Modernization of Russian Ground Forces*, Fort Leavenworth, Kan.: Foreign Military Studies Office, 2016, p. 32.

[4] *bmpd*, "The First Guard Tank Army Was Established," 2015.

as a heavy counteroffensive force; being near Moscow, it provides a degree of security for the regime, is in a central location on the railroad network, and is reasonably safe against air attack because it is deep within Russia's integrated air defense network.[5]

It is noteworthy that First Guards Tank Army was stood up as a higher headquarters, but it is perhaps more noteworthy that the army headquarters it replaced relocated to Voronezh, near the border of Ukraine. In the years since, 20th Guards Army repositioned to Voronezh with a single motor rifle brigade, Russia reactivated a tank brigade and moved two motor rifle brigades—the 23rd and 28th from the Central Military District—to reinforce it.

Building on the movement and activation of new units in the Western MD, in 2016 Russia announced the formation of what eventually turned out to be five new divisions. These include three motor rifle divisions on the Ukrainian border (one in concert with the creation of a new army in the Southern MD), one motor rifle division in the Caucasus, and a tank division in the Central MD.[6] One new motor rifle division, the 150th, will reportedly be a "universal" division and have a unique organization of two motor rifle and two tank regiments.[7] In addition, the two previously existing divisions in the Western MD, as well as the three on Ukraine's border, are said to be in the process of expanding into "Soviet-style" six-regiment divisions, with four maneuver regiments (which typically include three motor rifle and one tank regiment), supported by divisional artillery and air defense regiments.

A common thread through these developments is expansion. The two divisions in the Moscow area are each gaining two additional maneuver regiments; depending on whether the artillery and air defense regiments are increased proportionately, this could close to double their size. The three divisions being formed on the Russian-Ukrainian border are starting from four motor rifle brigades; when complete, this will be roughly triple their original strength. Each new motor rifle regiment calls for about 120 infantry carriers and 40 tanks; each new tank regiment calls for 90 main battle tanks and 40 infantry fighting vehicles. Table E.1 outlines the changes in these units (excluding the divisions in the Caucasus and the Central MD, as these may not follow the same pattern).

It should be clear that this expansion, which is ongoing as of summer 2017 and involves a considerable amount of military construction as well as creation of new units from extant and new equipment sets, is a major undertaking and, when complete, will represent a large force positioned near the borders of Ukraine and Belarus (mainly the former). In total, this expansion calls for an increase of seven motor rifle and five tank regiments; together about 1,000 infantry vehicles and over 750 main battle tanks.

Finally, the VDV has begun forming tank units. As of 2017, there is a company of tanks in each division or independent brigade; in 2018 some of these will be expanded to battalions.[8] Compared with the growth of the ground forces, this is relatively small, so far fewer than 100 tanks in total. It may be more illustrative of the broader trend of adopting combat lessons;

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[5] It is probably an exaggeration to state that a tank army exists purely for offensive operations; although Russian doctrine tends to emphasize the primacy of the tactical offensive, the tank army was regularly used as a counterattack force in the Second World War.

[6] See, for example, A. Nikol'skii, *Zapadnuyu granitsu Rossii prikroyut tri novye divizii* [Three New Divisions Will Cover Russia's Western Border], *Vedemosti*, January 12, 2016; M. Kofman, "New Russian Divisions and Other Units Shifting to Ukraine's Borders—Second Look with Updates," *Russia Military Analysis—A Blog on the Russian Military*, August 22, 2016.

[7] "The Ministry of Defense Has Created a 'Steel Monster,'" *utro.ru*, April 8, 2017.

[8] "*VDV RF v 2018 godu sformiruyut tri tankovykh batal'ona v dvukh diviziyakh i odnoy brigade*" ["Russian Airborne Forces in 2018 Will Form Three Tank Battalions in Two Divisions and One Brigade"], *TASS*, July 31, 2017.

Table E.1
New and Expanded Divisions in Western Russia

Unit	Previous Form	Anticipated Form
2nd Guards Motor Rifle Division	2 motor rifle regiments 1 artillery regiment 1 air defense regiment	3 motor rifle regiments 1 tank regiment 1 artillery regiment 1 air defense regiment
4th Guards Tank Division	2 tank regiments 1 artillery regiment 1 air defense regiment	3 tank regiments 1 motor rifle regiment 1 artillery regiment 1 air defense regiment
3rd Motor Rifle Division	2 motor rifle brigades	3 motor rifle regiments 1 tank regiment 1 artillery regiment 1 air defense regiment
144th Guards Motor Rifle Division	1 motor rifle brigade	3 motor rifle regiments 1 tank regiment 1 artillery regiment 1 air defense regiment
150th Motor Rifle Division	1 motor rifle brigade	2 motor rifle regiments 2 tank regiment 1 artillery regiment 1 air defense regiment
TOTAL	6 motor rifle brigades or regiments 2 tank regiments 2 artillery regiments 2 air defense regiments	12 motor rifle regiments 8 tank regiments 5 artillery regiments 5 air defense regiments

SOURCE: Gorenburg, "'New' Divisions in the West," 2016; "The Ministry of Defense Created a 'Steel Monster,'" 2017.

the VDV's airborne combat vehicles are lightly protected and highly vulnerable to the kinds of antitank weapons regularly employed in the Ukraine conflict.

Recent Operations

Ukraine

The experience of combat in Ukraine illustrates the characteristics of Soviet-developed fighting vehicles because versions of these have been used on both sides. The verdict has been quite clear. The battlefield in Ukraine has been exceptionally lethal for all types of armored vehicles but especially for the lightly armored IFVs and APCs. The website lostarmour.info tracks social media images and locations of destroyed vehicles and has amassed open-source evidence of over 1,000 destroyed fighting vehicles; the clear majority of these are Ukrainian vehicles, but battlefield circumstances probably affect the availability of photos of vehicles from each side differently, so it is difficult to draw broad conclusions other than that a lot of vehicles have been destroyed.[9] This level of destruction is probably accelerating the impulse to field more survivable vehicles, about which more will be said.

Writing in an issue of the *Moscow Defense Brief*, CAST analyst Anton Lavrov cites the war in eastern Ukraine as a clear example of the realities of armored combat in modern warfare and

[9] See LostArmour, "Analytics," LostArmour.info, undated.

the need for better-protected vehicles. The proliferation of lethal infantry antitank weapons, while not obviating the use of tanks completely, has rendered them less effective. In a conflict with more capable and better-armed adversaries than the Ukrainian Army or the separatists, tanks could be even more vulnerable, especially current Russian tank designs, including the latest T-72 and T-90 variants, which Lavrov considered inadequately protected.[10]

Syria

Although Russian armored forces have reportedly seen relatively little ground combat in Syria, Russian vehicles, including the T-90A, have been repeatedly used by Syrian regime forces and some of their allies. There does not seem to be much to report on their performance, other than one incident when a U.S.-developed TOW-2A ATGM struck a T-90A on the turret front. Though it is still a fairly capable weapon, the TOW-2A was first fielded in 1987 and is not representative of current U.S. munitions. Its inability to defeat the toughest part of the Russian T-90A (fielded in 2004) is one data point, but not a particularly surprising one given published estimates, on frontal protection of the vehicle.[11]

Current Systems

This section describes the main types of vehicles in each of three broad categories that are currently in service in the Russian military. Except for the new BMD-4M airborne fighting vehicle now entering service with the VDV, all the current systems in use are modernized rather than new platforms. Because new vehicles like Armata and Kurganetz-25 are still in development, they are covered in the later "Outlook" section.

Main Battle Tanks

Russia's current tank fleet consists of a mix of different vehicles with similar characteristics. All of Russia's main battle tanks since T-64A have been armed with a smoothbore 125mm main gun; all have three-person crews and an autoloader. Owing to competition between tank factories in the Soviet era, the specific subsystems on the T-64, T-72, and T-80 series of tanks may differ radically (e.g., diesel rather than gas turbine engine, hydraulic rather than electric autoloader), despite an overall similar level of performance. Russian attempts to consolidate around the T-72/T-90 series (the T-90 is an evolution of the T-72) have been constrained, in part, by the demand for greater numbers of vehicles, as outlined previously. As a result, a number of T-80s remain in service, notably in the 4th Guards Tank Division, while the rest of the ground forces operate T-72B or T-90s of various types.

The main trend in Russian tank production of the last few years has been the rapid conversion of large numbers of legacy T-72Bs to the modernized T-72B3 standard. For a fraction of the cost of a new tank, the T-72B3 has considerable advantages in lethality and situational awareness over its predecessors. It has an upgraded fire control system, a modern second-generation forward-looking infrared (FLIR) sensor that gives it comparable thermal imaging capability to that of Western sights (indeed, it is derived from technology obtained from the French before the Ukraine crisis), and a modified main gun that allows it to fire improved ammunition. Starting in 2013, UVZ has been converting around 300 T-72s to the new stan-

[10] Anton Lavrov, "The Use of Tanks in Eastern Ukraine: Lessons Learnt," *Moscow Defense Brief*, Vol. 3, No. 53, 2016b.

[11] "On the Russian Tank Damaged by a U.S. Missile in Syria," *defensetech.org*, March 30, 2016.

Figure E.1
T-72B3 obr 2016

SOURCE: Vitaly Kuzmin, "April 21st Rehearsal in Alabino of 2017 Victory Day Parade," vitalykuzmin.net, April 21, 2017.

dard each year, and a large number of them are now in service (around a thousand by the end of 2016, according to IISS, *The Military Balance*, with another 1,100 of legacy T-72BA and T-72B1s).[12] In addition, a newer version of T-72B3, a further modernized variant identified as the T-72B3 obr 2016, has begun to appear, both in units in First Guards Tank Army and also in one of the new divisions.[13] See Figure E.1.

This new variant, depicted in Figure E.1, includes a newer, more powerful engine, as well as enhanced protection on the sides and rear of the vehicle, well beyond that on any previous Russian vehicle, likely a lesson from the Ukraine experience.

The other two major types of Russian tanks currently in service are the T-90, of which some 350 are T-90A and in service, and the T-80U, of which about 450 are in service.[14] All these vehicles have similar limitations, notably the following:

- Lack of a modern commander's sight, limiting the situational awareness
- Lack of compartmentalized ammunition storage, meaning that if penetrated a tank is more likely to be a catastrophic kill, very likely resulting in the deaths of the crew
- Limited performance for the main armor piercing, fin-stabilized, discarding sabot (APFSDS) projectile available to the vehicle, relative to modern Western ammunition.

[12] IISS, pp. 212, 216.

[13] "The South of Russia Was Strengthened by Super-Protected Tanks" ["Юг России усилили сверхзащищенными танками"], *Izvestia*, July 24, 2017.

[14] IISS, 2016, p. 212.

Table E.2
Tank Production, 2007–2016

Tank System	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
T-72	31	31	40	40	70	127	260	293	170	?	1,062
T-80	?	?	?	?	–	115	–	–	–	–	115
T-90A	31	62	63	61	–	–	–	–	–	–	217
T-14 Armata	–	–	–	–	–	–	–	–	20	–	20

SOURCE: Andrey Frolov, "Russian Defense Procurement in 2011," *Moscow Defense Brief*, No. 28, 2012; Tomas Malmlof and Roger Roffey, "The Russian Defence Industry and Procurement," in Gudrun Persson, *Russian Military Capability in a Ten-Year Perspective—2016*, FOI-R—4326—SE, December 2016, p. 172.

NOTE: Numbers in **green** denote new builds, while numbers in **black** are modernizations of existing vehicles. FOI data may not contain all of 2015 T-72B3 conversion; the total in service by 2017 is around 1,000.

Some of these issues may be resolved relatively easily; for example, improved versions of the T-90 marketed to other countries, as well as the version of the T-72B3 used in tank biathlon competitions, have been observed with modern commander sights. The other challenges, particularly the ammunition issue, will require a major redesign (likely an entirely new turret, gun, and suite of ammunition).

Table E.2 depicts the production and conversion of main battle tanks for Russian military use. Looking across the tank fleet, it is clear that cost has been an important, perhaps even the dominant, consideration in modernization decisions thus far. For example, in 2011, the Russian MOD decided to end further purchases of the T-90A, which was a new-build tank. At the time, the commander of the Russian ground forces, General Postnikov, stated that the T-90, being simply the "17th modification" of the older T-72, was an "overpriced and inadequate system."[15] These comments sparked heated debate within Russia's defense industry, but even Vladimir Nevolin, a senior designer at UVZ, concurred with criticisms of the T-90's survivability.[16] The T-72B3 has comparable characteristics to the T-90A, but (as will be discussed further) the B3 conversion is notably less expensive than a newly built T-90. Other than T-14 Armata prototypes (also to be discussed further), no new Russian tanks appear to have been built for domestic use since 2010.

Infantry Fighting Vehicles and Armored Personnel Carriers

Russia retains a vast fleet of infantry carriers, including both IFVs and APCs. See Table E.3. Compared to tanks, a greater portion of Russia's IFV and APC fleets are legacy vehicles and clearly remain a lower priority for replacement. All these vehicles are lightly protected compared with Western IFVs or APCs, although more recent versions tend to be highly mobile and well armed. The main types of vehicles in these classes include:

- The BMP series of tracked infantry fighting vehicles
- The BMD series of air-droppable tracked infantry fighting vehicles
- The BTR series of wheeled armored personnel carriers
- The MTLB series of tracked armored personnel carriers.

[15] Russian Defense Policy, "Postnikov on the Army and PK (Part I)," March 17, 2011a.

[16] Russian Defense Policy, "Postnikov on the Army and OPK, (Part II)," March 20, 2011b.

Table E.3
IFV/APC Units Produced

System	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
BMP-2 upgrade	–	–	306–357 total vehicles of various types	400 vehicles of various types	130	112	100	112	112	?
BMP-3	31	41			–	83	112	–	40	?
BTR-80/82 new	90	155			150	150	290	115	10	?
BTR 80/82 upgrade	–	–			–	–	134	120	134	?
Kurganets-25	–	–	–	–	–	–	–	–	?	–
Bumerang	–	–	–	–	–	–	–	–	?	–

SOURCE: Persson (ed.), 2016; Frolov, 2008–2016.

Each class of vehicles has various strengths and weaknesses; all are fielded in large numbers, making replacement an expensive proposition. Given the very wide variety of variants across the different generations of these vehicles, the following paragraphs provide a general overview of the capabilities of each.

The BMP series, of which there are three generations (BMP-1, -2, and -3), are Russia's main infantry fighting vehicle and, in total, equip the majority of Russia's motor rifle formations as well as the motor rifle battalions in all tank brigades and regiments. Most in service are BMP-2s, while some units are armed with BMP-3s, and a few units in the Eastern MD still operate BMP-1s. All BMP variants are derived from Soviet designs, which emphasize mobility and firepower over protection. They are amphibious with minimal preparation, have high power-to-weight ratios, and all are armed with a mix of guns and missiles. However, their survivability is considerably worse than modern IFVs in the West. For example, the baseline side armor for the BMP-2 provides protection against small arms fire and fragments only; an applique armor solution is needed to provide protection against heavy machine gun (12.7mm) fire.[17]

The BMD is, essentially, a smaller, extremely lightweight version of the BMP. The vast bulk of the VDV are equipped with older BMD-2s, which are armed with a 30mm cannon and missile launcher. Unlike the ground forces, however, the VDV is in the process of fielding new BMD-4Ms. The BMD-4M (see Figure E.2) is still relatively lightly armored but is very well armed, with armament identical to the BMP-3's: a 100mm gun-missile launcher, a 30mm autocannon, and a coaxial machinegun. Moreover, the BMD-4M features an improved turret that includes modern thermal imagers for both the gunner and commander. It appears to be the only production vehicle so equipped for the Russians at this time. The first battalion sets were delivered to the Airborne Troops in late 2016, and recent statements by the commander of the Airborne Troops, Colonel General Andrey Serdyukov, indicate that three battalion sets will be fielded over the course of 2017 (about 150 vehicles, including BMD-4M and BTR-MDM, a tracked APC version of the same vehicle).

The armored personnel carriers in the Russian ground forces include the wheeled BTRs and the tracked multi-purpose towing vehicle light armored (MTLB). Both are very lightly

[17] "Auxiliary Armour Shields," *Kurganmashzavod*, 2017.

Figure E.2
BMD-4M

SOURCE: Vitaly Kuzmin.

armored but mobile. The BTR-80, released in 1984, has seen widespread use by the Russian military and has been exported throughout the world. It is armed with a 14.5mm heavy machine gun and can carry seven soldiers. The BTR-80 has been upgraded and developed into a host of variants, with the BTR-82 and BTR-82A (this version uses a 30mm cannon) being the latest, beginning production in 2011.[18] The BTR-82's improvements include added antimine protection, communications equipment, and weapons sights.[19] The MTLB, equipped with special wide tracks, is used in mountain and arctic formations. Although the Russians do not seem to be devoting resources to improving their APCs any more than their IFVs, it is noteworthy that both the BTR-82 and MTLB are being fielded with up-gunned turrets, armed with the same 30mm cannon of the BMP series. These are primarily of use against relatively soft targets (the Russians have never fielded modern armor-piercing ammunition for their 30mm cannon) but are still a step up from the 14.5mm heavy machine guns that were formerly the primary weapon on the BTR-80.

[18] *Janes*, "Military Industrial Company BTR-80 Armoured Personnel Carrier," November 3, 2015a.

[19] *Janes*, "Military Industrial Company BTR-82/82A Armoured Personnel Carrier," November 3, 2015b; Dmitry Gorenburg, Greg Zalasky, and Alla Kassianova, *Russian Defense Industry Modernization*, Arlington, Va.: CNA, DRM-2012,-U-002985-Final, November 2012, p. 213.

Personnel and Training

Although the overall number of contract soldiers has steadily increased since 2011 and has exceeded the number of conscripts since 2015, the ground forces appear to have a disproportionately smaller number of contract soldiers than other services. That said, the available contract soldiers are exclusively used to man the high-readiness elements of the ground forces. Russian Chief of the General Staff Valeriy Gerasimov commented in September 2016 on the number of higher-readiness battalion tactical groups (BTGs):

> In our districts, including the Southern Military District, battalion tactical groups, which are fully manned by contract service soldiers, have been created. There are now 66 of such BTGs; at the end of 2016 there will be 96, next year 115, and the year after 125.[20]

These figures suggest that many more brigades will have the ability to field two BTGs rather than one, although, as has been noted, the total number of brigades and regiments is also increasing.

Estimated Resources

Ground forces modernization has not been among the highest priorities for defense procurement, and although the number of "modernized" systems has been steadily growing in recent years, the degree of modernization, as suggested by the previous section, has varied somewhat. The SAP for 2011–2020 devoted 2.6 trillion rubles to the ground forces and Airborne Troops out of a total 19 trillion marked for force modernization. Some observers, including the Moscow-based CAST, have asserted this low prioritization makes little sense given the importance of land power to Russia's geopolitical position. Breaking from the trend of slow (and sometimes abortive) development cycles for new tanks and other vehicles should, in this view, be considered a priority by the Russian government.[21]

To be fair the 2020 SAP also called for 2,300 new tanks (a figure mentioned by President Putin) to be provided to the military by 2020.[22] Discussions of the 2020 SAP and its procurement targets for tanks have frequently assumed that those 2,300 new tanks will be T-14s, but this has not been confirmed (and would have been wholly unrealistic even before the economic downturn). Purchases of armored vehicles were, thus, included, but were planned to come later in the program, by which time more pressure was emerging on the defense budget than anticipated prior to 2014.

Table E.4 outlines the various estimated costs of different armored vehicles in development or currently in service, to the extent such figures are available.

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[20] Translation is by Dmitry Gorenburg, on his blog, "Russian Defense Policy," September 17, 2016.

[21] CAST, 2015, pp. 24–31.

[22] Susanne Oxenstierna and Fredrik Westerlund, "Arms Procurement and the Russian Defense Industry," *The Journal of Slavic Military Studies*, Vol. 26, No.1, February 28, 2013, p. 6; *Janes*, "Uralvagonzavod Armata T-14 (T14) Main Battle Tank," February 5, 2016a; Cooper, 2016, p. 91.

Table E.4
Cost Estimates for Selected Russian Armored Vehicles

Main Battle Tanks	Cost per Unit
T-72B3	Cost in 2013 dollars for modernization to T-72B3 obr 2012 was 52 million rubles, of which 30 million were for overhaul of the vehicle; modernization to the improved obr 2016 version set at 79 million rubles[a]
T-80	Not available; modernization to T-80UM may be comparable to early T-72B3, but turbine engine may raise costs; no recent exports to compare; a proposed modernization of T-80BV, if it goes through, likely to be more expensive
T-90	118 million rubles (as of 2011 at time of cancelation)[b]
T-14 Armata	Early estimates were 400 million to 500 million rubles; current claims are 350 million rubles (claimed to fall to 300 once full-scale production begins); final amount unclear as T-14 has not started state acceptance tests[c]
Infantry vehicles	
BMD-4M	80 million rubles (up from 61 million) in 2013[d]
Kurganets-25	Less than (or around) 300 million rubles
BTR-80/82 modernization	22.5 million rubles

SOURCES: [a] "Russia to Upgrade 150 T-72B Tanks," *mil.today*, March 11, 2016; and "*Kontrakt na modernizatsiyu tankov do urovnya T-72B3 v 2016 godu*" ["Contract for the Modernization of Tanks to the T-72B3 Level in 2016"], *bmpd* blog, January 24, 2016.

[b] Russian Defense Policy, 2011a.

[c] Yekaterina Zgirovskaya, "*Zolotaya sotnya 'Armat'*" ["The Golden Hundred Armatas"], *Gazeta.ru*, April 19, 2016.

[d] "Russian Airborne Troops Will Receive 7 BMD-4M Instead of 10, as the Price Has Risen by a Third," *RIA Novosti*, April 23, 2013.

Defense Industrial Trends

Uralvagonzavod

Uralvagonzavod (UVZ)[23] is an entirely state-owned company, located in Nizhni Tagil, Russia (around 850 miles east of Moscow), employing close to 30,000 people. It dominates the Russian tank industry. In addition to its military vehicle production, UVZ also possesses a significant civilian production component. The firm also produces freight rail cars, construction equipment, and tractors.[24]

Even before the fall of the Soviet Union, tank production had slowed considerably, with only a handful of manufacturers (including UVZ) still in operation. In the early 1990s, the MOD chose UVZ over Omsktransmash (the manufacturer of the T-80 tank and now a UVZ subsidiary), to lead tank production. However, with tank procurement halting entirely in the mid-1990s, UVZ needed to rely on its civilian sector and government subsidies to preserve its military production lines. UVZ's tank production was revitalized in 2001 with the signing of an export agreement with India for T-90 tanks. The deal provided UVZ with the resources it needed to modernize production and paved the way for agreements to supply newer versions of

[23] *Uralvagonzavod* is translated to English as Ural Railroad Car Factory.

[24] Gorenburg, Zalasky, and Kassianova, 2012, p. 206; Uralvagonzavod, "History," *uralvagonzavod.com*, undated.

the T-90 to the Russian government.[25] Subsequently, UVZ's deliveries of T-90 tanks to Russia and its other customers ramped up significantly, and the firm may have led the world in the production of tanks by 2008.[26]

Perhaps UVZ's greatest asset is the favor it enjoys with President Vladimir Putin. On several occasions, Putin has awarded the firm preferential contracts and transferred other state-owned assets to UVZ's control.[27] During the 2011–2012 protests in Moscow, a senior UVZ manager proclaimed his support for Putin and offered to transport his workers to help break up the opposition movement. That manager was subsequently granted an important government post; other UVZ figures also have similar close ties to the Putin regime.[28]

Russia's tank industry faces a number of issues today that may affect its ability to produce new systems. UVZ's dependence on the Russian government for support may adversely affect the firm given the greater fiscal constraints placed on Russia by the poor economic situation. Oleg Sienko has expressed concern: "We feel that they constantly cut [the budget]" and that this would seriously harm UVZ.[29] UVZ's heavy reliance on state credits may prove problematic, as well. In 2015, when UVZ was trying to refinance its loans in the midst of its legal issues with Alfa-Bank, it received only 17 billion of the 60 billion rubles in state credits it requested from the government.[30] UVZ managed to reach a deal with Alfa-Bank and refinanced with Gazprombank, but it apparently did not receive any state-guaranteed credits in 2016.[31] Sienko has also mentioned the "endless" process of setting prices—often a point of contention between the Russian military and defense industries—as another issue.[32]

In an April 2016 interview, CEO Oleg Sienko commented on the effect of sanctions. He stated that the main issue was the inability to obtain new manufacturing equipment. Sienko emphasized the importance of import substitution and hoped that by 2020 the problem of sourcing engineering tools could be solved by acquiring them from new Russian firms.[33] Sanctions have also halted joint development efforts with foreign companies such as Caterpillar, Renault, and Bombardier. Though the sanctions are likely to have their greatest direct effect on UVZ's civilian production lines, all of the firm's activities are likely to be affected by the sanctions. Typically, an even split occurs between civilian and military production in UVZ, but

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[25] Vasiliy Fofanov, "Short Term Rearmament Prospects of Russia's Armored Forces," *Moscow Defense Brief*, Vol. 1, No. 11, 2008.

[26] Mikhail Barabanov, "Russian Tank Production Sets a New Record," *Moscow Defense Brief*, Vol. 2, No. 16, 2009.

[27] Gorenburg, Zalasky, and Kassianova, 2012.

[28] Andrew E. Kramer, "Labor Unrest Stirs in Russia as an Economic Chill Sets In," *New York Times*, February 24, 2016; Gorenburg, Zalasky, and Kassianova, 2012, pp. 207–208.

[29] "*Oleg Sienko: Armata ruchnoy raboty v tri raza deshevle Abramsa*" ["Oleg Sienko: The Armata is Three Times Cheaper Than the Abrams"], *RIA Novosti*, April 18, 2016.

[30] "*'Uralvagonzavod' zaprosil gosgarantii na summu do 60 mlrd rubley*" ["Uralvagonzavod Requested State Guaranteed Credits Worth 60 Billion Rubles"], *Interfax*, May 25, 2015; "*'Uralvagonzavodu' odobrili gosgarantii na 17 mlrd rubley*" ["State Guaranteed Credits Worth 17 Billion Rubles Were Approved for Uralvagonzavod"], *Interfax*, September 7, 2015.

[31] Anna Zibrova, Aleksey Nikolsky, and Aleksandr Vorobev, "Rogozin poprosil Putina smenit' rukovodstvo 'Uralvagonzavoda'" ["Rogozin Requested That Putin Change the Leadership of Uralvagonzavod"], *Vedomosti*, October 5, 2016.

[32] Anatoliy Temkin and Petr Kiryan, "Gendirektor Uralvagonzavoda—RBK: 'Stavki bol'she 9%—eto ubiystvo'" [Uralvagon CEO to RBC: Rates Over 9% Are Murder]," *RBC*, January 19, 2015; Yekaterina Zgirovskaya, "Zolotaya sotnya 'Armat'" [The Golden Hundred Armatas]," *Gazeta.ru*, April 19, 2016.

[33] "Oleg Sienko," 2016.

recently there has been a growing imbalance in favor of armored vehicle production.[34] Along with exports, UVZ's civilian sector has sustained the company in the past, such as in the 1990s, when military procurement was limited. Now, due to the sanctions, railcar production appears not only unable to support the military side in the event of slow procurement but is also proving to be a liability as its falling sales have led to UVZ's recent losses.[35]

Some indications suggest that 2017 will be a better year for UVZ. UVZ reported a 45 percent increase in revenue for the first quarter of 2017 compared with the previous year, which resulted in a near doubling of profit in the first three months of 2017.[36] The Russian MOD continues to pay for T-72B3 upgrades and the first low-rate production batch of Armata tanks, but UVZ has also, notably, secured some export successes. In early July, a leaked copy of the company's 2016 annual report contained information on recent export contracts and negotiations. These included:

- 64 T-90S series tanks to Vietnam
- 73 T-90S series tanks to Iraq
- 146 T-90MS series tanks to Kuwait
- Further work on tanks supplied to India, Belarus, and Armenia
- Spare parts supply to Ethiopia and Angola
- Development of the ability for Egypt to conduct licensed production of T-90S series tanks.[37]

These exports are in addition to the contract signed with India in November for the delivery of 464 T-90MS kits for about 2 billion dollars. The fact that T-90MS variants are being sold suggests a degree of maturity for the design.

Kurganmashzavod

Kurganmashzavod (KMZ) is located in Kurgan, Russia, a little over 1,000 miles east of Moscow and employs about 5,000 workers.[38] KMZ was a state-owned company from its founding in 1939 until 1992 when the Russian government privatized it.[39] That privatization was conducted as a kind of "experiment," with KMZ being one of the first state-owned defense firms to be shifted to private ownership.[40] As with other Russian defense firms, such as UVZ, KMZ's production was sustained, in part, by export contracts during the constrained spending environment of the 1990s. The UAE, Kuwait, South Korea, and Cyprus were among the recipients of KMZ products, chiefly the BMP-3 and its variants.[41] KMZ's succession of owners (with Concern Tractor Plants running KMZ from 2005 on) placed their

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[34] Temkin and Kiryan, 2015.

[35] Sergei Titov, "Minpromtorg rasskazal o plane spaseniya Uralvagonzavoda" ["The Ministry of Industry and Trade Told About the Plan to Save Uralvagonzavod"], *RBC*, August 1, 2016.

[36] Andrew MacDonald, "Uralvagonzavod Almost Doubles Q1 Profit in 2017," *Jane's Defence Weekly*, May 19, 2017.

[37] Jeremy Binnie, "Russia's T-90 Makes Inroads in Middle East Market," *Jane's Defence Weekly*, July 6, 2017.

[38] Gorenburg, Zalasky, and Kassianova, 2012, p. 210.

[39] Kurganmashzavod, "*Istoriya*" ["History"], website, undated.

[40] "*Voennyy divizion 'Traktornykh zavodov' perekhodit pod kontrol' 'Rostekha'*" ["The Military Division of 'Tractor Plants' Is Moving under the Control of 'Rostech'"], *bmpd* blog, November 11, 2016.

[41] Kurganmashzavod, undated.

hopes for profits in these exports, but the number and value of contracts did not live up to expectations.[42] At one point, in 2008, the company was forced to use its own stock as loan collateral to keep afloat.[43]

KMZ has struggled to meet its contractual obligations. In 2010, the MOD filed a lawsuit against KMZ for failure to deliver BMP-3s to the military. KMZ responded in kind with lawsuits accusing the MOD of not accepting the equipment.[44] Late deliveries of the BMD-4M have also been a source of contention. Only through appeals to Russian officials overseeing the defense sector was KMZ able to obtain new contracts, both for BMP-3s (with 200 to be delivered from 2015–2017) and a new IFV, the Kurganets-25.[45]

KMZ's unpaid debts have been a recurring problem for the firm. In December 2015, reports surfaced that KMZ was in danger of a work stoppage due to unpaid debts to Gazprom for natural gas. However, Gazprom stated that KMZ had begun paying back its gas debts and gas deliveries would continue.[46] In February 2016, KMZ was taken to court by one of its creditors who sought to have KMZ declared bankrupt due to unpaid debts on leasing contracts. KMZ owed 41 million rubles but paid only 276,000, leading to the lawsuit. KMZ avoided bankruptcy when the court invoked a statute protecting "strategically important enterprises."[47] Another lawsuit from one of KMZ's vendors, seeking payments on a 200 million-ruble debt, ended in similar fashion in April 2016.[48]

In 2016, the possibility surfaced of a Rostec takeover of KMZ. In June 2016, a working group had been convened to discuss KMZ's situation and future prospects. According to the group, "The current owners of KMZ have destroyed the technological capabilities of the factory and the human resources of the repair services which allow for the technological precision of equipment. They have practically destroyed the production capabilities of the factory." The working group also criticized the practice of Concern Tractor Plants management in which KMZ's financial resources were being used to support other firms. Concern Tractor Plants ownership reportedly proposed to Prime Minister Dmitri Medvedev a complete transfer of the firm's military assets (including KMZ) and a partial transfer of its civilian production to Rostec. According to the proposal and the recommendations of the working group, transferring KMZ to Rostec would allow for stricter government control of funds provided for GOZ procurement and prevent them from being shifted to other subsidiaries.[49] In November 2016, the transfer occurred, though it apparently covered only the military divisions—including KMZ—of Concern Tractor

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[42] "*Voennyy divizion 'Traktornykh zavodov' perekhodit pod kontrol' 'Rostekha*,'" 2016.

[43] Gorenburg, Zalasky, and Kassianova, 2012, p. 209.

[44] Russian Defense Policy, "Suit, Countersuit Over GOZ," October 14, 2011c.

[45] Gorenburg, Zalasky, and Kassianova, 2012, p. 210; "*Proizvoditel': Minoborony RF do kontsa 2017 goda poluchit bol'she 200 novykh BMP-3*" ["Manufacturer: The Ministry of Defense of the Russian Federation Will Receive More Than 200 New BMP-3s by the End of 2017"], September 9, 2015.

[46] "Russia's Sole Manufacturer of Armored Vehicles May Grind to a Halt Over Debts," *TASS*, December 29, 2015.

[47] Nikolai Novichkov, "Urals Arbitration Court Rejects Claim to Bankrupt Major Russian Armour Producer," *Janes*, February 26, 2016.

[48] "*Delo o bankrotstve 'Kurganmashzavoda' prekrashcheno*" ["The Kurganmashzavod Bankruptcy Case Has Been Stopped"], *Voenno-promyshlennyi Kuryer*, April 18, 2016.

[49] Vera Musina, "*Spasyot li 'Rostekh' Kurganmashzavod?*" ["Will Rostech Save Kurgamashzavod?"], *Kikonline.ru*, August 22, 2016.

Plants.[50] In late December 2016, Rostec also gained control of tank manufacturer Uralvagonzavod. Rostec's CEO Sergei Chemezov raised the possibility of the creation of a unified armored vehicle holding company through the combination of KMZ and UVZ.[51]

Arzamas Machine-Building Plant

Arzamas Machine-Building Plant (AMZ) is one of the firms managed by Voyenno-Promyshlennaya Kompaniya (VPK), a large holding company that oversees several defense firms dealing chiefly with military vehicles. VPK, in turn, falls under Russian Machines, a holding company owned by Oleg Deripaska. AMZ is located in the city of Arzamas, about 250 miles east of Moscow. AMZ was privatized in 1993 and entered into the VPK/Russian Machines corporate structure in 2006.[52]

AMZ has apparently fared better than either KMZ or UVZ. Whereas Russia's IFV and tank manufacturers have been weighed down by unprofitable subsidiaries or other firms belonging to their parent companies, AMZ may be able to leverage its relationships with other Russian vehicle manufacturers (such as GAZ) that fall within Russian Machines to aid its own production.[53] According to AMZ, its volume of production grows from 20 percent to 25 percent yearly, enabling it to expand production and hire more workers.[54] AMZ's 2015 yearly report shows a steady trend of revenue growth and states its financial situation is "sufficiently stable."[55] Some of this revenue has been used by AMZ to acquire foreign equipment to modernize its facilities, but the effect of sanctions on this activity—as well as partnerships with other firms abroad—is not clear.[56]

AMZ did lose out on the BTR-90, expected to be the successor to the BTR-80, when the Russian MOD declined to procure the new APC.[57] However, AMZ was able to obtain a three-year contract in 2011 to produce the BTR-82, a modernized version of the BTR-80.[58] The firm has had success in gaining further contracts for BTR-82 production and modernization.[59] AMZ will also be involved in the creation of Russia's next generation of armored vehicles with its development of the Bumerang wheeled APC.[60]

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[50] "*'Rostekh' sobralsya poluchit' ves' voennyy segment 'Traktornykh zavodov'*" ["Rostech Has Prepared to Receive the Entire Military Segment of 'Tractor Plants'"], *Interfax*, November 23, 2016.

[51] "*'Kurganmashzavod' i UVZ mogut byt' ob"edineny v kholding po proizvodstvu bronetekhniki*" ["Kurganmashzavod and UVZ May be Combined in an Armored Vehicle Holding"], *Kommersant*, December 27, 2016.

[52] Arzamas Machine-Building Plant, "*Istoriya Predpriyatiya*" ["History of the Enterprise"], *amz.ru*, undated.

[53] Gorenburg, Zalasky, and Kassianova, 2012, p. 214.

[54] "*Arzamasskiy mashinostroitel'nyy zavod otkazalsya ot dvigateley Cummins dlya 'Tigrov'*" ["Arzamas Machine Building Plant Has Rejected Cummins Engines for the 'Tigr'"], *Kommersant*, June 2, 2016.

[55] "*Godovoi otchet za 2015 god*" ["Yearly Report for 2015"], Arzamasskii priborostroitel'nyi zavod imeni P. I. Plandina, Arzamas, 2016.

[56] Gorenburg, Zalasky, and Kassianova, 2012, pp. 213–214.

[57] "*Minoborony RF otkazalos' zakupat' bronetransportery BTR-90*" ["The Ministry of Defense of the Russian Federation Has Refused to Purchase the BTR-90"], *Interfax*, October 27, 2011.

[58] Gorenburg, Zalasky, and Kassianova, 2012, p. 213.

[59] "*Minoborony zaklyuchilo kontrakt na postavku 20 BTR-82A*" ["The Ministry of Defense Has Concluded a Contract for the Delivery of 20 BTR-82As"], *RIA Novosti*, April 10, 2016.

[60] Gorenburg, Zalasky, and Kassianova, 2012, pp. 213–214.

Outlook

This section discusses the potential future trajectories of Russian armored vehicle development and the concepts associated with the modernization of their maneuver forces. Broadly, it is clear that the ground forces modernization effort remains in flux. As will be shown, the final shape of the next generation of Russian fighting vehicles has yet to emerge. There will not be sufficient resources for anything close to a full replacement of any of the vehicle fleets, let alone all of them, by the end of the next decade.

It should be clear by this point that Russian armored vehicle development stalled after the end of the Cold War and has not recovered. However, it is also the case that in many respects the end of the Cold War ended a great deal of R&D into ground combat systems around the world. Russia has closed some of the quality gap with the United States and NATO with relatively small investments because most countries have been minimizing expenditures on expensive heavy armor. That said, there are areas in which technology development has proceeded apace, including in unmanned systems, communications technologies, and sensors. It is less clear that, facing competition from U.S., European, and Asian firms, Russian companies will be able to keep up unless allowed to work with foreign partners.

Doctrine and Operating Concepts

At present, it does not appear that any radical changes in the doctrine, organization, or force structure of the ground forces from the maneuver perspective are likely to occur soon.

Future Resources and Funding

This section describes the characteristics and capabilities of the potential next generation of combat vehicles that may enter Russian service. These include three new families of vehicles: the Armata heavy tracked chassis; the Kurganetz medium tracked chassis; and the Bumerang 8x8 medium wheeled chassis.

Armata and the Next Tank

Russia's next tank may very well not be the T-14 Armata concept vehicle that was unveiled at the 2015 Victory Day parade in Moscow. The Armata MBT, which is not scheduled to enter state acceptance trials for another year, may well evolve considerably before it reaches initial operating capability, currently scheduled for 2020. It is important to note, however, that most of the subsystems on the T-14 can be spun off and used to equip modernized versions of legacy vehicles. Despite some claims that the T-14 Armata is a potential breakthrough in tank design, it remains to be seen what its final form will be. It appears to be at the point where design trades are still being made to balance cost and performance. A report by UK military intelligence calls the Armata "the most revolutionary tank in a generation," but with the system still undergoing trials, it is likely too soon to evaluate the Armata.[61] The first 20 T-14 tanks were delivered in 2015 for testing and evaluation.[62] In April 2016, reports surfaced that the Russian military would receive

[61] Robert Mendick, Ben Farmer, and Roland Oliphant, "UK Military Intelligence Issues Warning over Russian Supertank Threat," *The Telegraph*, November 6, 2016.

[62] *Janes*, 2016; Tomas Malmlof, "A Case Study of Russo-Ukrainian Defense Industrial Cooperation: Russian Dilemmas," *The Journal of Slavic Military Studies*, Vol. 29, No. 116, February 16, 2016, pp. 1–22.

100 T-14s in 2017 and 2018; later, in September 2016, that number appeared to be revised down to 70 and the timetable stretched to the end of 2019.[63]

UVZ has also received a contract for the modernization of T-90 to an improved standard. Alexander Shevchenko, chief of armored vehicle development for the Russian MOD, claimed at the 2016 Russia Arms Expo that this will be the Proryv-3 (Breakthrough-3).[64] This is believed to be the T-90M, which would be an improved version of the T-90A that includes a new main gun (the same 2A82 125mm as seen on the T-14 Armata prototype) in a redesigned turret, as well as improvements to fire control, protection, and a new, more powerful engine. T-90M may be a more economical way to field some of the improvements developed for Armata across a larger portion of the ground forces.

For infantry fighting vehicles, KMZ continues to develop the Kurganets-25, part of a wave of new, medium-weight tracked vehicles Russia hopes to incorporate into its armored forces. The Kurganets-25 will come in IFV and APC configurations (along with an array of specialized variants). The Kurganets-25 (along with the T-14 Armata and other new systems) is thought to represent a shift in Russian armored vehicle design toward greater protection, a trend in line with Western weapons development. The IFV and APC will carry seven and eight soldiers, respectively, and will have more spacious compartments and faster exit ramps compared with the cramped insides of legacy BMPs. Other features include modern fire control systems, a more powerful engine enabling it to reach speeds of 80 kilometers per hour, and an amphibious capability. The Kurganets-25 will be heavier than its BMP predecessors, an indication of improved protection.[65] In September 2015, Concern Tractor Plants management announced that the development cycle for the Kurganets-25 would be pushed back a year, with development to be completed by the end of 2016 to allow for state testing in 2017. The chief reason for the delay was the Kurganets-25's height, which increased its vulnerability to antitank weapons.[66]

Meanwhile, AMZ's Bumerang APC is also under development. As with the tracked Kurganets-25, the eight-wheeled Bumerang places a new emphasis on crew and passenger survivability. Lack of protection is seen to be the biggest drawback of the BTR-80 and its variants; soldiers often prefer to ride on top of, rather than inside, BTR-80s due to the vehicle's insufficient protection. Composite armor, vehicle layout, and exit ramps (the Bumerang will carry nine soldiers) have been incorporated in the Bumerang with protection in mind. Russia's ground forces commander stated that the Bumerang will have comparable protection to equivalent vehicles fielded by NATO. Like other new Russian vehicles, the Bumerang is reported to be equipped with a suite of new fire control and sensor systems, which will improve target acquisition and gunner-commander coordination. Production of the Bumerang is scheduled to begin in 2017 with delivery to the army in 2019.[67]

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63 "*Istochnik: armiya RF k 2020 godu poluchit okolo 70 seriynykh tankov 'Armata'*" ["Source: The Russian Federation Army by 2020 Will Receive Around 70 Armata Tanks"], *TASS*, September 10, 2016.

64 "Russia to Modernize Several Hundred T-90 Battle Tanks—Defense Ministry," *Sputnik News*, September 9, 2016.

65 Sebastien Roblin, "Russia Hopes Its New Super Combat Vehicle Will Rule the Battlefield," *The National Interest*, July 30, 2016; "Kurganets-25 Infantry Fighting Vehicle," *Janes*, September 1, 2016; Christopher F. Foss, "RAE 2015: Kurganets 25 Family Undergoing Trials," *Janes*, September 15, 2015.

66 "*Gosispytaniya BMP 'Kurganets-25' zaplanirovali na 2017 god*," 2015.

67 Ivan Petrov, "*Na brone i na plavu*" ["On the Armor and Afloat"], *Rossiyskaya Gazeta*, February 2, 2016; "Military-Industrial Company Bumerang (Boomerang) Armored Personnel Carrier/Infantry Fighting Vehicle," *Janes*, November 3, 2015; Dmitri Grigorev, "*BTR 'Bumerang po ognevoy moshchi ne ustupit kolesnoy BMP*" ["BTR Bumerang's Firepower Is Not Inferior to Wheeled Infantry Fighting Vehicles"], *Rossiyskaya Gazeta*, January 2, 2017.

Figure E.3
Epoch "Universal Combat Module" Remote Turret on Kurganetz-25

SOURCE: "General Rehearsal of 2016 Moscow Victory Day Parade," Vitaly Kuzmin blog.

It is worth highlighting some of the effort Russia is taking to improve commonality of key systems across its highly diverse fleet of vehicles. For example, all three of the new classes of infantry fighting vehicles—the T-15 Armata IFV, the Kurganets-25 (see Figure E.3), and the Bumerang-BM—were seen in the 2015 parade with a common remote turret, the Epoch, which is armed with a 30mm cannon and four Kornet ATGMs.

Similar efforts to leverage commonality have taken place in vehicle fire control systems, sensors, and protective technologies, including explosive reactive armor and active protection systems. In particular, the development of an affordable and operationally effective hard-kill active protection system (i.e., one that employs a kinetic countermeasure to defeat an incoming projectile) has been a challenge for the U.S. military, because there are considerable technological obstacles to overcome. Russia's continued development of Arena-M and Afghanit hard-kill active protection suggests that these may eventually find their way on production vehicles, though it is unclear what technical limitations they will face.

APPENDIX F

Indirect Fires

Edward Geist

Recent History

For the purposes of this report, we define "indirect fires" to include ground-based Russian artillery and rocket systems with a range less than 100 km whose projectiles follow ballistic (i.e., "indirect") trajectories. Systems currently deployed by Russian ground forces include artillery pieces such as howitzers and mortars, as well as tube artillery systems with rockets 122mm, 220mm, and 300mm in diameter. Indirect fires played a central role in the Soviet army's operating concepts, and the USSR procured such systems in enormous quantities. While present-day Russian ground forces deploy only a limited fraction of the number of indirect fires its Soviet predecessor did, they still are deeply integrated into its approach to tactical operations. The immense inventory of indirect fires inherited from the Soviet Union helped discourage domestic investment in new multiple rocket launcher (MRL) and artillery systems, with most of the impetus for new development in the 1990s and 2000s coming from export orders. Under the 2020 SAP, however, the Russian military has begun procuring modernized indirect fires, including the Koalitsiia-SV self-propelled howitzer and the Tornado-G and Tornado-S tube artillery launchers. For the immediate future, however, the bulk of the Russian army's indirect fires will consist of modernized Soviet-era systems.

Doctrine and Operating Concepts

Traditionally, indirect fires figured prominently in Russian military planners' vision of how a war will be fought. In light of the Russian Army's embarrassing defeats in the Russo-Japanese War and the First World War, in the 1920s and 1930s Soviet military theorists developed the concept of "deep battle," which emphasized combined arms operations at the tactical, operational, and strategic levels. These thinkers, including Vladimir Triandafillov and Mikhail Tukhachevsky, envisioned that these deep operations would employ indirect fires at all three of these levels, with the goal of breaching enemy forward defenses with combined arms assaults and then exploiting these openings by using artillery and rockets to prevent the adversary from plugging the gaps. While the Red Army initially adopted an offense-oriented version of this doctrine that contributed to its disastrous defeats in the early phases of the German invasion, after the USSR's victory in World War II Soviet military leaders attributed their success to the deep battle. In the postwar period, the Soviet military incorporated the lessons of WWII into a

modernized version of deep battle, and the concept profoundly influenced military thinking in many foreign countries, including the United States.

The Russians distinguish their indirect fires by size between battalion and brigade artillery. Artillery units equipped with self-propelled guns or MRL systems are either incorporated organically with brigades as Brigade Artillery Groups for combined operations or are available as reinforcements from the Army Artillery Group. A typical Brigade Artillery Group includes two 152mm howitzer battalions and one 122mm MRL battalion. Larger MRL systems are attached to brigades in support of offensives and other operations.[1]

Despite the introduction of precision indirect fires with substantially increased ranges, the operating concepts for their employment found in recent Russian military writings have changed relatively little since the late Soviet period. One recent Western analysis argues that the Russians plan to counter Western precision munitions with a combination of massed fires and electronic countermeasures, with only selective use of Russian precision munitions against enemy targets. Neither Russian military writings nor the pattern of its defense procurement offer much insight into whether Russian military planners anticipate a substantial shift away from massed fire concepts in favor of higher precision as new systems such as the Koalitsiia-SV and the Tornado-G enter service. The equipping of newly formed units with inaccurate mass fire systems such as the BM-21 Grad MRL indicates that the Russians believe such weapons are still worth the investment.[2] It should be noted, as well, that the latest Russian systems are well adapted to employ inexpensive unguided munitions for mass fire operations as well as precision strikes. The Tornado-G can fire the same unguided rockets used by the Grad, both guided rockets with a 40 km range, and the Koalitsiia-SV can sustain an extremely high rate of fire thanks to its fully automated turret.

Recent Operations

Recent Russian military engagements in Ukraine and Syria reveal that, while the bulk of Russian indirect fires are slightly modernized Soviet-era designs, these are becoming more effective thanks to their integration with modern technologies, such as the use of drones as artillery spotters. The emerging combination of inexpensive legacy systems with better targeting could enable Russian ground forces to achieve a happy medium between the Soviet-era mass fires concept and the advantages of precision munitions. Costly precision fires could be conserved for targets that absolutely demand them, while mass fires could be made more discriminate, conserving munitions and reducing friendly fire incidents.

Ukraine

Russian, Ukrainian, and rebel forces in the Donbas are all armed with Soviet-made indirect fires, including Msta howitzers and, particularly, BM-21 Grad MRL systems. Both sides in the conflict have accused the other of indiscriminate tube artillery attacks against inappropriate targets. Given the clandestine and irregular nature of Russian military involvement in eastern Ukraine, it is difficult to ascertain what uses of indirect fires against Ukrainian positions were carried out by the Russian military and which were carried out by poorly trained rebel forces. The U.S. State Department charged that the July 11, 2014, MRL attacks against Ukrainian

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1 Grau and Bartles, 2016, p. 105.

2 "The New Motorized Rifle Brigade of the Central Command Was Reinforced with Ten 'Grad' MLRs" ["*Novuiu motostrelkovuio brigadu TsVO usilili desiat'iu RSVO 'Grad'*"], *Novosti VPK*, January 13, 2017.

positions in Zelenopillya were carried out by Russian 122mm tube artillery in Gukovo, a town on the Russian side of the border.[3]

Syria

Russian forces have deployed both artillery and MRL systems to support their operations in Syria. These include both Msta-B howitzers and BM-21 Grad launchers.[4] Russia has also provided Grads and heavy MRL Smerch and Uragan systems to the Syrian army.[5] Next-generation Russian indirect fires such as the Tornado have not been sent to the country, nor have large self-propelled artillery such as the Msta-S.

Exercises

The Russian military regularly conducts military exercises including artillery and MRLs. These include live-fire exercises in which different types of indirect fires practice coordinating their attack against a stationary or moving target.[6] To date these exercises are reported to have made little use of precision munitions, presumably due to their prohibitive cost.[7]

Current Systems

Indirect fires are proving to be one of the most enduring legacies of the enormous arsenal Russia inherited from the Soviet Union. While much Soviet-era weaponry has long since outlived its military usefulness, the USSR's self-propelled artillery and MRL systems are still in use, both in Russia and in dozens of foreign armies. Until the present decade, the Kremlin neglected to fund the development of next-generation indirect fires for the Russian ground forces. While Russia's defense-industrial complex developed improved munitions and launchers for the export market, the Russian military acquired few of them until the 2020 State Armaments Plan. Procurement by the Russian military of next-generation indirect fires remains relatively slow, with relatively few Tornado MRL systems and no finalized Koalitsiia-SVs in service as of early 2017 (see Table F.1). New purchases of BM-21 Grads and modernized Msta-SMs suggest that the Russian military believes these offer a better value than their costly modernized counterparts.

Multiple Rocket Launchers

Multiple rocket launchers (MRL) enjoy a privileged position in Russian military culture, and recent efforts to develop modernized indirect fires have emphasized them. MLRs—dubbed

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[3] Michael Weiss and James Miller, "Russia Is Firing Missiles at Ukraine," *Foreign Policy*, July 17, 2014. Ukrainian media asserted that these attacks were carried out using the Tornado-G rather than the older Grad; "*Soldaty v Zelenopili zagynuly ot novitn'oho rosiis'koho 'Tornado-G'—ZMI*," *Unian*, July 13, 2014.

[4] Ruslan Mel'nikov, "*V Sirii v boi vstupili novye rossiiskie RSZO 'Grad'*" ["New Russian 'Grad' MRLs Were Used in Syria in Syria"], *Rossiskaia Gazeta*, March 17, 2017.

[5] "*RSZO 'Uragan' v Sirii*" ["Uragan in Syria"], *Voennoe obozrenie*, November 23, 2016; "*V Sirii poiavilis' tiazhelye reaktivnye sistemy zaplavogo ognia 'Smerch'*" ["Heavy Rocket Systems of Volley Fire BM-30 'Smerch' Used in Syria"], *Voennyi informator*, September 29, 2015.

[6] "*Voennye ucheniia rossiiskoi artilerii proshli pod Orenburgom*" ["Military Exercises of Russian Artillery Were Held Near Orenburg"], *Sputnik*, March 23, 2017.

[7] Maksim Tikhonov, "*Shkvalnyi ogon' obrushili artilleristy na 'vraga' na poligone v Primor'e*" ["An Artillery Barrage Rained Down on the 'Enemy' at the Primor'e Testing Range"], *VL.ru*, March 22, 2017.

Table F.1
Russian Rocket Artillery

	Name	Designer	Producer	Entered Service	Last Produced	Active Inventory (2017)
9K51	Grad	Splav	Splav	1963	1988?	~550/2550
9K51M	Tornado-G	Splav	Splav	2014	In production	74?
9K58	Smerch	Splav	Splav	1989	???	100
9K515	Tornado-S	Splav	Splav	2016	In production	24?
9K512	Uragan	Motovilikhinskie Zavody	Motovilikhinskie Zavody	1975	1991	200/900
9K515	Uragan 1-M	Motovilikhinskie Zavody	Motovilikhinskie Zavody	2017?	In production	8

SOURCE: IISS, 2016.

Katiushas after a Stalin-era song—formed a significant part of the Red Army's armament in World War II, and these weapons are as prominent in Russian popular memory of that conflict as the T-34 tank. In the 1960s the USSR introduced the postwar successor to the Katiusha, the BM-21 Grad MLR (Figure F.1, left). Many thousands of these launchers were built for the Red Army between 1963 and 1988, while thousands more were exported. The 122mm Grad has seen service in dozens of conflicts in many parts of the world; even today it remains in service in over 50 armies.

However, the venerable Grad is now seriously outdated, which impelled the development of its replacement, the Tornado-G (Figure F.1, right). This system employs rockets the same diameter as the Grad but features modern guidance and control systems (see Table F.2 for a list of compatible 122mm rockets). The Tornado-G can be emplaced and ready to fire in a fraction of the time required by its predecessor, and it boasts more capable self-locating and laying features. Its designer claims it is "15 times as effective" as the Grad, while Russian media accounts make more modest assertions that it is "2–3 times as effective."[8] Irrespective of whether the system is an astronomical or more modest improvement over its predecessor, it is only available in limited numbers. Its development seems to have been relatively troubled, and the initial versions shown to the public in the early 2010s looked very different from those now being delivered to the Russian ground forces. Accounts vary as to exactly when the Tornado-G first entered service, but until late 2016 it seems that only a few dozen launchers were available, possibly not in complete battalion sets.[9] Recent media reports state that the Russian military received two additional battalion sets (36 launchers), but it also regularly reports that Russian

[8] "*Razrabotchik: noveishaia RSZO 'Tornado-G' v 15 raz efektivnee 'Grada'*" ["Newest 'Tornado-G' MRL Is 15 Times More Effective than 'Grad'"], *RIA Novosti*, June 4, 2015; "*Artilleristy ZVO gotoviatsia k pervym strel'bam is RSZO 'Tornado-G,'*" ["The Artillerymen of the Western Military District (ZVO) Are Preparing for the First Practical Shooting from the Multiple Rocket Launchers (MRLs) Tornado-G"], *RIA Novosti*, February 1, 2017.

[9] "*Okolo 20 RSZO 'Tornado-G' usiliat voronezhskii motostrelkov*" ["About 20 MLV 'Tornado-G' Will Strengthen Voronezh Motorized Units"], *Novosti VPK*, October 3, 2016.

Figure F.1
BM-21 Grad Launcher and Tornado-G Launcher

SOURCE: Vitaly Kuzmin.
NOTE: The photos are licensed under the Creative Commons. The BM-21 Grad is on the left and the Tornado-G is on the right.

Table F.2
Selected Russian 122mm Rockets

Name	Type	Minimum Range (km)	Maximum Range (km)
9M22	Fragmentation	5	20.4
9M521	Guided fragmentation	15	40
9M522	Guided fragmentation	8	34
3M16	Antipersonnel minelayer	2.5	13.4
9M28K	Antitank minelayer	2.5	13.4
9M217	Guided cluster	8	30
9M218	Guided cluster	8	30
9M28D	Leaflet scattering	1.65	15.42
9M519	EW	4.5	18.3
Ugroza 1-M	Laser-guided fragmentation	1.6	42

SOURCE: IHS Markit, "122mm BM-21 Grad-Series Rockets," in *Jane's Ammunition Handbook*, updated May 12, 2017.

military units have received Grad launchers.[10] Assistant Defense Minister Iurii Borisov claimed in April 2016 that the Russian army planned to purchase 700 new MRLs through 2020, but it he did not clarify the relative proportions of legacy systems like the Grad and next-generation systems such as the Tornado-G.[11]

The Russian media regularly claims that the Smerch rocket launcher (Figure F.2, left) is the most powerful nonnuclear weapon in the inventory of the Russian ground forces. The

[10] "The New Motorized Rifle Brigade of the Central Command Was Reinforced with Ten 'Grad' MRLs," 2017.

[11] "*Iurii Borisov: Minoborony Rossii kupit do 2020 goda eshche okolo 700 RSVO*" ["Yuriy Borisov: Russia's Defense Ministry Will Purchase About 700 MRLs by 2020"], *Novosti VPK*, November 4, 2016.

Figure F.2
Smerch and Tornado-S Launchers

SOURCE: NPO Splav.

Table F.3
Selected Russian 300mm Rockets

Name	Type	Minimum Range (km)	Maximum Range (km)
9M55	Cluster	20	70
9M55K1	Self-guided cluster	20	70
9M55K4	Antitank minelayer	20	70
9M55K5	Antiarmor fragmentation	25	70
9M55F	Fragmentation	25	70
9M55S	Thermobaric	25	70
9M528	Fragmentation	25	90
9M534	UAV delivery	20	90
9M542	Guided fragmentation/cluster	???	120

SOURCE: "*Reaktivnaia sistema zaplavogo ognia 9K58 Smerch*" ["9K58 Smerch Multiple Rocket Launcher"], *Russian Arms Forum*.

Smerch was developed in the 1980s and is a much larger (300mm versus 120mm) rocket compared with the Grad and Tornado-G. (See Table F.3 for a list of compatible 300mm rockets.) The Smerch is a relatively popular export item, and while far fewer states have it than the Grad, most of those that have been manufactured are in the possession of countries other than Russia. Russian ground forces have about 100 Smerch launchers at present.

The modernized successor of the Smerch, the Tornado-S, entered service with the Russian ground forces at the end of 2016. The Tornado-S (Figure F.2, right) is a 300mm rocket like the Smerch but includes similar guidance and accuracy improvements as the Tornado-G. Two 12-launcher brigades are presently available.[12] It is unclear how much the loss of Ukrainian components impaired Russian MRL production, but the director of the factory that makes the Smerch

[12] "*Armiia poluchila pervuiu partiu RSVO 'Tornado-S*" ["Army Received the First Batch of 'Tornado-S' MRLs"], *RIA Novosti*, December 29, 2016.

Figure F.3
Uragan and Uragan-1M Launchers

SOURCE: Wikimedia, Motovilikhinskie Zavody.

Table F.4
Selected Russian 220mm Rockets

Name	Type	Minimum Range (km)	Maximum Range (km)
9M27F	Fragmentation	10	35
9M27K1	Cluster	10	35
9M27K2	Antitank minelayer	10	35
9M27K3	Antipersonnel minelayer	8	34
9M59	Antitank minelayer	10	35
9M51	Thermobaric	5	13

SOURCE: IHS Markit, "220mm Uragan Rockets," in *Jane's Ammunition Handbook*, updated July 17, 2017.

stated in a January 2017 interview that its rocket launch tubes had been imported from Ukraine and that the firm had developed a domestic substitute.[13]

The 9P140 Uragan self-propelled rocket launcher first entered service with the Red Army in the late 1970s. This 220mm rocket launcher can use a variety of projectiles, including high-explosive fragmentation, antipersonnel fragmentation, thermobaric, and antipersonnel mine-laying munitions. (See Table F.4 for a list of compatible 220mm munitions.) Russia presently has about 900 of these launchers inherited from the USSR, with about 200 in active inventory. The Uragan-1M is not just a modernized version of the earlier Uragan but, rather, a completely new system with a new launcher that employs interchangeable launch tube modules. The Uragan-1M offers not merely guidance and accuracy upgrades but also the ability to use both the 220mm projectiles from the original Uragan and the 300mm rockets employed by the Smerch and Tornado-S.[14] According to Russian media reports, this design

[13] "*Dostoinye nasledniki 'Katiushi'*" ["Worthy Heirs of 'Katyusha'"], *Novosti VPK*, January 26, 2017.

[14] Aleksandr Privalov, "*Svoi uchastnik khuzhe inostrantsa*" ["Own Participants Are Worse Than Foreigners"], *Voenno-promyshlennyi Kuryer*, April 24, 2013; Stanislav Zakarian, "*Novaia RSVA 'Uragan-1M' nachala postupat' na vooruzhenie rossiiskoi armii*" ["Uragan-1M Received by Russian Army"], *IA "Oruzhiue Rossii,"* September 18, 2016.

offers the advantage of a substantially increased rate of fire, with the ability to fire two salvos without changing position, which, in turn, is useful "when the enemy is conducting anti-battery suppression." The initial eight Uragan-1Ms entered service with the Kantemirovka Tank Division's 275th Self-Propelled Artillery Regiment in the fall of 2017.[15]

Self-Propelled Mortars and Artillery

Self-propelled artillery was another category of weapon emphasized by Soviet ground forces more than their Western counterparts, and as a result, the Russian Federation inherited an immense, varied assortment of these systems (see Table F.5). The Russian arms industry no longer manufactures these systems in the immense quantities it did during the Cold War, but today it produces modernized self-propelled artillery for both domestic and export markets.

The largest Russian self-propelled artillery system is the 2S7 Pion/2S7M Malka, which carries a massive 203mm gun. The Malka is based on a T-80 chassis and entered service in 1983. While it was last produced in 1990, the Russian army is now taking them out of storage and returning them to the ground forces.[16] The 2S7 can fire shells at ranges up to 47 kilometers.

Russian ground forces also retain a small number of 2S4 Tiul'pan self-propelled mortars in active inventory. This 240mm self-propelled gun is based on the chassis from a Soviet mine-laying vehicle and entered service in 1972. Last produced in 1988, the Russian army has a total of about 430 2S4s, a few dozen of which have been taken out of storage. The Tiul'pan can fire the guided Smelchak mortar round, enabling it to carry out precision strikes. Furthermore, both the 2S4 and the 2S7 can deliver nuclear artillery rounds

Table F.5
Russian Self-Propelled Artillery

	Name	Designer	Producer	Entered Service	Last Produced	Active Inventory (2017)
2S7M	Malka	Barrikady	Barrikady	1986	1990	~16+/320
2S7	Pion	Barrikady	Barrikady	1983	1990	
2S19	Msta-S	Uraltransmash	Uraltransmash	1969	In production	450/600
2S5	Giatsant-S	Uraltransmash	Uraltransmash	1976	1993	150/950
2S3	Akatsiia	Uraltransmash	Uraltransmash	1971	In production?	800/1800
2S1	Gvozdika	KhTZ	KhTZ	1972	1991	150/2150
2S31	Vena	Motovilikhinskie Zavody	Motovilikhinskie Zavody	2010	In production	Few
2S34	Khosta	Motovilikhinskie Zavody	Motovilikhinskie Zavody	2017?	In production	~50
2S35	Koalitsiia	TsNII Burevestnik	Uraltransmash	2017?	In production	Few
2S4	Tiul'pan	Uraltransmash	Uraltransmash	1972	1988	10/430

SOURCE: IISS, 2016.

[15] Yevgeniy Andreyev, Bogdan Stepovoy, and Aleksey Ramm, "*Artilleriia narashivaet moshch': Armeiskie soedineniia usilivaetsiq tiazhelymi artsistemy*" ["Russian MoD Begins Large-Scale Reform of Artillery Units"], *Izvestiia*, December 14, 2017.

[16] IISS, 2016, p. 190.

In late 2017 the Russian military announced it was reintroducing heavy artillery brigades. According to a Russian expert quoted by *Izvestiia*, the Russia's experience in recent conflicts showed that 122mm and 152mm artillery was insufficient not only for the tasks of "destroying competently erected field fortifications" but also of "firing points in urban buildings." The 45th Svir Order of Bogdan Khmelnitskiy Heavy Artillery Brigade, which had been disbanded in 2009, was reinstated in 2017 and equipped with 16 2S7s and 8 2S4s. Artillery brigades in combined-arms armies are also receiving 2S4s and 2S7s. Russian military thinkers' return to heavy artillery is motivated by a belief that the combination of these legacy systems with new capabilities, such as UAV artillery spotters, will enable them to accomplish objectives similar to other, cost-prohibitive, precision munitions.[17]

The 2S19 Msta-S 152mm self-propelled howitzer (Figure F.4) is perhaps the most important Russian weapon in its class at present. It entered service in 1989 and remains a strong seller for export buyers. The Russian ground forces have around 600 of these systems, 450 of which are active.[18] Significantly, a substantial fraction of these are a modernized variant, the 2S19M2 (also referred to as the 2S33), and dozens more are on order from its manufacturer, Uraltransmash.[19] The 2S33 is reported to have a maximum rate of fire of ten rounds per minute, compared to

Figure F.4
S2S19M2 Msta-SM

SOURCE: Wikimedia Foundation.

[17] Andreyev, Stepovoy, and Ramm, 2017.

[18] IISS, 2016, p. 190.

[19] "*Uralvagonzavod podpisal kontrakty s Minoborony RF na summu bolee 8 mlrd rublei*" ["Contracts Worth Over 8 Billion Signed between Uralvagonzavod and the Russian Ministry of Defense"], *Mezhdu strok*, September 8, 2016.

Figure F.5
Koalitsiia-SV

SOURCE: Wikimedia Foundation.

eight for its closest U.S. counterpart, the Paladin M109A6.[20] In recent years, the MOD has also received newly completed examples of the previous upgrade, the 2S19M1.[21]

The planned successor to the Msta-S is the 2S35 Koalitsiia (Figure F.5). While examples of this system first appeared in the 2015 Moscow Victory Day Parade, it is arguably still under development, because existing units are based on a modified T-90 tank hull instead of the T-14 Armata hull envisioned for the final version. The Koalitsiia turret, like that of the Armata, is highly automated. The use of a pneumatic autoloader is expected to enable an extremely high rate of fire of 16+ rounds per minute, with a crew of only three people. Planned procurement of the 2S35 seems to be slipping, like that of the T-14, and it seems only a handful have been completed by early 2017.[22]

The 2S3 Akatsiia 152mm self-propelled gun dates back to the 1960s, but its most recent variant, the 2S3M2, has been in production since 2006. Russian ground forces have 1,800 2S3s, but the older variants are now badly outdated, and 1,000 are in storage. Many other examples of this weapon have been exported and remain in service.

The 2S5 Giatsint-S 152mm gun complements the 2S3 by offering longer range and a higher rate of fire. It was developed in the 1970s, entered service in 1978, and remained in production until 1993. The Russian Army retains 950 of these systems with 800 in storage.

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[20] *bmpd*, "*1-aia gvardeiskaia tankovaia armiia poluchaet novye samokhodnye 152-mm samokhodnye gaubitsy 2S33 'Msta-SM'*" ["First Guard Tank Army Receives New 152mm 'Msta-SM' Self-Propelled Howitzers"], March 12, 2016.

[21] *bmpd*, "*Proizvodstvo i modernizatsiia 152-mm samokhodnykh orudii na 'Uraltransmashe*'" ["Production and Modernization of 152-Mm Self-Propelled Guns On "Uraltransmash"], April 2, 2015.

[22] "*Rossiiskaia artilleria nachnet perevooruzhenie na 'Koalitsiiu' v blizhaishchee vremia*" ["Russian Artillery Will Begin Re-Equipping the 'Coalition' in the Near Future"], *Novosti VPK*, November 21, 2016.

The 2S1 Gvozdika amphibious 122mm self-propelled howitzer was introduced in the 1970s and produced in immense quantities. While production stopped in 1991, it remains in service with dozens of armies. The Russian ground forces retain only 150 of its 2,150 2S1s in active inventory, however. The 120mm 2S34 Khosta is the modernized replacement for the 2S1, which entered service with Russian ground forces in 2008. About 50 2S34s are in service as of 2016.

The 120mm 2S31 Vena is similar in armament and weight to the 2S34 but employs a more conventional layout. It is reputed to have entered service in 2010 but does not seem to have been produced in substantial numbers.

Towed Artillery

While towed artillery no longer plays as prominent a role in Russian military planning as it did in the mid-twentieth century, the guns employed by several of its self-propelled artillery systems also exist in standalone versions (Table F.6). Most towed artillery has been removed from active inventory and is now in storage, but some have been sent to Syria and employed in Russian operations there.[23]

Precision Munitions for Self-Propelled Guns and Towed Artillery

Russian ground forces still retain immense stockpiles of artillery shells dating back to the Soviet period, but these are incapable of realizing the potential of advanced systems such as the modernized Msta or Koalitsiia. In the 1980s the *Konstruktornoe Biuro Priborostroenie* (Instrument Design Bureau, KBP) developed the first guided Soviet artillery shells, the Krasnopol' and the Santimeter. Analogous to the U.S. M712 Copperhead, these employ various forms of laser guidance. KBP later developed a 120/122mm variant of the same technology, the Kitolov. KBP, which is today a part of the Rostec subsidiary NPO *Vysokotochnye Kompleksy*, makes these munitions for both domestic and export markets (in the latter case offering 155mm versions compatible with NATO guns). Russian news media have reported on various advanced artillery shells under development, such as the Krasnopol-D, a satellite-guided weapon analogous to the U.S. Excalibur that will supposedly be fired by the Koalitsiia-SV.[24] All these shells are manufactured by Kalashnikov, which is yet another Rostec subsidiary (see Table F.7 for a list of Russian precision artillery munitions). Substantially more exotic

Table F.6
Russian Towed Artillery

	Name	Designer	Producer	Entered Service	Last Produced	Active Inventory (2017)
2A65	Msta-B	Titan	Motovilikhinskie Zavody	1987	In production	150/750
2S36	Giatsant-S	Uraltransmash	Uraltransmash	1975	1989	0/1100

SOURCE: IISS, 2016.

[23] Roman Kamkov, "*V Sirii 'Msta-B' gotovy primenit' 'lazernye snariady'*" ["Russian 'Msta B' Ready to Use 'Laser Projectiles' in Syria"], *Novosti VPK*, April 4, 2016.

[24] Mariia Solodilovaia, "*Upravliamye artilleriiskie snariady: napravleniiasovershenstvovaniia*" ["Guided Artillery Shells: Directions of Improvement"], *Rostec*, October 1, 2013; "*V Sirii pervye primeneny rossiiskie upravliamye snariady 'Krasnopol'*" ["Russia Used Guided Projectiles 'Krasnopol' for the First Time in Syria"], *Voennoe obozrenie*, August 18, 2016.

Table F.7
Russian Precision Artillery Munitions

	Name	Type	Designer	Manufacturer	Caliber	Range
3OF39M	Krasnopol-M	Laser-guided	KBP Tula	Kalashnikov	152mm	25 km
3OF75	Santimeter-M	Passive laser-guided	KBP Tula	Kalashnikov	152mm	20 km
3VOF112	Kitolov-2M	Laser-guided	KBP Tula	Kalashnikov	120mm	12 km
n/a	Krasnopol-D	GPS-guided	KBP Tula	Kalashnikov	152mm	Under development

SOURCE: "*Artilleriiskie kompleksy upravliaemoe vooruzheniia*" ["Guided Artillery Weapon Complexes"], *KBP Tula*, undated.

are prospective "atomic" munitions supposedly being pursued with the assistance of Russian nuclear weapons designers. These are not tactical nuclear artillery shells but, rather, an attempt to employ the technology underlying the implosion mechanisms in nuclear weapons to make higher-performance conventional munitions.[25]

On May 16, 2015, Major-General Mikhail Matveevskii, commander of the Russian Ground Forces Rocket and Artillery Force, stated in a radio interview that new high-accuracy munitions "lacking foreign analogues" would be developed for the Koalitsiia-SV. These would complement a full set of both "conventional" and "specialized" munitions being developed for the system, which he characterized as including smoke, incendiary, and illumination rounds. The precision rounds, he asserted, would exceed their Western counterparts in both accuracy and range.[26] These advanced munitions would be necessary to realize the full potential of the Koalitsiia-SV, making it difficult to justify its high cost relative to modernized 2SM19M2s. These considerations surely figure into the decision by the MOD to delay procurement of the Koalitsiia, which is probably still not ready for serial production.[27]

Breathless media accounts aside, it does not appear that the Russians are presently placing a particularly high priority on stockpiling high-precision artillery munitions. As with their U.S. equivalents, high per-unit cost is surely a major disincentive. Nor is it clear that Russia can presently manufacture these weapons at a substantially higher rate. In 2013, *RIA Novosti* announced that Kalashnikov would be building a new plant to manufacture high-precision weapons for the MOD, but it is unclear whether this came to fruition.[28]

Personnel and Training

As with the rest of the Russian military, its artillery units are transitioning from a Soviet-style draft army to increased reliance on volunteers. Recent Russian media reports imply that volunteers are preferred for positions requiring a greater degree of skill, but that draftees still make

[25] Sergei Ptichkin, "*'Atomnye' snariady dliia 'Armaty'*" ["'Atomic' Shells for 'Armata'"], *Rossiiskaia gazeta*, May 14, 2015.

[26] "*Dlia samokhodnoi gaubitsy 'Koalitsiia-SV' budet razrabotan vysokotochnoi boepripas novogo pokoleniia*" ["New Generation of High-Precision Ammunition Developed for the Self-Propelled Howitzer 'Coalition-SV'"], *Novosti VPK*, May 19, 2015.

[27] Koalitsiia-SVs have appeared in the Moscow Victory Day parade since 2015, but these appear to be preproduction units expected to differ in major details from the ultimate production version.

[28] "*Kontsern 'Kalashnikov' planiruet postroit' zavod po proizvodstvy vysokotochnoi vooruzhenii*" ["Concern 'Kalashnikov' Plans to Build a Plant for the Production of Precision Weapons"], *Novosti VPK*, September 19, 2013.

up a significant fraction of artillerists. A March 2017 new article about a 5th Army training exercise in Sergeevka quoted the commander of a self-propelled howitzer division, noting that its Msta-S are manned entirely by volunteers. Lieutenant Colonel Aleksandr Poloshkov, the commander of the 5th Army's Rocket and Artillery, stated that while "part of the staff are conscripts, we have already recruited volunteers to those positions that primarily determine the fighting efficiency [*boesposbnost'*] of the unit." Poloshkov elaborated further that Russian artillery training is evolving to account for modern military conflict and the introduction of precision munitions in particular. He noted that while his unit's officers had trained last year in the use of the laser-guided Krasnopol shell, the remainder of its personnel will train to use it in the summer of 2017.[29]

Russian artillery officers train in one of the most venerable institutions of military education in Russia, the Mikhailov Military Artillery Academy. Originally founded in Saint Petersburg in the eighteenth century, since the collapse of the Soviet Union a series of mergers and reforms resulted in its incorporation with artillery schools in various parts of Russia. In keeping with Soviet practice, applicants with no military experience, ranging in age from 16 to 22, as well as older individuals who have already served, are eligible to apply for a five-year course of study. The academy has departments specializing in "artillery," "airborne and marine artillery," "rocket and MRL systems," and "artillery spotting and automated control systems."[30]

Recent media reports give little indication that there is a shortage of skilled artillery personnel in the Russian military relative to other specializations. In the early 2000s, news reports indicated that Russian ground forces had less than 80 percent of the artillery specialists it needed, but greater investment and the military reforms undertaken since 2008 seem to have alleviated this problem.[31]

Estimation of Resources Spent on Indirect Fires

Until recently, indirect fires represented only a minor part of total Russian defense spending. In the 1990s and 2000s, the firms producing them were kept afloat by robust export sales rather than the domestic market. CAST reported that ground forces were the planned recipients of only 15 percent of spending under the 2020 State Armaments Program, and indirect fires in turn represented only a minor share of that.[32] The SAP called for acquiring modernized indirect fires such as the Tornado-G and Tornado-S, but these did not begin entering regular service until the mid-2010s. Most recent Russian investment in indirect fires has been in the modernization of older systems, much more cost-effective on a per-unit basis.

While neither the Russian government nor defense industry publish detailed cost breakdown or per-unit costs for its next-generation indirect fires, it is possible to piece together some rough estimates on the basis of publicly available information. A report was published in the Russian media in 2015 stated that the per-unit cost of the Tornado-G was 32.5 million rubles,

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[29] Tikhonov, 2017.

[30] Mikhailovskaia Voennaia Artilleriskaia Akademiia, "*Postupaiushchim*" ["To the New Recruits"], *mvaa.mil.ru*, undated.

[31] Mikhail Khodarenok, "*Voennye reformy ispytyvaiut defetsit novatorstva*" ["Military Reforms Are Experiencing a Lack of Innovation"], *Nezavisimoe voennoe obozrenie*, July 20, 2001.

[32] CAST, 2015, p. 23.

about half a million dollars at the current exchange rate at the time.[33] About 74 of these systems have entered service so far, with an estimated total cost of 2.4 billion rubles (about 40 million dollars). No figures were found for the per-unit cost of the Tornado-S or the Uragan 1-M, but both of these must be much more expensive than the Tornado-G. Like the T-14 Armata, the Koalitsiia-SV appears to have a prohibitive per-unit cost. The versions of this system that have appeared in the Victory Day parade are not the ultimate version, because they are based on modified T-80 chassis instead of the Armata chassis planned for production. Despite this cost-saving measure, each prototype appears to have cost several million dollars to manufacture. Figures collected from Uraltransmash contracts by a Russian blogger found that the manufacture of ten prototype Koalitsiias in 2014 required the purchase of components costing more than 1.5 billion rubles.[34] Given that this does not include assembly costs and is probably not even a complete accounting of other inputs, each Koalitsiia-SV probably costs 200 million rubles and possibly considerably more. The final version employing the Armata hull is likely to be even more expensive. The director of UVZ stated in April 2017 that each T-14 Armata costs 250 million rubles, about $3.7 million dollars at current exchange rates, but other estimates are as high as 350 million rubles.[35]

The prohibitive purchase price of new systems such as the Koalitsiia is surely a factor in the decision to emphasize modernization of Soviet-era indirect fires in recent Russian procurement. The modernization of about 60 Msta self-propelled howitzers to 2S19M1 and 2S19M2s in 2014 required components that cost about the same as manufacturing the ten Koalitsiia prototypes. While the Koalitsiia has superior specifications, Russian defense planners seem to have reached a sensible conclusion that these are not generally worth paying more than six times the cost of a modernized Soviet-era platform, and additional acquisitions of these platforms were recently announced.[36] Similarly, some new rocket artillery units are still being equipped with BM-21 Grad launchers. While the Russian government has announced plans to purchase 700 MRL systems before the end of the decade, it is unclear how many of these will be next-generation platforms.[37] It seems that modernized legacy systems will make up the bulk of Russian indirect fires for the immediate term, and that additional budgetary stress will delay procurement of next-generation systems.

Defense Industrial Trends and Challenges

The Russian indirect fires industry has been troubled by irregular business and limited government support throughout the post-Soviet period. Throughout the 1990s and 2000s, the country's main manufacturers of MRLs and artillery depended upon export business for their survival. Much of the Soviet-era industry collapsed, and what remained was consolidated into

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[33] Evgenii Maliar, "*Sistema zplovnogo ognia: kharakteristiki. 'Tornado-G'—sistema zplovogo ognia*" ["Characteristics of the 'Tornado-G' System of Volley Fire"], FB.ru, May 27, 2015.

[34] bmpd, "*Proizvodstvo i modernizatsiia 152-mm samokhodnykh orudii na 'Uraltransmashe,'*" 2015.

[35] Oruzhie Rossii, "*Skol'ko stoit russkii tank 'Armata' i pochemu on luchshii?*" ["How Much Does 'Armata' Cost and Why Is It the Best Tank?"], *Oruzhie Rossii*, April 6, 2017.

[36] bmpd, "*Proizvodstvo i modernizatsiia 152-mm samokhodnykh orudii na 'Uraltransmashe,'*" 2015.

[37] "*Iurii Borisov: Minoborony Rossii kupit do 2020 goda eshche okolo 700 RSVO*," 2016.

two firms: Uraltransmash, which makes self-propelled guns, and Splav, which makes tube artillery along with its subsidiary Motovilikhinskie Zavody. At present both firms have been incorporated into the state holding company Rostec. The 2014 economic crisis hit these enterprises particularly hard, due to a loss of both domestic and export business as well as mismanagement of some of the enterprises. While the Russian government eventually intervened to help bail them out, its relatively slow and stingy support suggests that indirect fires are a lower priority than other areas of defense procurement.

Uraltransmash

Located in Yekaterinburg, Uraltransmash boasts that it is "one of the oldest concerns in the Urals," as it claims descent from an early-nineteenth-century gold ore processor. It is probably more accurate to date its founding to the latter months of 1941, when the Yekaterinburg factory Metallist, which made capital goods for the Soviet oil industry, received equipment and personnel evacuated from factories further west threatened by the German invasion. Converted to tank production, during the war the factory made the T-60 light tank as well as components for the famous T-34. During the Cold War, Uraltransmash became the USSR's premier maker of self-propelled artillery, which left it well placed to become Russia's only maker of these weapons in the post-Soviet period. The tank maker UVZ absorbed it in 2009.[38]

A casual visitor to Uraltransmash's website could be forgiven for believing that its days making military hardware were behind it, because it barely acknowledges this aspect of its operations. Instead, it showcases the plant's civilian production, which includes tramcars and equipment used for oil production. However, articles in the Russian defense industry press and the company's own financial documents make it clear that self-propelled artillery, particularly the venerable Msta-S, account for the vast majority of Uraltransmash's business. This dependency proved catastrophic in the aftermath of the 2014 Crimea crisis, when Iraq cancelled a 10.7-billion-ruble order for the Msta-S, which was expected to account for nearly half of the plant's total revenue that year. Instead, Uraltransmash's 2014 revenues totaled a mere 29.5 percent of what it had anticipated. This unanticipated misfortune, along with the collapse of demand for the factory's tramcars, threw the concern's finances into chaos and contributed to the bankruptcy and absorption by Rostec of its parent firm, Uralvagonzavod, in late 2016.[39]

The troubles of UVZ are the subject of regular comment among both Russians and Western observers, but it is unclear just how much the difficulties of Uraltransmash contributed to the crisis of its corporate parent. In 2014–2015, Uraltransmash rapidly descended from hopes of doubling its business thanks to Iraqi orders to a massive reduction in its revenue from both its military and civilian businesses. Interestingly, an audit conducted at the end of 2015 seems to indicate that revenues from Russian government defense sales also fell in 2015 relative to 2014. If so, this suggests that the Kremlin does not place a particularly high priority on Uraltransmash's output, including the high-profile Koalitsia-SV. The contrast between Uraltransmash and Novator—another poorly managed defense enterprise that received significant subsidies from the Russian government to maintain the country's ability to manufacture

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[38] NPO Splav, "*Istoriia AO "NPO 'Splav'"* ["The History of JSC SPA 'SPLAV'"], undated.

[39] Most media accounts attributed Uraltransmash's misfortunes primarily or solely to the cancellation of tramcar orders from Russian cities, even though publically available information makes clear that this resulted in only a fraction of the revenue loss caused by the cancellation of the Iraqi Msta-S order. *bmpd*, "*'Uraltransmash' postradal iz-za sryva kontrakta na postavku samokhodnykh gaubits 'Msta-S' v Irak*" ["Uraltransmash" Suffered from the Failure to Fulfill Contract Obligation to Supply Self-Propelled Howitzers 'Msta-S' to Iraq"], May 3, 2015.

long-range cruise missiles—is particularly striking. UVZ and Uraltransmash had to fall into a truly perilous state before Moscow felt the need to bail it out. This assistance took the form of an order in September 2016 for 42 new 2S19M2 Msta-SMs as well as the modernization of older 2S19s. Due to be completed in 2019, Russian media suggested that this business was intended both to prevent the total collapse of Uraltransmash and bankroll some desperately needed capital improvements at the plant.[40] The absence of the Koalitsiia-SV from these schemes suggests that it is either too immature for serial production or too expensive to justify the added cost relative to the Msta, quite possibly both.

Unstable and erratic management also seems to have contributed to Uraltransmash's woes. As a subsidiary of UVZ, the company is overseen by a board of directors consisting largely of senior managers from that firm. Until December 2015, Uraltransmash's general director was Aleksei Nosov, the well-connected brother of the mayor of Nizhnii Tagil, Sergei Nosov. In the face of the collapse of both its civilian and military business, Nosov requested assistance from UVZ management to help stem the crisis and apply pressure to renegotiate its contracts with the Russian MOD, only to be rebuffed. UVZ General Director Oleg Sienko complained that Uraltransmash was responsible for its own business and that Nosov ought to manage its problems on his own, its status as a wholly owned subsidiary notwithstanding.[41] In December 2015, Nosov resigned his position at Uraltransmash and was reassigned to another UVZ subsidiary in Yekaterinburg, tank gun maker Zavod No. 9, only to be fired the following June for almost never coming to work. Pavel Kolesnik was named acting General Director in his stead, but it was always understood that he would hold that role only temporarily. In July 2016, UVZ named Vladimir Gorodilov as Uraltransmash's new general director. The former head of the Engine Research Institute, a UVZ subsidiary that develops tank engines, Gorodilov was seen by many as a relief after the stress of the previous two years. A Yekaterinburg news website quoted an anonymous Uraltransmash employee, who said "after Nosov came things only ever went from bad to worse. They say that Gorodilov is experienced and sophisticated. We hope he'll be able to turn the situation around somehow."[42]

Uraltransmash is a mere shadow of its Soviet-era self and seems to be among the worst run enterprises in the Russian defense industry. In its heyday, the factory employed about 10,000 workers. In 2014, it employed an average of 3,429 workers, which dropped to 3,022 in 2015 following layoffs resulting from its economic distress.[43] Those employees lucky enough to keep their jobs suffered through substantial pay cuts, with annual monthly salaries falling 4.9 percent in nominal terms to 36,556 rubles.[44] While the 2015 audit claimed that "salaries were always paid on time" that year, in early 2016 Uraltransmash temporarily stopped paying its employees as a result of a conflict with the MOD over advance contract payments.[45] Appar-

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[40] "*Uralvagonzavod podpisal kontrakty s Minoborony RF na summu bolee 8 mlrd rublei*," 2016.

[41] Mariia Sharoglazova, "*Rukovodtsvo 'Uralvagonzavoda' vynuzhdeno vziat' na sebia funktsiii upravleniia predpriiatiem*" ["The Management of Uralvagonzavod Is Forced to Assume Managing the Enterprise"], *Pravda Urfo*, September 10, 2015.

[42] Sergei Panin, "*Na zavode—optimizm: mnogostradal'nomu Uraltransmashu naznachili novogo direktora*" ["Optimism at the Plant: The Long-Suffering Uraltransmash Appointed a New Director"], *E1.ru*, July 12, 2016a.

[43] OOO, "Interkom-Audit," *Auditorskoe zakliuchenie po o godovoi bukhalterskoi otchetnosti aktsionernogo obshchestva "Uraltransmash" za 2015 god*, May 10, 2016, p. 32.

[44] OOO, 2016, p. 45.

[45] Sergei Panin, "*Iz-za Ministerstva oborony sotrudniki Uraltransmasha na mesiats ostalis' bez zarplaty*" ["Due to the Ministry of Defense, Uraltranshash Employees Were Left Without Salary for a Month"], *E1.ru*, March 23, 2016b.

ently the vast majority of Uraltransmash's workers are employed in its defense business, because the tramcar production shop apparently comprised only 70 workers prior to the layoffs.[46] The discontent and low morale among the plant's staff is unusual in the contemporary Russian defense industry, making Uraltransmash unattractive for the skilled workers it needs to develop and manufacture advanced weapons. Like Novator, Uraltransmash is based in Yekaterinburg, one of Russia's largest cities. Uraltransmash's most crucial employees can probably find other work nearby if they look for it, and at this point, many of them probably are.

Uraltransmash's many problems call into question its ability to deliver militarily useful quantities of advanced indirect fires such as the Koalitsiia-SV to the Russian ground forces. It remains to be seen whether the absorption of its parent Uralvagonzavod into Rostec and additional MOD orders will be sufficient to salvage the enterprise.

NPO Splav

In contrast to Uraltransmash, Russia's sole manufacturer of tube artillery, NPO Splav (literally, "alloy"), enjoys robust corporate health, thanks in considerable part to strong demand for its products from foreign buyers. Based in Tula, which has been a center of the Russian arms industry since Tsarist times, Splav was officially founded in 1945 and has dominated the development of the country's tube artillery ever since. It designed the Grad and Smerch rocket launchers. During the Putin-era consolidation of the Russian defense industry into state-owned holding companies, Splav fell under the umbrella of Rostec while itself becoming a holding company incorporating various enterprises involved in tube artillery, including the Briansk Chemical Factory, the Novosibirsk Artificial Fiber Factory, and recently Motovilikhinskie Zavody, which manufactures the Uragan MRL as well as some smaller self-propelled artillery. Recent events, particularly the way in which Motovilikhinskie Zavody was forcefully incorporated into Splav in 2016, suggest that Rostec probably manages the holding in an imperious fashion that bypasses its formal institutions, such as its board of directors.[47]

While Splav and its subsidiaries produce a variety of nonmilitary goods, the company makes no effort to hide that it is primarily a manufacturer of tube artillery. These include naval systems in addition to those for the ground forces. The holding's civilian production is surprisingly diverse, including medical equipment, evaporative coolers, and furniture.

Splav owes much of its post-Soviet success to the wisdom of Nikolai Makarovets, who served as its general director from 1985 until 2015. A designer-manager in the Soviet mold, Makarovets diversified Splav's production and steered the firm through the troubled 1990s, a feat for which he was named a "Hero of the Russian Federation," Russia's highest award. In 2015, however, the Russian government issued a decree forbidding general director and chief designer positions to be held simultaneously by the same individual. The septuagenarian Makarovets, therefore, resigned from the former position but retained the latter.[48] Rostec management named Vladimir Lepin as temporary general director. Lepin's performance was apparently found satisfactory, because he was made Splav's permanent general director in 2016.

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[46] Mariia Chernykh, "*30 noven'kikh vagonov pyliat'sia v tsekhe: na 'Uraltransmashe' priostanovili proizvodtsvo tramvaev*" ["30 Brand-New Cars Are Dusting in the Shop: Uraltransmash Suspended the Production of Trams"], *E1.ru*, June 22, 2015.

[47] Natal'ia Kaliuzhnaia, "*'Motovilikhu' perekovali v 'Splav'*" ["'Motovilikha' Changed the Name to 'Splav'"], *Novyj kompan'on*, September 6, 2016.

[48] Anton Chemburov, "*Nikolai Markarovets osvobozhden ot dolzhnosti general'nogo direktora OAO 'NPO 'SPLAV'*" ["Nikolai Markarovets Released the Duty of the General Director of 'SPLAV'"], *Myslo*, July 14, 2015.

Lepin had not spent his career at Splav, but he boasted both impressive academic qualifications and extensive experience as a manager of other Russian defense enterprises.

Russia's post-Crimea economic troubles seem to have had little negative effect on Splav's financial fortunes. At the end of 2016, the firm bragged that its total revenue was 2.5 times that of the previous year, with attendant profit growth of 38 percent. Interesting, it attributed these robust sales to foreign orders for its tube artillery systems rather than the 2020 SAP.[49] While Splav does not advertise export prices for its weapons, a plausible hypothesis is that the decline in the value of the ruble has lowered the price of its products for many foreign buyers, making them more attractive. Domestic demand for Splav's rocket launchers is also robust. The firm completely fulfilled its obligations for 2016 under the SDO, and in September it also announced it had secured four new contracts from the MOD for Tornado-S and Smerch systems with a total value of over 10 billion rubles.[50] Current orders for 2017 should consume the entirety of the plant's production capacity.[51]

Senior Russian government officials seem more than satisfied with Splav's performance. Assistant Defense Minister Iurii Borisov stated in September 2016 that he was "very glad that there's an enterprise in Tula that makes the very best MLRS" and that he hoped "that orders will keep increasing through 2025."[52] Defense Minister Sergei Shoigu visited the plant in February 2017 and praised its efforts to continue production while modernizing its production facilities.[53] Splav proudly showcases the many government awards received by its research and development staff on its website.

Splav currently has a little more than 4,000 employees. These include one academician and three corresponding members of the Russian Academy of Rocket and Artillery Sciences, 11 doctors of science, and 34 candidates. Although Shoigu called for the Russian defense industry to reduce the average age of its workers during his recent visit to Splav, the enterprise has a number of active programs to attract and cultivate young talent.[54] While official figures on the average pay received by Splav's workers are not available, it seems to offer competitive compensation. Splav also offers Soviet-style employment benefits, such as summer camps for employees' children, a nature retreat for adult workers, and internal sports leagues.[55]

Tula is Russia's 38th largest city, with a population of a little less than 500,000 people. Around 62,000 of the residents are industrial workers. Despite the city's importance historically as an arms production center, the predominant local industry is actually metals, dominated by firms such as Tulachermet and the Kosogorskii Metallurgical Factory. The local

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[49] NPO Splav, "*Novosti kompanii*," ["Company News"], splav.org, undated.

[50] "*Tul'skii 'Splav' podpisal kontrakty na summu bol'she 10 milliardov rublei*" ["'Splav' Signed Contracts for Over 10 Billion Roubles"], *TSN 24*, September 21, 2016.

[51] Rostec Press Service, "*Vladimir Lepin: 'Tornado-S': eto novaia era v otrasli*" ["Vladimir Lepin: 'Tornado-S' Is a New Era in the Industry"], *IA "Oruzhiue Rossii,"* January 28, 2017.

[52] "*Iurii Borisov: NPO 'Splav' sozdaet luchshie sistemy zaplovogo ognia*" ["Iuri Borisov: Splav Creates the Best Systems for Volley Fire"], *TSN 24*, September 16, 2016.

[53] NPO Splav, undated.

[54] "*Sergei Shoigu: Ob"emy gosoboronzakaza na 'Splave,' nesmotria na modernizatsiiu, umen'shat' ne budem*" ["Sergey Shoigu: We Will Not Reduce the State Order to Splav Despite Modernization"], *Tul'skie izvestiia*, February 3, 2017; NPO Splav, "*Kadrovaia politika*" ["Personnel Policy"], undated.

[55] NPO Splav, "*Sotsial'naia politika AO 'NPO Splav'*" ["Social Policy of the JSC Splav"], *splav.org*, undated.

defense industry is further divided among many different firms, including Splav, KBP Tula, the Tula Weapons Factory, the Tula Machine-Building Factory, and many others (many owned by Rostec). While Splav is an important local employer, it is not a predominant one either in its industry or in general. The city itself is the capital of Tula Oblast, which is located immediately south of Moscow Oblast. The city's long history and central location make it a comparatively attractive place to live.

Motovilikhinskie Zavody

Headquartered in Perm, Motovilikhinskie Zavody was founded in 1736 as a bronze-casting factory. It began making steel cannons in the 1860s and played a large role supplying the Russian army with guns in both world wars. In the postwar period, it diversified into tube artillery, developing and producing the Uragan 220mm rocket launcher starting in the 1970s. It was known as the Lenin Factory until 1992, at which point it was renamed after the local river. Today it produces multiple types of indirect fires, including both the Uragan-1M and smaller self-propelled guns.

Until late 2016, Motovilikhinskie Zavody was a separate holding company within Rostec, akin to Splav. Its subsidiaries included metal foundry Kamastal, Motovilikha Civilian Machine Building, which makes equipment for the oil industry, and the SKB Design Bureau.[56] In September, Rostec decided unilaterally to make Motovilikhinskie Zavody a subsidiary of Splav. This decision was apparently made without consulting the management or board of Motovilikhinskie Zavody and was the conclusion of a lengthy struggle between Rostec, which was the firm's largest shareholder, and private shareholders. A major impetus for this aggressive step was that the firm remained unprofitable despite three years of strong revenue growth. Apparently its civilian businesses were profitable while its defense enterprise continued losing money even after doubling its revenue. This set up a predictable conflict between private shareholders and the managers of the firm (the latter of whom controlled 30 percent of the stock), who wanted to emphasize the profitable private businesses, and Rostec, which was determined not to risk losing Motovilikhinskie Zavody's critical contribution to the production of indirect fires. Obviously, Rostec won out.

The incorporation of Motovilikhinskie Zavody into Splav likely portends significant changes in its finances and management that have yet to become apparent. These likely include the full subordination of Motovilikhinskie Zavody to Rostec management, as well as measures to prop up its defense production activities. Over the last few years the plant's top management has been in flux, apparently a result of the struggle with Rostec. Yuriy Klochkov was general director from 2014 until April 2016, when he resigned, ostensibly for personal reasons. The Russian business newspaper *Kommersant* reported, however, that he and some of the plant's other managers had been pushed out by Rostec to cement its control over Motovilikhinskie Zavody. Since then the acting general director has been Ivan Kostin, who had been its general director in the 2000s.[57]

These tumultuous shifts in management notwithstanding, strong growth in demand has impelled a hiring spree at Motovilikhinskie Zavody. Between 2013 and 2015 the plant's staff

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[56] Motovilikhinskie Zavody, "*O kompanii*" ["About the Company"], *mz.perm.ru*, undated.

[57] Maksim Strugov, "'*Motovilikha' meniaet boevoi raschet*" ["'Motovilikha' Changes the Combat Crew"], *Kommersant*, May 26, 2016.

grew from 2,067 to 2,785.[58] In 2012 the average pay was 27,000 rubles/month.[59] Anonymous comments about conditions at the plant posted on a Russian website by Motovilikhinskie Zavody employees indicate a high degree of disaffection among its staff. One complained in March 2015 that "it all began with the arrival of Klochkov. They got rid of the skilled workers' bonuses and then tried to economize on production . . . now they're delaying our paychecks and paying us in installments!"[60] Another expressed incredulity that television reporting had claimed the average salary at the factory was 35,000 rubles/month. "The specialists are simply fleeing the factory," he or she noted, as "an engineer-technologist makes 14,000 rubles here—that's a janitor's salary!"[61]

The sharp contrast between Motovilikhinskie Zavody's management problems and its growing revenue make it difficult to predict how successfully it will be able to fulfill orders for the various military hardware it makes. Presumably, capital is available to modernize production and hire skilled employees, but an alienated staff and constant management turnover could neutralize this advantage. In September 2016, the firm reported it had secured contracts from the MOD totaling 2.9 billion rubles.[62]

Perm, where Motovilikhinskie Zavody is based, is Russia's 13th-largest city and has a population of about a million people. Located on the Kama River just west of the Ural mountains, Perm was founded in the eighteenth century but became a major industrial city only in Soviet times. While a significant local employer, Motovilikhinskie Zavody is only a minor part of the region's industry. Other Perm manufacturers, such as rocket engine maker Iskra, ODK-STAR, and especially aircraft engine maker Perm Motors, all employ significantly more workers than Motovilikhinskie Zavody.

Outlook

There is a contradiction between the centrality of indirect fires in Russian operating concepts and the relatively low priority they have received in recent defense investments. Several plausible explanations for this mismatch are possible. One possibility is that the inventory of indirect fires inherited from the USSR is considered sufficient for Russia's contemporary needs, particularly with a modest number of next-generation systems supplementing them. Another possibility is that Russian tactics and operating concepts for ground warfare are in flux and that Russian military leaders have either failed to reach a consensus that new indirect fires are needed or they have concluded that indirect fires will be less important in future wars. A final possibility is that Russian military thinkers believe additional spending on indirect fires is necessary but they lost out to other interests in the competition for defense investment under the 2020 SAP. These possibilities are not mutually exclusive, and all could be true to one degree or another.

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[58] Motovilikhinskie Zavody, "*Godovoi otchet PAO "Motovilikhinskie zavody" za 2015 god*" ["Annual Report of the Motovilikhinskie Zavody for 2015"], undated, p. 5.

[59] Aleksei Nikol'skii, "*Interv'iu-Nikolai Bukhvalov, gendirektor 'Motovilikhinskikh zavodov,'*" *Vedomosti*, March 12, 2013.

[60] Motovilikhinskie Zavody, *Antijob*, March 12, 2015b.

[61] Motovilikhinskie Zavody, *Antijob*, February 26, 2015a.

[62] Motovilikhinskie Zavody, "*Motovilikhinskie zavody zakliuchili novye kontrakty na forume 'ARMIIA-2016'*" ["Motovilikhinskie Zavody Signed First Contracts at Army-2016 Forum"], *mz.perm.ru online*, September 9, 2016.

Doctrine and Operating Concepts

It remains to be seen how indirect fires fit into emerging Russian concepts such as noncontact warfare. An increased emphasis on precision munitions could signal a trend away from Soviet-style mass fire operations, but this would not necessarily indicate the abandonment of deep battle. Russian defense procurement seems to indicate that relatively inaccurate mass fires will be coordinated with precision strikes for maximum military effect. This position is evolutionary rather than revolutionary, but it makes economic and military sense for the Russian ground forces. It makes maximal use of its extensive inventory of legacy systems while offering the advantages of precision strike when they are absolutely necessary.

The fact that Russia plans for several qualitatively different forms of conflict also complicates its planning for indirect fires. Wars in the near abroad, such as the involvement in eastern Ukraine would presumably require a different combination of systems and munitions than force projection operations like Russia's intervention in Syria. Conflict with a peer power such as China or NATO would likely demand yet another combination. While conflict with a peer might call for a larger number of expensive precision munitions than wars with less capable powers, the opposite might be the case as well, as the Russians could employ massed area fires against targets that could not be localized because of EW measures. The lack of data about how many of these costly munitions Russia is purchasing for its indirect fires makes it difficult to estimate what scenarios it is currently prioritizing. A combination of increased acquisition of such munitions and more explicit incorporation of them into Russian tactics and operating concepts could signal that Russia considers a great power conflict more likely.

Resources and Funding

It seems unlikely that Russia will proceed with a rapid procurement of next-generation indirect fires even in the dubious event its economic outlook improves dramatically. The 2020 SAP envisioned only a relatively modest investment in indirect fires even before it was scaled back in the aftermath of the 2014 economic crisis. Due to their high cost, it seems probable that procurement of next-generation indirect fires such as the Koalitsiia-SV will slow unless budgetary pressures ease considerably.

Future Systems and Procurement Priorities

If current trends hold, Russian ground forces will procure a limited number of such systems each year through the end of this decade. The Tornado-G, Tornado-S, and Uragan 1-M will all be in limited service by the end of this year. Their Soviet predecessors, however, will make up the bulk of Russian MRL systems for the foreseeable future. Similarly, the Msta will remain the primary self-propelled gun for the time being, particularly given recent orders for additional units. Full deployment of the costly Koalitsiia-SV is likely to be delayed for budgetary reasons, and it is unlikely to be delivered to Russian ground forces in substantial quantities until the 2020s.

Research and Development and Possible Discontinuities

Given the lengthy lead times and ample forewarning of new developments in Russian indirect fires since 1991, it seems improbable that any unanticipated new systems will enter service in the next decade. Russian indirect fires in the late 2020s will consist of some combination of the Tornado-G, Tornado-S, Uragan-1M, Koalitsiia-SV, and Soviet legacy systems. One possible area of unanticipated innovation is munitions, but slow progress on announced munitions such

as the Krasnopol-D satellite-guided artillery shell and languid procurement of advanced munitions suggests that qualitatively new munitions will not be available in substantial quantities.

Personnel and Training

Indirect fires are affected by the same personnel trends as the remainder of the Russian armed forces. Both the ongoing transition to a greater reliance on contract soldiers and apparent challenges with officer retention limit Russia's ability to field an effective artillery capability. At the same time, there seems to be little indication that indirect fires face any greater challenges on these fronts than other areas of the Russian military.

APPENDIX G

Long-Range Strike

Edward Geist

Recent History

For the purposes of this discussion, "long-range strike systems" are defined as missiles intended for use on a theater level to accomplish operational (as opposed to purely tactical) objectives, generally with a range of greater than 100 km. This definition includes short-range ballistic missiles such as the SS-21 Tochka and Iskander-M, ground-launched ballistic missiles (GLBM) such as the Iskander-K, and air-launched cruise missile (ALCM) such as the Kh-35 and Kh-59. It excludes air-to-air missiles and surface-to-air missiles (SAM), air-to-surface, and surface-to-surface missiles with short ranges, as well as strategic (long-range) delivery systems (i.e., intercontinental ballistic missiles [ICBMs]). For the sake of completeness, missiles falling into ambiguous categories are included, such as the Kh-38 (an ALCM with relatively limited range) and the Kh-101 (the conventional variant of a nuclear-tipped long-range Russian ALCM).

Doctrine and Operating Concepts

Russian military thinkers disagree about the extent to which Russia's strike systems should be employed in nuclear and conventional roles. As with their U.S. counterparts, contemporary Russian strike systems evolved from Cold War-era systems designed to deliver nonstrategic nuclear weapons. Particularly since the collapse of the Soviet Union, these weapons have been employed for highly accurate conventional strikes as well. Some Russian writers have argued that these weapons provide Russia with a "non-nuclear strategic deterrent" that can provide decisionmakers with a more flexible, credible alternative to threats of nuclear retaliation. Others argue that, owing to the limited supply of these costly munitions, they ought to be held in reserve as a deterrent against peer powers rather than employed in a conventional role.[1] Furthermore, there appears to be little consensus among Russian political and military leaders about how Russia ought to use strike systems to deliver nuclear weapons. This tension is sure to influence greatly how Russia employs its strike capability in a conflict with a peer power.

Russian strategists and military officials concur that precision fires are applicable to a broad range of foreign policy tasks, but they disagree as to the extent to which their country

[1] V. I. Polegaev and V. V. Alferov, "*O neyadernom sderzhivanii, ego roli i meste v sisteme strategicheskogo sderzhivaniya*" ["On Nonnuclear Deterrence and Its Role in Strategic Deterrence"], *Voennaya Mysl'*, No. 7, July 2015.

is currently equipped to exploit them. Use of precision fires in Syria shows that these systems are already contributing to the Kremlin's expeditionary goals, but it seems their primary application at the moment is increasing the robustness of Moscow's deterrence posture. A recent report by the Norwegian Defence Research Establishment argues that, "for the foreseeable future," the primary goal of Russia's precision fires will be what some Russian military writers term a "pre-nuclear deterrence capability." This is essentially an additional layer of deterrence between more modest employments of conventional force and tactical nuclear weapons.[2] Russian strategic theorists and political leaders have long coveted such capabilities because they recognize that an overreliance on nuclear threats lacks flexibility and credibility for dealing with a conventionally superior opponent such as NATO.[3] The premise that additional nonnuclear deterrence options would enhance Russia's strategic position is widely accepted among Russian defense thinkers, but it is not a foregone conclusion that Russian precision fires are primarily intended for this role. The intended strategic applications for precision strike systems dominates Russian discussions of them, but the objective of exploiting systems such as Iskander as a more usable alternative to tactical nuclear weapons may remain mostly aspirational. Due to the limited availability of these costly munitions, Russia would face a stark tradeoff between employing them conventionally to attempt to convince an adversary to capitulate or holding them in reserve to deliver tactical nuclear weapons if necessary.

Recent statements by Russian military officials indicate that they believe they can integrate their precision fires into "reconnaissance-strike complexes" (*Razvedyvatel'nye-udarnye kompleksy*). This concept, which originated as part of the "Revolution in Military Affairs" championed by Marshall Nikolai Ogarkov during the late Soviet period, consists of the integration of precision weapons with C4ISR to "wage war over much greater distances and with much greater precision, coordination, and tempo than ever before."[4] While Soviet and post-Soviet Russia coveted these capabilities, they remained largely aspirational until Russian military spending increased in the late 2000s. In the 2000s, Russian military theorists elaborated Ogarkov's theories with additional concepts such as the "reconnaissance-strike system" (*razvedyvatel'nyi-udarnyi system*), which would "minimize the cycle of 'intelligence-kill'" and "greatly reduce the time from target detection to destruction." In November 2016, Lieutenant-General Mikhail Matveevsky, commander of the Ground Forces Missile and Artillery Troops, announced that such a "reconnaissance-strike system" had been demonstrated in the "Kavkaz-2016" exercise.[5] That same month an article appeared in *Voennaia mysl'* characterizing Russia's employment of "reconnaissance-strike complexes" during its intervention in Syria. These necessitated a high degree of interservice cooperation that would have been impossible for the Russian armed forces a few years ago.[6]

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[2] Roger N. McDermott and Tor Bukkvoll, *Russia in the Precision-Strike Regime: Military Theory, Procurement, and Operational Impact*, FFI-Rapport 17/00979, August 1, 2017, p. 39.

[3] A. A. Kokoshin, "*Iadernye konflikty v XXI veke*" ["Conflict of Ideas in 21st Century"], Moscow: Media-Press, 2003.

[4] Dima Adamsky, *The Culture of Military Innovation*, Stanford, Conn.: Stanford Security Studies, 2010, p. 35.

[5] McDermott and Bukkvoll, 2017, p. 18.

[6] McDermott and Bukkvoll, 2017, p. 24, and O. V. Tikhanychev, "*O roli sistematicheskogo ognevogo vozdei'stviya v sovremennykh operatsiiakh*" ["On the Role of Systematic Fire Cover in Modern Operations"], *Voennaia Mysl',* 2016, No. 11, pp. 16–20.

Nonstrategic Nuclear Weapons

After the collapse of the Soviet Union Russia increased its reliance on nonstrategic nuclear weapons (NSNW) to offset its waning conventional power. Russia's substantial NSNW has been interpreted both inside and outside Russia as the basis for a regional nuclear deterrent, which would deter major incursions into Russian territory by employing nuclear weapons as usable war-fighting instruments. Some Russian authors have articulated aggressive strategies to employ these weapons to secure Russian interests, most notoriously the notion that Russia could "escalate to deescalate."[7] Under this scenario, Russia would engage in first use of NSNW to forestall a grave conventional threat to its national survival, with the aim of compelling its adversary to withdraw. Some Western commenters have treated this concept as declared Russian doctrine, but several comprehensive surveys have found that official Russian statements about NSNW have been highly inconsistent.[8] Dmitry Adamsky notes that "senior officials' statements, national level documents, manuals, professional writings, exercises, and industry modernization programs attribute different missions to this arsenal," and that, furthermore, "theoretical postulates are not always supported by actual assets, several capabilities exist in a conceptual vacuum, and industry initiatives are disconnected from official policy." He concludes that "Russian thought on RND [regional nuclear deterrence] and the role of NSNW in it is an unelaborated concept, far from being a doctrine."[9] If Russia truly lacks a coherent doctrine for employing its strike systems in a nuclear role, the resulting uncertainty necessarily confuses its decisionmaking about when to employ these costly systems.

Conventional Strike

In contrast to the confusion surrounding its potential use of NSNW, Russia's military doctrine for conventional strike operations is relatively clear. There is no skepticism about the military effectiveness of precision conventional strike operations in Russia or lack of enthusiasm for them, but there is concern that Moscow would need many more of the weapons than it can currently afford to decrease greatly its reliance on nuclear threats for its security. President Putin apparently shares these worries, because he stated in 2012 that "the role and significance of nuclear deterrence in the armed forces will remain so long as we lack other types of weapons, such as next-generation strike complexes."[10] In time, Russian leaders hope that high-precision conventional weapons will be able to take over roles that previously could be filled only by nuclear weapons. At present this remains mostly aspirational, although recent comments regarding the conflict in Syria suggest increasing confidence in Russia's "non-nuclear strategic deterrent."[11]

Roles attributed by Russian military figures to conventional strike systems include supporting strategic deterrence; counterbalancing U.S. precision munitions; convincing local and regional adversaries that Russia is capable of and willing to conduct warning and retaliatory

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[7] Nikolai Sokov, "Why Russia Calls a Limited Nuclear Strike 'De-Escalation,'" *The Bulletin of the Atomic Scientists*, March 13, 2014.

[8] Kristin Ven Bruusgaard, "Russian Strategic Deterrence," *Survival: Global Politics and Strategy*, Vol. 58, No. 4, August–September 2016, pp. 7–26.

[9] Dmitry Adamsky, "Nuclear Incoherence: Deterrence Theory and Non-Strategic Nuclear Weapons in Russia," *Journal of Strategic Studies*, Vol. 37, No. 1, 2014, pp. 91–134.

[10] Vladimir Putin, "*Byt' sylnymi: garantii natsional'noi bezopasnosti dliia Rossii*" ["Being Strong Is the Guarantee of National Security for Russia"], *Rossiiskaia Gazeta*, February 20, 2012.

[11] Iurii Gavrilov, "*Ochen' tochnye rakety*" ["Very Precise Missles"], *Rossiiskaia gazeta*, January 12, 2017.

strikes; the destruction of critically important targets; disorganizing enemy command and control; and the destruction of key targets in coordination with general-purpose forces.[12] Russia has employed conventional strike operations for several of these goals in the conflicts in Georgia and Syria.

Despite its employment in the 2008 Georgian war and a recent exercise in which Russia envisioned using an Iskander missile to take out a terrorist base in the mountains of Tadjikistan, it seems the Russians primarily envision using long-range strike systems in a major war with a peer competitor. Limited employment of these systems for expeditionary operations reinforces this goal by demonstrating Russia's capabilities to peer adversaries. The Tadjik exercise, for instance, showed that Russia might relocate Iskander launchers to friendly neighboring states from whence they could threaten NATO bases in Afghanistan.[13] A 2013 article in the *Herald of the Russian Academy of Military Sciences* titled "How Russia Should Prepare for Wars of the Future" explicitly characterized long-range strike systems such as Iskander as a counterweight to Western military might. Noting that "the countries of Western Europe may be drawn into military engagements with Russia in fulfillment of their alliance obligations to the NATO bloc," the author asserted that should this "improbable" war break out, it would be "essential to fully utilize Russia's advantage" in "missiles and cruise missiles (the Iskander and Tochka-U missile complexes)" to "counter" those states. The author argued that conflicts with former Soviet republics and satellites along Russia's western border, by contrast, could be "neutralized" by "Ground Forces brigades together with precision strikes from air and sea as well as air and maritime landing operations."[14] The enduring advantage in artillery and other indirect fires inherited from the USSR offers more cost-effective means of defeating these states' militaries than resorting to scarce and expensive systems such as Iskander.

Russian defense analysts disagree as to what kind of targets precision fires such as the Iskander missile ought to be employed against for maximum strategic effect. Some Russian authors advocate using these weapons in precision strikes against critical civilian infrastructure rather than military targets. They have two rationales for this position. First, civilian targets are likely to be stationary and more vulnerable than their military counterparts. Second, they believe an attack on civilian targets might have a larger political effect on the adversary, therefore increasing the likelihood of their capitulation to Russian demands.[15] This point of view is by no means universal, however. Russian military exercises involving these weapons appear to envision their employment against military targets.

Recent Operations

Georgia

Some Russian and Georgian participants in the 2008 Russo-Georgian conflict claimed that the Iskander had been used to attack various military targets inside Georgia. The *Moscow Defense Brief*, published by the Russian defense think tank CAST, asserted that the Iskan-

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[12] Dave Johnson, "Nuclear Weapons in Russia's Approach to Conflict," frstrategie.org, June 2016, pp. 40–41.

[13] *Russia Today* reported "Russia Sent 'Iskander-Ms' to Tajikistan to counter NATO" ["*Rossiia otprtavila v Tadzhikistan 'Iskander-M' dlia protivostoianiia NATO*"], *inosmi.ru*, May 29, 2017.

[14] V. Iu. Mikriukov, "*Kak podgotovit'sia Rossii k voinam budushchego*" ["How Should Russia Prepare for Future Wars"], *Vestnik AVN*, 2013, No. 2, p. 44.

[15] McDermott and Bukkvoll, 2017, pp. 31–32. General Vladimir Slipchenko was a prominent advocate of this position. Vladimir Slipchenko, *Voiny novogo pokolenia—Distantsionnye i bezkontaktnye*, Moscow: Olma-Press, 2006.

der had been used to attack a Georgian tank base in Gory.[16] Russian military authorities, however, insisted that the Iskander had not been employed in the conflict and that contrary reports resulted from confusion between the new missile and the older Tochka. However, recent Russian press accounts seem to admit that the Russian Army's Missile and Artillery Training Center in Kasputin Yar, which began receiving preproduction Iskander-Ms around 2005, employed them in combat in Georgia.[17]

Syria

The Russian government has employed the conflict in Syria to showcase its conventional strike capabilities. Russia's use of these weapons in support of Bashar al-Assad has three mutually-reinforcing goals: destroying critical targets in support of military operations, impressing foreigners with the capabilities of modern military technology, and gaining combat experience with these systems. Russian forces have employed long-range cruise missiles, including Kalibr SLCMs and Kh-101 ALCMs, to attack targets in Syria. Furthermore, it is reported that Iskander launchers are present at the Khmeimim airbase in Syria, but there are no indications that these missiles have been used in the conflict there.

Exercises

While the high cost of precision munitions discourages expending many of them in live-fire exercises, the Russian military does employ them for personnel training. Iskander brigades are provided with a special training course at the Kasputin Yar test range before entering service. Press reports suggest that these training courses typically conclude with a missile launch.[18]

Current Systems

Ground-Launched Ballistic and Cruise Missiles

At present, the Russian military deploys two surface-launched ballistic missiles, one GLBM and two surface-launched antiship missiles (see Table G.1). The OTR-21 Tochka is a short-range ballistic missile first introduced in the late 1970s. In its most modernized variant, it has a maximum range of 185 km. The Tochka is currently being replaced by the Iskander-M, a much more nuclear-capable ballistic missile. Under current plans the Russian army will have retired the Tochka and fielded 11 brigades of Iskanders by 2020. These brigades will also include Iskander-Ks, which are cruise missiles using the same launcher as the Iskander-M. The domestic versions of both the Iskander-M and Iskander-K are reported to have a range just under the 500 km allowed by the INF Treaty, but many Western analysts believe these systems may have longer de facto ranges and, therefore, violate that agreement. The Russian military also deploys two coastal antiship missile systems, the 3K60 BAL and the 3M55 Oniks. The former is a ground-launched version of the Kh-35 subsonic ALCM with a range of 200 to 300 km in its modernized variant, while the latter is a supersonic, ramjet-powered missile with a range of 600 km in its domestic version.

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[16] Stefan Forss, "The Russian Operational-Tactical Iskander Missile System," *Julkaisusarja 4: työpapereita*, No. 43, 2012, p. 17.

[17] *bmpd*, "*Deviatyi brigadnyi komplekt raketnykh kompleksov 'Iskander-M'*" ["Ninth Brigade of Rocket Systems 'Iskander-M' Entered Service"], November 30, 2016.

[18] "The Rocketers Carried Out a GroupLaunch of Iskander-M Missiles Near Astrakhan" ["Ракетчики выполнили групповой пуск ракет «Искандер-М» под Астраханью"], *tvzvezda.ru*, 2016.

Table G.1
Current Russian Ground-Launched Strike Systems

Name	Developer	Producer
Surface-to-Surface Ballistic Missiles		
OTR-21 Tochka	Kolomna KBM	Votkinsk Machine Building Plant
9M723 SRBM (Iskander-M)	Kolomna KBM	Votkinsk Machine Building Plant
Surface-to-Surface Cruise Missile		
R-500 GLCM (Iskander-K)	Novator	Novator
Surface-Launched Antiship Cruise Missiles		
3K60 BAL (Kh-35)	KBM Moscow	KTRV
Bastion (3M55 Oniks)	NPO mashinostroeniia	Strela

SOURCE: IISS, 2016; Kolomna KBM, KBM Moscow, NPO Mashinostroeniia.

The Iskander (NATO reporting name SS-26 Stone) is a highly accurate short-range, nuclear-capable, road-mobile missile system that first entered service with the Russian armed forces in 2006. The Iskander exists in three variants, all of which share the same launcher: the Iskander-M, which carries two single-stage solid-fueled "quasi-ballistic" missile with a declared range of 500 km (Figure G.1); the Iskander-K, armed with two R-500 cruise missiles with a declared range of 480 km (Figure G.2); and the Iskander-E, a less-capable export variant of the Iskander-M carrying two solid-fueled ballistic missiles with a range of only 280 km.[19] These variants are assembled from components designed and produced by four individual firms: KBM Kolmna, Votkinskii Zavod, Novator, and Titan-Barrikady (see Table G.2).

Public statements by high-ranking government officials, including Presidents Medvedev and Putin, signal that the Russians consider the Iskander to be of paramount strategic importance. Starting in 2008, these officials directly connected the Iskander to U.S. ABM deployment in Europe, threatening to use the missile to target ABM sites.[20] On November 5, 2008, then President Dmitrii Medvedev declared in a speech that if the United States did not change its course on missile defense his country would resort to the deployment of "the Iskander missile system in the Kaliningrad Region to be able, if necessary, to neutralize the missile defense system."[21] The recent deployment of Iskander-M launchers to the Russian enclave of Kaliningrad after the start of construction on the ABM site at Redzikowo in Poland in May 2016

[19] "The Rocketers Carried Out a Group Launch of Iskander-M Missiles near Astrakhan," 2016, pp. 15–16; KBM, "*Operativno-takticheskii raketnyi kompleks "Iskander-E"* ["Operational-Tactical Complex Iskander-E"], *KBM*, undated. Russian-language usage of the Iskander-M and Iskander-K designations, with the Iskander-K sometimes conflated with the Iskander-M even in KBM's own literature.

[20] Forss, 2012, pp. 6–8.

[21] Forss, 2012, p. 6.

Figure G.1
Iskander-M Launcher

SOURCE: KBM.

Figure G.2
Iskander-K Launcher

SOURCE: KBM.

Table G.2
Source of Iskander Components

Name	Developer	Producer
9M723 SRBM	Kolomna KBM	Votkinsk Machine Building Plant
R-500 GLCM	Novator	Novator
Iskander launcher	Titan	Barrikady

SOURCE: Kolomna KBM, Titan-Barrikady.

indicates that the Russians may be making good on these threats.[22] Similarly, the final variant, the Iskander-E, was offered to foreign customers and was acquired by Armenia.[23]

The Iskander-M carries the 9M723 "quasi-ballistic" missile, which incorporates advanced features to increase its ability to penetrate missile defenses. Designed by the KBM design bureau in Kolomna, the 9M723 is built by the Votkinsk Machine Building Plant, which also manufactures Russia's solid-fueled ICBMs and submarine-launched ballistic missiles (SLBMs). Instead of travelling well into space like a conventional ballistic missile, it remains in the upper atmosphere to maneuver and evade interceptors.[24] The inclusion of terminal guidance enables a circular error probable (CEP) of only five meters, allowing the missile to threaten all but the hardest targets using a conventional warhead of about 500 kg. Many Western analysts believe the Iskander-M can carry a lightweight nuclear warhead further than the 500 km range stipulated by the 1987 INF Treaty.[25] The All-Russian Science and Research Institute under Rosatom reputedly developed the nuclear warhead for the 9M723 missile.[26]

The Iskander-K carries the R-500 ground-launched cruise missile. Designed and manufactured by Novator in Yekaterinburg, the R-500 is rumored to be a slight modification of the Kalibr SLCM, which has a range in excess of 2,000 km. Russia also manufactures a reduced range version of the Kaliber for export, the Klub, so this does not in itself constitute proof that the Iskander-K violates the INF, but it appears problematic.[27] Even if the R-500 is not currently in violation of the INF, modifying it to extend its range would probably be simple. Like the Kalibr, the R-500 is reputed to follow an aeroballistic trajectory to enhance its ability to penetrate missile defenses.

All Iskander variants share the same transporter and launch complex, developed and manufactured by Titan-Barrikady in Volgograd. Comprising 51 vehicles, each brigade includes 12 launch vehicles carrying two missiles apiece, 12 reload vehicles carrying 2 additional mis-

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[22] Jeffrey Lewis, "Iskanders in Kaliningrad," *Arms Control Wonk*, December 11, 2016.

[23] "*Serzh Sagsian: u nas voobshche net problemnykh voprosov s Rossiei*" ["Serzh Sargsyan: We Do Not Have Any Problematic Issues with Russia At All"], *RIA Novosti*, November 11, 2016.

[24] "*OTRK 'Iskander'—velikii voin I zashchitnik*" ["PTRC 'Iskander'—A Great Warrior and Defender"], *Armeiskii vestnik*, February 13, 2014.

[25] Forss, 2012, pp. 15–16.

[26] McDermott and Bukkvoll, 2017, p. 27.

[27] Bill Gertz, "Russia Again Flight Tests Illegal INF Cruise Missile," *Washington Free Beacon*, September 28, 2015.

siles apiece, 11 command vehicles, 1 repair vehicle, 1 information preparation vehicle, and 14 vehicles to support brigade personnel.[28]

Development of the Iskander system began in the final years of the Soviet Union.[29] The 1987 INF Treaty resulted in the phase-out of the system's Soviet predecessor, the OTR-23 Oka ballistic missile, along with all other intermediate-range ballistic missiles (IRBM) and medium-range ballistic missiles (MRBM) in the Soviet arsenal. The retirement of Russia's remaining Scud-Ds in the early 1990s left Russia with only one operational SRBM, the SS-21 Tochka. In the early 1990s, the design bureau that designed the Oka, KBM, attempted to market a small commercial satellite launcher, the Sfera, derived from the OTR-23. While this project failed to come to fruition, the engine developed as the first stage of the Sfera served as the basis for the single-stage Iskander-M. Initial testing of the Iskander began in 1995, but the system underwent incremental design upgrades for a period of almost 15 years before it entered serial production. Early versions were probably similar to the eventual export version, the Iskander-E, and therefore, had little potential threat to violate the INF Treaty.[30]

Development of the cruise-missile variant of the Iskander seems to have begun in the mid-1990s. Much like KBM and the Oka, the INF Treaty eliminated the market for ground-launched cruise missiles (GLCM) developed by Novator for the Soviet military, the RK-55 Relief. Novator repurposed the design for maritime applications to develop the Kalibr SLCM. A well-publicized espionage case tried in 2002 revealed that work on the GLCM variant of the Kalibr, the R-500, was already well underway in 1998.[31] In 2001, Novator reached an agreement with KBM to combine the R-500 with the Iskander-M launcher to create the Iskander-K.

It is unclear how many of the earlier versions of the Iskander were produced or if they ever entered limited service with the Russian military. The earliest tested iterations of the system were significantly different from those that entered serial production.[32] An early version of the Iskander-K employing a modified Klub missile was tested at a range of 360 kilometers in 2007.[33]

Serial production of the Iskander-M began around 2008–2009. The original version of the 2020 SAP envisioned the acquisition of ten brigades of Iskander-M systems, in addition to one brigade (the 26th Independent Missile Division of the Western Military District) that received them prior to the start of the SAP, for a total of 132 launchers and 528 missiles (see Table G.3). In July 2012, Prime Minister Dmitrii Medvedev announced that the Russian government had decided to invest 24 billion rubles to modernize production of the Iskander, to be divided between 17 enterprises.[34] As of November 2016, nine brigades had received Iskander-M launchers (see

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28 "*Rossiiskaia Armiia poluchila htorii za god komplekt raketnykh kompleksov 'Iskander-M'*" ["The Russian Army Will Receive the Second Set of Iskander-M Missile Systems for the Current Year"], *Telekompaniia Zvezda*, November 18, 2014.

29 Veronika Ushakova, "*Tsena 'Iskandera'*" ["The Price of 'Iskander'"], *Voenno-promyshlennyi Kuryer*, December 24, 2014.

30 Forss, 2012, p. 9.

31 Olga Allenova, "*Ostraia sekretnaia nedostatochnost'*" ["Acute Secret Insufficiency"], *Kommersant Vlast'*, June 25, 2002.

32 Ushakova, 2014.

33 Forss, 2012, p. 16.

34 Andrei Bondarenko, "*'Votkinskii zavod': vozrozhdaia byluiu moshch'*" ["Votkinskii Factory: Reviving the Former Glory"], *Novosti VPK*, March 7, 2013.

Table G.3
Makeup of Iskander Brigade

Type of Vehicle	Number
Tractor-Elevator-Launcher (TEL)	12 (24 missiles)
Reload Vehicles	12 (24 missiles)
Command Vehicles	11
Personnel Support Vehicles	14
Data Preparation Vehicle	1
Repair and Service Vehicle	1
Total	51 (48 missiles)

SOURCE: "*Искандер* (ОТРК)" ["Iskander (Tactical Missile)"], *Wikipedia.ru*.

Table G.4
Current and Planned Deployments of Iskander Missile Brigades

No.	Deployment Date	Formation	Location	District
1	October 2011	26th Missile Brigade	Luga	Western
2	June 2013	107th Missile Brigade	Birobidzhan	Eastern
3	November 2013	1st Missile Brigade	Krasnodar	Southern
4	July 2014	112th Missile Brigade	Shuya	Western
5	November 2014	92nd Missile Brigade	Totskoe	Central
6	July 2015	103rd Missile Brigade	Ulan-Ude	Eastern
7	November 2015	12th Missile Brigade	Mozdok	Southern
8	March 2016	20th Missile Brigade	Spassk-Dalnyi	Eastern
9	November 2016	119th Missile Brigade	Elenskii	Central
10	Pending	152nd Missile Brigade	Cherniakhovsk	Western
11	Pending	448th Missile Brigade	Kursk	Western

SOURCE: *bmpd*.

Table G.4), although it is unclear if all of them have the full complement of reloads.[35] Production of the Iskander-M seems to have proceeded as planned despite the scaling back of defense procurements following the 2014 economic crisis.

Procurement and deployment of the Iskander-K seems to have lagged that of the ballistic missile version. Testing of the system led many Western critics to accuse Russia of violating the INF Treaty and caused political controversy in the United States due to the muted official

[35] bmpd, 2016.

response.[36] Photos attest to the presence of Iskander-K launchers at military exercises and with at least some of the deployed Iskander-M brigades, but the number deployed remains obscure.

Air-Launched Strike Weapons

The Russian military also deploys a range of air-launched strike weapons (see Table G.5). These include air-launched versions of the Kh-35 and 3M55 Oniks antiship missiles whose characteristics are basically equivalent to their ground-based counterparts. The Kh-31 is a supersonic antiship and antiradiation missile with an operational range of about 100 km. The Kh-38 is a short-range (40 km) supersonic air-to-surface missile. The Kh-59 is a subsonic TV-guided cruise missile with a range of over 285 km in its domestic versions (the newest variant, the Kk-59MK2, is rumored to have a range over 500 km). The Kh-55/555 and Kh-101/102 are subsonic standoff cruise missiles intended primarily to arm Russia's nuclear strategic bombers, but they also exist in conventionally armed versions, the Kh-555 and Kh-101. While these missiles have a range of thousands of kilometers in their nuclear versions, the range of the conventionally armed variants tends to be considerably less.

Sea-Launched Strike Weapons

The predominant Russian sea-based strike systems are the Kalibr family of cruise missiles built by NPO Novator. These can be launched from both submarines and surface vessels and are produced in a variety of models whose ranges vary from a few hundred kilometers to thousands of kilometers, depending on fuel capacity (see Table G.6). A version with reduced capabilities, the Klub, is made for export. The 3M55 Oniks is also produced in versions for launch by submarines and surface vessels. The most exotic Russian strike weapon on the horizon is the

Table G.5
Current Russian Air-Launched Strike Systems

Name	Developer	Producer
Air-to-Surface Missiles		
Kh-31	OKB Zvezda	KTRV
Kh-38	KTRV	KTRV
Kh-55/555	Raduga	KTRV
Kh-59	Raduga	KTRV
Kh-101	Raduga?	KTRV?
Anti-Ship Cruise Missiles		
Kh-35	KBM Moscow	KTRV
3M55 Oniks	NPO mashinostroeniia	Strela

SOURCES: KTRV, NPO Mashinostroeniia.

[36] According to Pavel Podvig, the official U.S. protest that Russia was violating the INF Treaty was a response to testing of the RS-28 "Rubezh" ICBM, not the Iskander-K, but U.S. officials have not publically provided details on what system they fear would violate the INF. Pavel Podvig, "More Details on Russia and the INF Violation," *Russian Strategic Forces*, August 28, 2014.

Table G.6
Current Russian Sea-Launched Strike Systems

Submarine-Launched Cruise Missiles		
Kalibr 3M-54K	Novator	Novator
Kalibr 3M-14K	Novator	Novator
Klub 3M-54E	Novator	Novator
Klub 3M-14E	Novator	Novator
3M55 Oniks	NPO Mashinostroeniia	Strela
Submarine-Launched Hypersonic Missile		
3M22 Tsirkon	NPO Mashinostroeniia	NPO Mashinostroeniia?

SOURCE: "*'Kalibr,' OKB "Novator" i bochka degtia*," ["'Caliber,' OKB 'Innovator' and a Barrel of Tar"], *nortwolf_sam*, October 8, 2015.

3M22 Tsirkon submarine-launched hypersonic missile, which is expected to enter deployment within a few years.

Personnel and Training

In keeping with their relatively elite status within the Russian armed forces, personnel responsible for strike systems such as the Iskander are trained more extensively and compensated more generously than is typical for the Russian ground forces. These units contain a smaller proportion of draftees than average, and anecdotal evidence suggests that they are being transitioned to exclude nonvolunteers. For instance, in December 2014 Major-General Mikhail Matveevskii noted that 70 percent of personnel in Iskander brigades were volunteers.[37] Media reports about a 2016 test launch of an Iskander at Kasputin Yar noted that "500 volunteer servicemen" took part in the exercise, which is the final stage in the training of a new Iskander brigade.[38] Given the brief period that Russian draftees spend in service, an all-volunteer force makes sense for Iskander operations as a means of avoiding constantly training new personnel. The unusual privileges afforded to Iskander brigades help forestall the need to rely upon draftees. Matveevskii noted that new sporting facilities and a swimming pool were under construction for the use of the personnel of the Iskander brigade posted in Birobidzhan. Such facilities were previously only provided for the Strategic Rocket Forces.[39]

Before entering service, each Iskander brigade goes through a training course at the Russian Ground Forces Rocket and Artillery School at Kasputin Yar. After classroom instruction, personnel engage in hands-on-training culminating in a live-fire exercise. The extreme cost of launching an Iskander seems to allow only a few to be expended for training purposes, so these

[37] "Sixty 'Iskander' and Another as Many" ["*Шестьдесят 'Искандеров' и еще столько же*"], *Nezavisimoe Voennoe Obozrenie*, December 19, 2014.

[38] "The Rocketers Carried Out a Group Launch of Iskander-M Missiles Near Astrakhan," 2016.

[39] "Sixty 'Iskander' and Another as Many," 2014.

training launches are combined with larger exercises envisioning operational scenarios. Press reports so far have only referred to Iskander-M launches, even though it seems that Iskander-K test launches have been conducted as well.

Estimation of Resources Spent on Strike Systems

Strike systems are clearly a high priority for the Russian government, and it has expended considerable resources to maintain and develop its ability to produce these weapons. A full accounting of the amount the Kremlin has spent on systems such as the Iskander and Kalibr is difficult, among other reasons because of the high degree of secrecy surrounding the state defense budget. The Russian government has paid not just for the development and production of these systems but for the recapitalization of their manufacturers, particularly Votkinskii Zavod and Novator. Russian state investment in these firms in the form of both direct recapitalization and debt write-downs totals billions of dollars. Anecdotal reports from the Russian defense press indicate that the initial recapitalization was substantially supported by state targeted funds.[40] Since Votkinskii Zavod also makes strategic nuclear missiles, it is impossible to isolate the fraction of these costs specifically devoted to strike systems.

The high cost of the strike weapons themselves has caused considerable concern in Russia as expenditure of these munitions in Syria has grown. A report that Russia had delivered 28 3M14E cruise missiles (the export variant of the Kalibr) to India for $182 million dollars in 2008–2009 led to widespread claims that each Kalibr cost $6.5 million dollars (about four times the flyaway cost of a Tomahawk).[41] In October and November of 2015, the Russian Navy fired 44 Kalibr missiles at 18 targets in Syria, nearly as many as the 47 Novator delivered to the Russian military in the first half of 2016.[42] Even under the generous assumption that the true cost of a Kalibr is closer to a million dollars, this still represents a large expenditure and suggests that Russia lacks the munitions to carry out such strikes on a larger scale or for an extended period.

While no official numbers for the Iskander are available, an anonymous Russian blogger claimed in 2015 that each Iskander-M missile costs "about two million dollars."[43] If this is accurate, then a full Iskander brigade set probably costs between $125 million and $175 million,

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[40] In 2013, General Director Valerii Kashin of KBM Kolomna provided some details about the recapitalization program in an interview. He stated that his enterprise had received 800 million rubles in state targeted funds in 2012, which were used, in part, to construct an assembly park for Iskander complexes. He estimated that the Iskander program would be the target of about 40 billion rubles in capital investment before 2020, about 60 percent, or 24 billion rubles, of which would be from the state budget with the remainder self-funded out of "enterprise profits." Kashin implied that KBM would represent nearly a third of that investment—12 billion rubles. "*Proizvodstvo 'Iskander-M' trebuet investii,*" *Voenno-promyshlennyi Kuryer*, April 3, 2013.

The extent to which the "self-financed" part of investment was ultimately bankrolled by the state after it bailed out struggling defense enterprises in the economic slump that followed the 2014 annexation of Crimea is unclear, but it must have varied considerably from enterprise to enterprise.

[41] TsAMTO, "*DefexpoIndia-2012*," armstrade.org, undated, p. 18. It seems improbable that the Kalibr is vastly more expensive than its U.S. equivalent. It seems more likely that the sale to India included costly additional services or that the reported numbers were in error. In any case, cruise missiles such as the Kalibr are necessarily costly.

[42] Vladimir Gundarov, "*Polgoda raboty i dva chasa voiny oboshlis' pochty v tri trilliona rublei*" ["Half a Year Worth of Work and Two Hours of War Cost Three Trillion Roubles"], *Novosti VPK*, July 25, 2016.

[43] Proper, "*Ocherednoi brigadnyi komplekt 'Iskander-M'*" ["The Next Brigade of 'Iskander-M'"], *Russkii top*, July 16, 2015.

with a full cost of procuring the planned brigade sets of around $1.5 billion to $2.5 billion.[44] If the missile costs significantly more, this total could be much higher, but it still seems the Iskander is comparatively affordable relative to Russia's investment in strategic nuclear forces.

Defense Industrial Trends and Challenges

Russian strike systems are developed and manufactured by a small number of state-owned development and manufacturing organizations. One firm dominates each category of strike weapon. GLBMs such as the Iskander-M and older OTR-21 Tochka are designed and assembled by KBM Kolomna. Russian SLCMs such as the Kalibr and their ground-launched derivatives are products of NPO Novator. ALCMs are the purview of the state-owned holding company Tactical Missiles Corporation and its subsidiaries, including Raduga (strategic ALCMs) and NPO Mashinostroenie (hypersonic missiles). Over the past decade, the Russian government has invested significant capital in these enterprises to maintain its ability to produce modern military hardware for both domestic use and export. Critical bottlenecks remain, particularly in the aftermath of the loss of Ukrainian components such as engines. At present, Russia has only one source of solid-fuel ballistic missile engines (Votkinskii Zavod) and one source of turbojet cruise missile engines (NPO Saturn). It appears probable that the Russian defense industry cannot significantly expand its production of strike weapons unless these challenges are alleviated.

Unlike the USSR, which had numerous missile design bureaus that duplicated each others' efforts, post-Soviet Russia maintains only a handful of institutions that develop cruise and ballistic missiles. These include the Moscow Institute of Thermal Technology, which developed the Topol-M, Yars, and Rubezh ICBMs; the Makayev Design Bureau, which designed the Lainer SLBM and Sarmat ICBM; Raduga, which develops ALCMs; the Kolomna Design Bureau, which designs shorter-range ballistic missiles; and Novator, which develops and builds naval and GLCMs. In addition, the Titan design bureau (recently merged with its associated production facility to form Titan-Barrikadnaia) develops equipment such as tractor-elevator-launchers (TELs) for mobile missiles. As the latter three developed Russia's current generation of battlefield strike weapons, they will be discussed in detail below.

Kolomna Design Bureau

Originally founded during the Second World War to develop mortars, the Konstrutivnoe Biuro Mashinostroeniia (literally, "Machine Design Office," normally known in Russian by the acronym KBM) has blossomed to become one of the most prolific developers of military equipment, not only in Russia but also in the entire world. True to its origins, KBM designed most of the Soviet Army's mortars, but it also diversified into man-portable air-defense systems, antitank missile systems, and finally tactical ballistic missile systems, including the SS-21 Tochka, the R-400 Oka, and the Iskander-M.

For most of the post-Soviet era, including most of the period during which Iskander was being developed, KBM was a Federal State Unitary Enterprise. This meant that the Russian

[44] Each brigade has 12 launchers and 12 reload vehicles, for a total of 48 missiles. At $2 million apiece, this comes to $96 million. Each brigade set includes 51 vehicles, which vary from costly launchers and command vehicles to relatively simple personnel support vehicles. Assuming generously that the launchers and command vehicles cost an average of $0.5 million apiece and the remaining vehicles somewhat less, this totals about $125 million.

government solely owned KBM even though it was allowed to manage its own affairs. In 2008, KBM was placed under the control of Rostekhnologiia, the state holding company created at Putin's behest in the previous year.[45] In 2012, KBM was converted into a public corporation and transferred from Rostekhnologiia into a different state holding company, Vysokotochnye Kompleksy, which is itself a subsidiary of Rostekhnologiia (known since 2014 as Rostec). These dramatic changes in KBM's institutional structure may not have affected the concern's affairs as one might imagine, however, because the individuals controlling it remained substantially the same. Senior Rostec officials populated the board of KBM, most notably Oleg Markovich Govorun, who had previously been associate general director of that holding company. Since 2013, Govorun has been CEO of KBM. The only figure from KBM itself on the board was Valerii Mikhailovich Kashin, whose presence was unsurprising given that he had been head of KBM since 2005 as well as vice general director of Vysokotochnye Kompleksy. In April 2015, Sergei Viktorovich Pitikov replaced Kashin as KBM's managing director, but Kashin retained his position as chief designer. In January 2016, Kashin was made a corresponding member of the Russian Academy of Sciences.

While KBM originally only designed weapons, it came to play a critical role in making them. In practice, this involves systems integration, final assembly, and testing, rather than the manufacture of major components. KBM employed 3,093 people and had a revenue of 12.69 billion rubles in 2012, with a profit of 1.2 billion rubles.[46] It is far from the only major employer in its home city of Kolomna, however. Located in Moscow Oblast, Kolomna is a major industrial city that produces cement, railway locomotives, and agricultural equipment as well as defense equipment.

KBM is reputed to be very well run by the standards of the Russian defense-industrial complex. It received an award from the Military-Industrial Commission in 2015 for its success fulfilling its part of the State Defense Order.[47] The year before that, KBM was selected "the research institution of the military-industrial complex with the highest social-economic effectiveness" out of over 450 considered.[48] In 2013, Russian Defense Minister Sergei Shoigu named KBM as "one defense enterprise with which we have no problems whatsoever."[49]

Tactical Missiles Corporation

Kompaniia Takticheskoe Raketnoe Vooruzheniie (Tactical Missiles Corporation, known in Russian by the acronym KTRV) is a large state-owned enterprise established by the Russian government in 2002 to manufacture air-launched cruise missiles. Unlike some other consolidated Russian state-owned defense enterprises, but similar to Almaz-Antei, KTRV is not just a holding company but also a developer and manufacturer of systems in its own right. Its official responsibilities include hypersonic missiles, air-to-air missiles, and air-to-surface missiles, but it also produces surface-launched derivatives of its ALCMs.

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[45] "*Kto voidet v Rostekhnologii*" ["Who Will Join Rostech"], *Expert Online*, 2008.

[46] Unfortunately, KBM has not released financial figures since 2012. "*Chistaia pribyl' VPK 'KBM' v 2012 godu uvelichilis' bol'she chem vdvoe*," *KBM*, February 20, 2013.

[47] "*Pochetnaia gramota za vypolnenie gosoboronzakaza*" ["Honorary Diploma for the Performance of the State Defense Order"], *KBM*, September 18, 2015.

[48] "*KBM—luchshaia nauchnaia organizatsiia OPK v Rossii*" ["KBM—The Best Scientific Organization within Russia's Military-Industrial Complex"], *KBM*, December 30, 2014.

[49] "*Shoigu nazval KBM predpriiatiem, s kotorym u Minoborony net problem*" ["Shoigu Called KBM an Enterprise with Which the Defense Ministry Has No Problems"], *KBM*, September 20, 2013.

KTRV incorporates the remnants of numerous Soviet defense enterprises, including those responsible for the legacy systems still in use by the Russian military. The Soviet Zvezda-Strela factory in Korolev, Moscow Oblast, formed the basis for the company's headquarters and is today a site for both research and final assembly of missiles. As of early 2017, KTRV's website lists 20 separate subsidiaries scattered across the Russian Federation, two of which have substantial subsidiaries of their own. One of these is NPO Mashinostroeniia, manufacturer of space hardware, including the Proton rocket. The Russian government has continued to add defense enterprises to KTRV's portfolio since its establishment 15 years ago, most recently the Saint Petersburg-based naval weapons maker Gidropribor in 2015.[50] KTRV's economic activities in both the defense and civilian sectors, therefore, extend well beyond cruise missiles. The decision to entrust KTRV with responsibilities outside its original purview suggests that the Russian government places considerable trust in its management.

KTRV's general director, Boris Viktorovich Obnosov, has held his position since 2003. Obnosov was born in 1953 and has a distinguished background not only as a manager in the defense complex but also as a diplomat and as an academic. He served in the Russian delegation to the UN during the 1990s, after which he worked on arms control issues in the Russian Foreign Ministry. He also holds impressive academic titles as a dean at the Moscow Aviation Institute and as a member of both the Russian Academy of Rocket-Artillery Sciences and the Russian Academy of Cosmonautics.[51] His deputy, Vladimir Nikolaevich Iarmoliuk, has a similar background, having graduated from the same training academy and also having worked for Russian state-owned arms export firms. Iarmoliuk has also held his position since 2003. KTRV is further overseen by a board of directors including Obnosov, the heads of several other defense organizations, and fairly high-ranking government officials.[52] The head of the board of directors is Boris Viacheslavich Gryzlov, an important Russian politician who has benefitted from his long alliance with Russian President Vladimir Putin. Gryzlov was Minister of Internal Affairs from 2001 until 2003, after which he was head of the United Russia Party until 2008.[53] A permanent member of the Russian Security Council, Gryzlov has been Putin's Plenipotentiary Envoy to the Contact Group in Ukraine since December 2015.[54]

KTRV has not published detailed financial data in recent years, but it releases aggregate figures that give some sense of the scale of its operations. In 2015, KTRV received gross revenues of 152.327 billion rubles, 36.3 percent more in nominal terms than the previous year. It produced a profit of 14.741 billion rubles from this revenue, an increase of 19.3 percent over 2014. The company's workforce grew as well, from 41,762 in 2014 to 44,060 in 2015.[55] What is known about KTRV's subcomponents suggests that the bulk of these employees work at a few large subsidiaries, such as Raduga and NPO Mashinostroeniia.

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50 "*O korporatsii*" ["About the Company"], ktrv.ru, undated.

51 "*General'nyi Direktor*" ["General Director"], *KTRV*, undated.

52 "*Pervyi Zamestitel*" ["First Deputy"], *KTRV*, undated.

53 "*Biografiia*" ["Biography"], gryzlov.ru, undated.

54 "*Putin: Gryzlov naznachen polnomochnym predstavitelem RF v kontaknoi gruppe po Ukraine*" ["Putin: Gryzlov Appointed as the Plenipotentiary Representative of the Russian Federation in the Contact Group for Ukraine"], *IAR TASS*, undated.

55 "*Itogi finansovo-khozaistvennoi deiatel'nosti AO "Korporatsiia 'Takticheskoe Raketnoe Vooruzhenie'" i ego dochernykh obshchestv za 2015 god*" ["Financial and Economic Activity of the JSC 'Corporation for Tactical Missle Armament' and Its Subsidiaries for 2015"], *Vestnik KTRV* Vol. 4, No. 52, April 2016, p. 1.

KTRV's subsidiaries produce a bewildering array of goods in addition to missiles, ranging from high-tech optics and spacecraft to simple components. Unfortunately, most of them do not provide information about the breakdown of their output, particularly defense components. The gross revenue figure, however, seems to indicate that the bulk of KTRV's business comes from the SDO. Most important, KTRV is the manufacturer of every Russian air-to-surface missile that could be considered a strike system, including the Kh-31, Kh-35, Kh-38, Kh-55, Kh-59, and Kh-101, and is also the current maintainer/developer of most of these systems.

KTRV offers its workers fairly attractive pay and generous benefits. Average monthly salaries in 2015 were 41,954 rubles per month.[56] Employees who do hazardous work are entitled to free sanatorium stays, and those who do not but have medical conditions are heavily subsidized. Workers can send their children to "health-improving" summer camps around Moscow and in southern Russia at only 10 percent of cost.[57] In addition to regular youth engagement programs detailed in KTRV's monthly newsletter, the company also encourages an internal sports league in which its different subsidiaries compete.[58]

KTRV's diverse subsidiaries are distributed across a range of Russian cities, but its main facility is in Korolev, a legendary *naukograd* (science city) in Moscow Oblast. Named after the designer of the rocket that launched Sputnik into orbit in 1957, Korolev was originally established as the site of an artillery research institute before the Second World War and is today a center of both scientific research and high-tech manufacturing, particularly of space and missile-related hardware. Its most famous employer is not KTRV but RKK Energiia, the manufacturer of the Soyuz spacecraft and its associated launcher. The city has a current population of about 220,000.[59] The proportion of KTRV's development and manufacturing activity that takes place in its Korolev facility is not apparent from open sources, but a significant amount of assembly work clearly takes place there.[60]

MKB Raduga

Mashinostroitel'noe konstruktornoe biuro Raduga (Machine-Building Design Bureau "Rainbow") is the subsidiary of KTRV most extensively involved in the development and manufacture of cruise missiles for strike missions. Headquartered in the city of Dubna in Moscow Oblast, Raduga originated in 1951 as a development facility for cruise missiles. Until 1982, it remained a filial of the Mikoyan Design Bureau, but in 1966 it was dubbed Raduga. In 1978 the associated factory received the same name, and the entire complex became an independent enterprise in the 1980s. Raduga has developed over 40 missiles over the course of its long history, many of which remain in service. These include nuclear-armed standoff missiles such as the Kh-15 and Kh-55. Raduga is also proud of its role developing hypersonic weapons for both the Soviet and Russian governments. In 2004, the Russian government transferred Raduga to the recently established KTRV.[61]

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[56] "*Itogi finansovo-khozaistvennoi deiatel'nosti AO "Korporatsiia 'Takticheskoe Raketnoe Vooruzhenie'" i ego dochernykh obshchestv za 2015 god*," 2016, p. 1.

[57] "*Programma ozdorovleniia*" ["Health Program"], *KTRV*, undated.

[58] "*Ch'ia komanda sil'nee?*" ["Whose Team Is Stronger?"], *Vestnik KTRV*, Vol. 6, No. 54, 2016, p. 4.

[59] Rosstat, "*Chislennost' naseleniia Rossisskoi Federatsii po munitsipal'nym obrazovaniem*" ["Population of the Russian Federation by Municipality"], January 1, 2016.

[60] "*Chtoby vypolnit' proizvodstvennyi plan*" ["Fulfilling the Industrial Plan"], *Vestnik KTRV*, Vol. 11, No. 59, 2016, p. 2.

[61] "*Istoriia*" ["History"], *KTRV*, undated-b.

The general director of Raduga is Vladimir Nikolaevich Trusov. Born in 1942, Trusov has worked at Raduga since 1968 and has been general director since 1993. The KTRV website attributes his ascent to his "deep theoretical knowledge, great capacity for work, and talent as an organizer as well as an engineer."[62] Unlike his counterparts at some other Russian defense enterprises that combine development and manufacturing responsibilities, Trusov is not the head designer as well as general director. Raduga's head designer is apparently still Igor Sergeevich Seleznev, a legendary Soviet missile designer who recently celebrated his 85th birthday. Seleznev was both general director and head designer during the 1980s, at which time Trusov was his immediate deputy, and he served as Trusov's immediate deputy from 1993 until 2007. Recent news coverage seems to indicate that he is still formally head designer, although the extent of his day-to-day duties is unclear.[63]

Raduga releases limited information about its management and financial dealings, but what little it does indicates that these aspects of its operations are deeply integrated with the rest of KTRV. Raduga's board of directors is largely composed of senior figures from KRTV, such as Obnosov and KRTV Commercial Director Viktor Evgenievich Vagan.[64] The last published budget documents from the concern are over five years old, and they indicate that as of that date Raduga planned a massive expansion of its business due to the 2020 SAP. In 2011, Raduga had total revenue of 3.951 billion rubles, from which it produced a profit of 144.829 million rubles. Plans at that time envisioned that in 2013 revenues would be 4.549 billion rubles and that they would jump to over 14 billion rubles in 2014.[65] In 2011, Raduga had an average of just under 1,300 employees, but figures provided in its annual report for that year suggest that executives then planned to increase their staff to nearly 4,000 to meet the anticipated orders.[66] Unfortunately, publically available sources do not state how much Raduga's employee roster actually grew in the past five years. (Raduga's employees are included in the total given above for KTRV.) Raduga's workers enjoy similar benefits as those of other KTRV subsidiaries, and it seems the central office in Korolev plays the lead role in setting social policy.

Like Korolev, Dubna is a science city near Moscow, albeit a considerably smaller one. As of 2016, it had a population of about 75,000. Dubna's most famous, and largest, employer is the Joint Institute for Nuclear Research. About 6,000 people work there, including about 1,000 scientific researchers. Thanks to the presence of the Joint Institute, Dubna was one of the privileged "nuclear cities" in Soviet times and continues to enjoy some of the political and cultural benefits of that status. Dubna is also the site of the Ivankov Hydroelectric Power Station and several other advanced production facilities in addition to Raduga.

Raduga's primary output is cruise missiles for both foreign buyers and for the Russian MOD. While the relative importance of each market for the plant's bottom line is unclear

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62 "*Direktor*," *KTRV*, undated.

63 "*85-letnii iubilei segodnia otmechaet legendarnyi konstruktor raketnogo oruzhiia Igor' Seleznev*" ["Igor Seleznev, the Legendary Missile Designer, Marks the 85th Anniversary Today"], *Vesti Dubny*, September 23, 2016.

64 "*Spisok afiilirovannykh lits otkrytoe aktsionernoe obshchestvo mashinostroitel'noe konstruktorskoe biuro 'Raduga' imeni A. Ia. Berezniaka*," ktrv.ru, 2012.

65 "*Godovyj otchet otkrytogo "aktsionernogo obshchestva mashinostroitel'noe konstruktorskoe biuro 'Raduga' imeni A. Ia. Berezniaka, za 2011 god*" ["Annual Report of the Open Joint-Stock Company 'State Engineering Design Bureau 'Rainbow'"], *ktrv.ru*, 2011, p. 38.

66 "*Godovyj otchet otkrytogo "aktsionernogo obshchestva mashinostroitel'noe konstruktorskoe biuro 'Raduga' imeni A. Ia. Berezniaka, za 2011 god*," 2011, pp. 21, 37–38. Individual worker productivity was estimated at 3.58 million rubles per employee for 2014, which works out to 3,926 workers for the stated anticipated gross revenue of 14.0592 billion rubles.

because publically released data only address KTRV as a whole, the export versions of the plant's cruise missiles such as the Kh-38 and the Kh-59 are heavily promoted to potential foreign customers.[67] Raduga also makes a surprising range of civilian goods, as well, although these seem to produce a relatively limited fraction of the plant's revenue. According to the KTRV website, these include agricultural equipment, medical instruments, and wind turbines.[68] The only three systems directly attributed to Raduga on the KTRV website are the Kh-58, Kh-59, and Moskit-E, although it makes an ambiguous reference to "others."[69] Curiously, neither the company nor its parent KTRV seem to acknowledge publically their involvement in what may be Raduga's most important products: the Kh-101 and Kh-102 standoff cruise missiles, which form part of the armament of Russia's Tu-95 and Tu-160 strategic bombers. Raduga developed and produced the Kh-55 ALCM from which these two weapons are derived during the Soviet period, yet the more modern missiles are not referenced in any official Raduga or KTRV materials. Presumably this reticence results from some kind of official blackout policy, yet Russian media made elaborate reports touting the Kh-101 after it was used in Syria.[70]

Novator

Located in Yekaterinburg, a city in the southern Urals, Novator is Russia's premier designer and manufacturer of cruise missiles. Founded in 1947 on the basis of the design office of the No. 8 Kalinin Factory as OPK-8, in its early years it focused on antiaircraft guns. In the late 1950s, OKB-8 began working on antiaircraft missiles and road-mobile platforms for them, and in the 1960s, it expanded its work to include naval missiles, as well. In 1966, it was renamed Novator.[71] It codeveloped and manufactures both the missile and the launcher for the S-300 SAM system. Its other output includes the Buk and Shtil SAMs, the S-10 Granat SLCM, and its abortive GLCM derivative, the RK-55. The latter formed the basis for the Kalibr series of SLCM as well as the R-500 GLCM used in the Iskander-K. In 1991, Novator became an independent enterprise. After the Russian government formed the Almaz-Antei holding company in 2002, Novator was one of the many enterprises involved in SAM development that were incorporated into it.

Perhaps due to the controversial nature of its work on LRCMs, Novator keeps a lower public profile than some other Russian weapons manufacturers. Figures on its financial performance and total employment have not been released in several years. In 2013, Novator's total revenues were 11.867 billion rubles, from which it derived a profit of 283 million rubles.[72] In 2014, the company had a total of 2,576 employees, including 684 production workers and 1,472 "specialists and leaders."[73] Pavel Ivanovich Kamnev has been both chief designer

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[67] "*Na vooruzhenii armii i flota*" ["Armament of the Army and the Navy"], *Vestnik KTRV*, Vol. 10, No. 58, 2016, p. 3.

[68] KTRV, "*O korporatsii*" [About the Company], 2018.

[69] "*Produktsiia*" ["Products], 2009.

[70] Pervyi Kanal, "*Tu-160 Krylataia Raketa Kh-101*" ["Tu-160 Cruise Missle Kh-101"], youtube.com, November 1, 2017.

[71] Novator, "Novator" (archived version of earlier Novator company website maintained by Ufa State Aviation Technology University), *ugatu.ac.ru*, undated-b.

[72] "*Organizatsiia AO OKB 'Novator'*" ["Organization of JSC 'Novator'"], *List-org.com*, undated.

[73] OAO, "*Opytnoe Konstruktorskoe biuro 'Novator,' Dokumentatsiia k Izveshcheniiu No. 52/25-2014 o priglashenii delat' oferty na pravo zakliucheniia dogovora na razrabotku proektnoi i rabochei dokumentatsii "Tekhnicheskoe perevooruzhenie predpriatiia na Otrkytom aktsionernom obshchestve "OKB "Novator" g. Ekaterinburg, Sverdlovskaia oblast,"*" ["Documentation for Issue No. 52/25-2014 About Bidding on the Right to Contract 'Technical Rearmament of Enterprise at JSC "OKB Novator"'"], January 14, 2014, pp. 43–44.

and managing director of Novator since 1996. Kamnev is highly decorated—President Putin awarded him "Hero of Labor of the Russian Federation" in April 2016—but he is now 79 years old and cannot continue running Novator indefinitely. Kamnev's immediate deputy, Vladimir Ivanovich Vol'man, is significantly younger than Kamnev but still past retirement age.[74] A recent tragedy suggests that his management style incorporates a significant element of nepotism. Local news in Yekaterinburg reported in October 2016 that Kamnev's 54-year-old son, who had worked as Novator's chief legal council, had committed suicide in his office at the plant.[75] Furthermore, Novator's IT director, Denis Vladimirovich Vol'man, appears to be Vladimir Volman's son.[76]

While Novator's senior leadership largely seems, like Kamenev, to have been at the enterprise since the Soviet period, it offers employee benefits and worker training programs designed to attract and cultivate younger talent. In 2015 Novator boasted 42 employees with the Russian equivalent of Ph.D.s. The plant created a Commission of Scientific Development of Workers in 2005, which carries out technical seminars, as well as a Commission of Young Specialists. The latter organization not only aims to improve the intellectual development of young workers but also to help solve their practical problems as well as provide social services such as sporting events and work outings. To support younger workers, Novator offers housing subsidies for new employees, the direct provision of housing on favorable terms to particularly in-demand specialists, as well as a lump-sum payout to members of its employee union on the occasion of both marriage and the birth of a child.[77]

Novator's troubles extend to its manufacturing operations, which apparently proceed despite seriously outdated facilities and equipment. These problems attracted criticism in the Russian-language blogosphere in 2015 when a Russian nationalist located a document on a Russian government website about plans to modernize Novator at state expense. Noting that the plant's buildings all dated to the mid-1970s, that more than half of its production equipment dated to the Soviet period, and that less than 10 percent of it was under five years old, he lamented that the modernization "should've been started much earlier."[78]

Novator probably employs less than 0.5 percent of the working population of Yekaterinburg and likely has limited influence on local and regional politics. A city of nearly 1.5 million people, Yekaterinburg has a well-diversified and fairly prosperous economy by Russian standards. It is headquarters to a number of major Russian corporations.

Titan

Based in Volgograd, Titan-Barrikady dates to before the Russian Revolution. In 1913, Tsar Nicholas II approved the construction of an artillery plant in the city of Tsaritsyn, but it was not completed until the 1920s because of the First World War. Renamed Barrikady (Barricades) in 1923, before the Nazi invasion, the plant made artillery pieces for the Soviet Army.

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74 "*Vol'man Vladimir Ivanovich*," *Entsiklopediia Urala*, undated.

75 Il'ia Kazakov, "*Syn gendirektora OKB 'Novator' pokonchil so soboi v rabochem kabinete*" ["Son of the General Director of OKB Novator Committed Suicide in His Office"], *el.ru*, October 10, 2016.

76 Novator, "*Kontakty*" ["Contact Information"], *okb-novator.ru*, undated-a.

77 Novator, undated-a.

78 "*'Kalibr,' OKB 'Novator' i bochka degtia*," 2015.

During World War II, the plant's design staff contributed to the improvement of the T-34 tank, foreshadowing their postwar emphasis on self-propelled artillery.[79]

At the conclusion of the Soviet period, the Titan concern was separated from Barrikady, and the two firms coexisted as independent partners until 2014. Titan, which specialized in sophisticated modern weapons, benefited from the Russian government's consistent interest in its road-mobile ICBM launchers, particularly the TEL for the Topol-M ICBM. Barrikady, in contrast, struggled throughout the 1990s and early 2000s due to a lack of demand for its output. Attempts to diversify into civilian manufacturing failed to prevent the firm from falling into bankruptcy. Recovery began in 2006, when Barrikady began manufacturing Iskander launchers (which had been designed by Titan) and launch equipment for the Topol-M and its derivatives. The Russian government placed great importance on these systems, so it elected to recapitalize Barrikady to modernize its production facilities. In 2007–2008, the Military-Industrial Commission and Titan carried out a program to correct Barrikady's deficiencies. In 2014, the Russian government merged Titan and Barrikady into a single enterprise under the name Titan, which was changed to Titan-Barrikady in 2016.[80]

Due to its privileged position providing equipment for Russia's nuclear arsenal, Titan-Barrikady is integrated into the set of government enterprises that develops and manufactures strategic nuclear delivery systems. In the mid-2000s, part of the plant's manufacturing capability was owned by Rostekhnologiia, but in 2010–2011 all of what is now Titan-Barrikady was transferred to the ownership of the Moscow Institute of Thermal Technology (MITT), which designs Russia's solid-fueled ICBMs and SLBMs. MITT, in turn, is directly owned by Rosimushchestvo rather than being under a holding company such as Almaz-Antei or Rostec.

Current information about the staff size and financial status of Titan-Barrikady is obscure, probably due to the sensitive nature of the firm's products. A 2016 article in *Natsional'naia oborona* indicated that its current total employment is about 6,000 people.[81] Occasional statements by Titan-Barrikady managers and Russian government officials indicate that the enterprise is in good financial condition. They place particular emphasis on the generous compensation received by Titan-Barrikady employees, which seems to have grown in real terms even after the financial downturn in 2014.

Titan-Barrikady's general manager and chief designer is Viktor Aleksandrovich Shurygin. Shurygin grew up in Volgograd and is a missile engineer by training. He has worked at Titan since the 1970s, when it was Barrikady's in-house design office. Shurygin was promoted to his current position in 1992 and has held it since. The Russian government appears to trust Shurygin's management—he received the State Prize of the Russian Federation in Science and Technology in 2013—and he successfully orchestrated a substantial increase in Titan-Barrikady's production in 2016.[82] Titan-Barrikady seems to be run more like a Soviet research-production combine than a capitalist enterprise, which is not all that surprising given

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79 "*Istoriia*," ["History"], *Titan-Barrikady*, *cdbtitan.ru*, undated-a.

80 "*Istoriia*," undated-a.

81 "*MIT—Lider v obespechenosti bezopasnosti Rossi*" ["MIT Is the Leader in Ensuring Russia's Security"], *Natsional'naia oborona*, April 2016.

82 "*Talantam i trudom. Kakim byl 2016 god dlia 'Titan-Barrikady'*" ["Talent and Work. What Was the Year 2016 for 'Titan Barricade'"], *Argumenty i fakty*, December 28, 2016.

that it is a wholly-owned subsidiary of one of the major institutions of the Russian nuclear weapons complex.

While Shurygin himself is over 70, he has invested considerable resources into attracting and cultivating younger workers to his enterprise. The average age of workers at Titan was 43 in 2012, compared with 44 the previous year.[83] Titan-Barrikady touts its generous social policy on its website and in its press releases. It continues to provide its workers with the same kind of benefits provided by Soviet defense enterprises, such as free vacations and sanatorium visits as well as summer camps for employees' children.[84]

Shurygin stated in a 2011 interview that R&D made up 18 percent of the work at Titan at that time.[85] Given the merger and the expansion of Titan-Barrikady's production in recent years, this figure has probably gone down somewhat since then. The enterprise's growth may have allowed increased real investment in R&D even if its share of Titan-Barrikady's activity has decreased.

Titan-Barrikady is a major employer in the city of Volgograd, but it is hardly a predominant economic player there. Volgograd has a total population of 1 million, of which about 40,000 are manufacturing workers, compared to 100,000 in the late Soviet period.[86] Not all of Titan-Barrikady's employees work in production, so it probably represents about 10 percent of the manufacturing activity in the city. Even so, Titan-Barrikady probably has greater influence than these numbers indicate. It is an unusually prosperous employer that manufactures advanced, high-added-value goods for a consistent buyer. Most important, it enjoys the privileges of a being a member of the Russian nuclear weapons complex.

Votkinskii Zavod

Located in the city of Votkinsk, Votkinskii Zavod (literally Votkinsk Factory) is one of the oldest factories not just in the Russian defense industry but in Russia as a whole. It was founded in 1759 as an iron smelter and, in the nineteenth century, produced railway equipment and machine tools. Despite manufacturing some items for the Tsarist military, its full conversion to the production of ordnance took place only in 1938, under the rule of Josef Stalin. During the 1950s the plant began producing ballistic missiles, and in the 1960s it began manufacturing the USSR's first solid-fueled ballistic missiles. Votkinskii Zavod produced SS-16 Sinner road-mobile ICBM, SS-20 Saber, SS-25 Topol, OTR-21 Tochka, and OTR-23 Oka. As it happened, after the collapse of the Soviet Union, it was the only large solid-fuel missile production facility within Russia (the manufacturer of the SS-24 Topol was in eastern Ukraine). When the Russian government elected to acquire its first post-Soviet ICBM, the road-mobile Topol-M, Votkinskii Zavod, therefore, received the orders.

Until very recently, Votkinskii Zavod struggled to produce modern ballistic missiles in substantial quantities. Deployment of the Topol-M and its derivatives, the MIRVed Yars

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[83] TsKB Titan, "*General'nyi director I general'nyi konstruktor OAO 'TsKB 'Titan' Viktor Shurygin vstretil s molodymi spetsialistami predpriatii*" ["Viktor Shurygin, General Director and General Designer of JSC 'TsKB' Titan "Met with the Young Specialists of the Enterprise"], *VPK*, February 4, 2013.

[84] Vera Makevnina, "*FNPTs 'Titan-Barrikady': otvet za vyzovy vremeni*" ["FNPC 'Titan-Barricades': Response to the Challenges of Time"], *Komsomol'skaia Pravda Volgograd*, December 21, 2016.

[85] Vera Makevnina, "*Kadry, modernizatsiia, kachestvo: tri 'kita' strategii 'Titana'*" ["Personel, Modernization and Quality: Three Whales of the 'Titan' Strategy"], *Natsional'naia oborona*, 2011.

[86] "*Na predpriatiakh Volgograda ostalos' okolo 40 tysiach rabochikh*" ["Forty Thousand Workers Employed in the Enterprises in Volgograd"], *Vysota 102.0*, September 13, 2016.

ICBM and Bulava SLBM, lagged behind expectations until the 2010s, and many blamed this shortfall on production problems at the plant. Vladimir Putin implicitly acknowledged these problems in 2011 when he personally visited the plant to announce that it would be modernized at government expense. Putin's remarks indicated that as part of the plan to double the production rate of missiles starting in 2013, during the next three years 1.7 billion rubles would be spent on Votkinskii Zavod.[87] In 2015, the plant's director stated that his facility had received nearly five billion rubles over the previous five years for modernization, and that it had spent 5.7 billion rubles of its own money on top of that.[88] Greatly accelerated deliveries of Iskander-M and Yars missiles to the Russian armed forces suggest that this investment paid off for the Kremlin.

Like Titan-Barrikady, Votkinskii Zavod was transferred in 2010 to the MITT, the state-owned concern that primarily builds strategic nuclear delivery systems. The plant's 65-year-old director, Viktor Grigorievich Tolmachev, worked his way up from being a shop foreman and has held his current position since 1995. Tolmachev is evidently an able manager, as he successfully navigated his factory through the economic distress of the late 1990s. As Tolmachev is fond of pointing out in interviews, Votkinskii Zavod is a major economic player and employer in Udmurtiia. In 2011, the plant's staff numbered about 12,000 people, and in 2015, Tolmachev stated that it had grown 13 percent since then, suggesting that it currently employs between 13,000 and 14,000 workers.[89] The average monthly salary in 2011 was 23,680 rubles, and the minimum was 10,100—both very generous not just for the area but for Russia as a whole. Votkinskii Zavod offered its employees relatively generous social benefits as well. The age of the average worker has been going down and was 38.5 years in 2016. Tolmachev emphasizes the role of continuing worker education to maintain a vibrant, well-qualified staff.[90]

While Russian media coverage regularly acknowledges that Votkinskii Zavod manufactures the country's nuclear delivery systems, the factory's website only acknowledges its civilian business. This includes manufacturing sophisticated equipment for the Russian gas and civilian nuclear industries.[91] At the beginning of the century this work made up the bulk of Votkinskii Zavod's business, but thanks to robust demand for its missiles the SDO now represents over 90 percent of the concern's production revenue.[92] In 2015 total production revenue exceeded 27 billion rubles.[93]

While much of Russia's post-Soviet defense industry is concentrated around major urban centers such as Moscow and Saint Petersburg, Votkinsk is a comparative backwater. Votkinsk is a city of about 100,000 people in Udmurtia, an Autonomous Republic located in the Western Urals. Udmurtia is the homeland of the Udmurts, a Finno-Ugric ethnic group who came

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87 Bondarenko, 2013.

88 Aleksandr Sobolev, "*Votkinskii zavod. Dobrye traditsii predpriiatiia-veterana*" ["Votkinskii Zavod: The Venerable Traditions of a Veteran Factory"], *Udmurtskaia pravda*, December 4, 2015.

89 Aleksandr Sobolev and Aleksander Smolokurov, "*Viktor Grigorievich Tolmachev: Intervi'iu dlinnoi v 10 let*" ["Viktor Grigorievich Tolmachev: An Interview with a Length of 10 Years"], *Udmurtskaia pravda*, June 8, 2011.

90 "*Votkinskii zavod. Zavod—eto kollektiv*" ["Votkinskii Zavod: It's a Collective"], *Delevoi kvadrat*, Vol. 8, No. 129, August 2016.

91 "*Zagotovitel'noe proizvodstvo*" ["Stockpiled Production"], *vzavod.ru*, undated.

92 "*Zagotovitel'noe proizvodstvo*," undated, and Sobolev and Smolokurov, 2011.

93 Sobolev and Smolokurov, 2011. Unfortunately, the source of these figures did not characterize the extent of the firm's nonproduction revenue or of what it consisted.

under the rule of Muscovy in the sixteenth century. The autonomous republic has a population of 1.5 million, about half of which are Udmurts, but over 600,000 of them live in the regional capital of Izhevsk. Votkinsk is a comparatively minor urban center which was founded along with the factory and whose life has always revolved around it. Besides being home to the missile plant, Votkinsk's other claim to fame is that it was the birthplace of the famous composer Pyotr Tchaikovsky. The city's population is overwhelmingly ethnic Russian, with only about 10 percent Udmurts. As 63 percent of the city's population is of working age, Votkinskii Zavod evidently employs about a quarter of working residents. Votkinsk is, therefore, something of a *monograd* (one-industry town), but it benefits from the fact that it enjoys a monopoly on a product the Kremlin considers absolutely indispensable.

Unfortunately for the Russian government it seems Votkinskii Zavod's products may not live up to the standards of their U.S. counterparts. The Soviet Union predominantly favored liquid-fueled missiles, but post-Soviet Russia sought in the 1990s and early 2000s to replace them with solid-fueled missiles sharing common design features (Figure G.3). In addition to languid production rates, these missiles also suffered from indifferent performance in test launches, particularly the Bulava SLBM. The Bulava has failed in over a third of test launches, most recently in 2016 (in contrast, its closest U.S. counterpart, the Trident D5, rarely suffers launch failures). Russian media reports have attributed the dismal record of the Bulava to manufacturing defects.[94] While Votkinskii Zavod's land-based missiles such as the Iskander-M and Yars have much better testing records, the problems with the high-profile Bulava may be indicative of overall manufacturing problems at the plant, particularly given its aggressive production increases over the last few years. Even the present production rate is a fraction of what it was in the 1980s. Votkinskii Zavod produced missiles for 288 Topol launchers between 1988 and 1991, compared to 23 Yars ICBMs in 2016, along with a similar number of Bulava

Figure G.3
Missiles Produced by Votkinskii Zavod (Iskander-M Is Third from Right)

SOURCE: "*Raketnaia tekhnika*" ["Missile Technology"], *Iasnaia*, February 15, 2015.

[94] "*SMI: 'Bulava' dala sboi iz-za proizvodstvennogo braka*" ["Media: 'Bulava' Failed Due to Production Flaws"], *RBK*, September 14, 2013.

SLBMs.[95] Votkinskii Zavod's challenges manufacturing SLBMs may disguise an ability to greatly expand production of Iskander-Ms if it reallocates resources, however. As the Iskander-M is much smaller than the Topol-M, Yars, or Bulava, if the Russian government decides to prioritize the smaller missiles at the expense of nuclear strategic modernization it might be possible to deploy them at a significantly faster rate.

NPO Saturn

Headquartered in the city of Rubynsk near Yaroslavl, NPO Saturn is Russia's most important manufacturer of gas turbines, including the jet engines used in strike weapons such as the Kh-59 and Iskander-K cruise missiles. Saturn's diverse output includes many essential components for the Russian military and civilian economy, such as jet engines for passenger and military aircraft, turbines for the Russian navy, and equipment for the gas extraction industry. While Saturn is a substantial firm and is expanding its production capacity, it cannot make enough engines to meet government demand. Its near-monopoly supplying these components to the Russian state results from the loss of turbine imports from Ukraine, including of RD95-300 engines used in certain cruise missiles.

Saturn's origins date back to the efforts of the Tsarist government to establish a domestic automobile industry during the First World War. Under Stalin the factory became an important manufacturer of reciprocating airplane engines, and in the 1950s it became a major producer of military and civilian jet engines. After the fall of the Soviet Union the plant became a private firm called the Rubynsk Motor Plant, only to be renamed Saturn following a merger in 2001.[96] Today Saturn is controlled by a nested set of state-owned holding companies. Its immediate owner is the Unified Engine-Building Corporation, which is owned by Oboronprom, which is owned, in turn, by Rostechnologiia.

In contrast to many enterprises in the Russian defense complex whose executives are well past retirement age, the top managers of Saturn are relatively young. Peculiarly, the man universally acknowledged as the head of Saturn, Viktor Anatolievich Poliakov, does not have the title of general director, instead being styled assistant general director/managing director.[97] Born in 1953, Poliakov has worked at the plant since he graduated from school in 1975. The plant's general director, Aleksandr Viktorovich Artiukhov, is not mentioned on the plant's website as a manager. In January 2017 Poliakov elevated a 45-year-old engineer, Roman Khramin, to the position of chief designer.[98] Senior managers from Unified Engine-Building Corporation and Oboronprom dominate the plant's board of directors.[99]

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[95] "*Chetyre polka RVSN s 23 MBR 'Iars' zastupiat na dezhurstvo do kontsa 2016 goda*" ["Four Strategic Missile Brigades with 23 'Yars' ICBMs Will Enter Service by the End of 2016"], *RIA Novosti*, December 15, 2016. Three project 955 SSBNs are in service with an additional five under construction, with the later SSBNs carrying 20 Bulava SLBMs apiece. As of December 2016, official plans called for the completion of all eight submarines by 2020, therefore requiring 20 to 25 Bulava missiles to fully arm them. "*Na 'Sevmashe' zalozhili posledniuiu iz vos'mi atomnykh podlodok 'Borei'*" ["The Last of Eight 'Borei' Nuclear Submarines Laid Down at 'Sevmash'"], *RIS Novosti*, December 23, 2016.

[96] "*Istoriia*" ["History"], *NPO Saturn*, undated-c.

[97] "*Top-menedzher OAO "NPO 'Saturn' Viktor Poliakov udostoen zvaniia 'Pochetnyi grazhdanin goroda Rubynska'*" ["Top Manager of NPO Saturn Viktor Poliakov Awarded 'Honored Citizen of the City of Rubynsk'"], *Aviaport.ru*, March 27, 2013.

[98] "*Ispolnenie obiazannostei general'nogo konstruktora PAO "NPO 'Saturn' vozlozheno na Romana Khramina*" ["Roman Khramin Given Responsibilities of Chief Designer at NPO Saturn"], *Press-sluzhba NPO*, January 9, 2017.

[99] "*Godovoi otchet publichnogo aktsionernogo obshchestva, "Nauchno-proizvodstvennoe ob"edinenie 'Saturn' za 2015 god*" ["Annual Report of the Public Joint-Stock Company 'Saturn' for 2015"], 2015, pp. 10–13.

Unsurprising given its monopoly manufacturing essential components for critical Russian military hardware, Saturn has enjoyed robust business in recent years. In 2015 its production revenue totaled over 24 billion rubles, compared to 18 billion the previous year. This revenue generated a profit of 6.2 billion rubles. The enterprise made 16.87 billion rubles selling aircraft components, 1.446 billion rubles on land-based equipment, and 4.8 billion rubles carrying out R&D tasks.[100] Unfortunately, even though the firm is forthcoming with statistics about its official production of civilian aircraft engines, it is reticent with figures about its production of cruise missile engines, only stating that it fulfilled the SDO and that it was working with a foreign client to adapt the engine to its missile.[101] In 2014, the SDO made up about 40 percent of Saturn's business.[102] According to the NPO Saturn website, since that year it has been undergoing a modernization program that "will practically renovate the entire factory."[103]

In 2015 Saturn had a total staff of 12,501 employees. This total included 7,178 "workers," 3,597 "specialists," 1,429 "middle managers" and 199 "upper managers." While a considerable fraction of the employees were under 35 (4,251), 5,677 were over 45 and 1,995 were past retirement age.[104] The average monthly salary for Saturn employees was 32,100 rubles.[105] The enterprise invests considerable resources in continuing worker education, particularly through a longstanding cooperation arrangement with the local university.[106] Saturn also provides generous social benefits to its employees, including providing them with discount cards that work at 70 partner businesses, summer camps for their children (on which Saturn spent 2.28 million rubles in 2015), sanatorium stays, and, most expensive, subsidized housing. Saturn spent tens of millions of rubles that year subsidizing worker housing or providing it outright.[107]

In Soviet times NPO Saturn's predecessor was the most important employer in the city of Rybinsk, whose population has fallen by over 60,000 in the past 25 years along with the decline of local industry. Today about 190,000 people live in Rybinsk, and the city is substantially underpopulated relative to its ample Soviet-era housing stock. While not in terrible shape by the standards of many post-Soviet Russian cities, Rybinsk is neither particularly vibrant economically nor in the immediate vicinity of a major center such as Moscow.

NPO Saturn's significance for the Russian strike complex is that it is the sole manufacturer of the TRDD-55 jet engine employed in the Kh-59, Kalibr, Klub, Iskander-M, and Kh-101 cruise missiles. The TRDD-55 was developed at the beginning of the 2000s as a mod-

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100 "*Godovoi otchet publichnogo aktsionernogo obshchestva, "Nauchno-proizvodstvennoe ob"edinenie 'Saturn' za 2015 god*," p. 35.

101 "*Godovoi otchet publichnogo aktsionernogo obshchestva, "Nauchno-proizvodstvennoe ob"edinenie 'Saturn' za 2015 god*," p. 33.

102 *Interfaks-AVN*, "*Interv'iu s upravliaiushchim direktorom NPO 'Saturn' Il'ei Federovym*" ["Interview with NPO Saturn Leading Director Il'ei Federov"], *Novosti VPK*, July 17, 2014.

103 "*Istoriia 2009–2014*" ["*History 2009–2014*"], *NPO Saturn*, undated.

104 "*Godovoi otchet publichnogo aktsionernogo obshchestva, "Nauchno-proizvodstvennoe ob"edinenie 'Saturn' za 2015 god*," p. 62.

105 "*Godovoi otchet publichnogo aktsionernogo obshchestva, "Nauchno-proizvodstvennoe ob"edinenie 'Saturn' za 2015 god*," p. 73.

106 "*Godovoi otchet publichnogo aktsionernogo obshchestva, "Nauchno-proizvodstvennoe ob"edinenie 'Saturn' za 2015 god*," pp. 64–65.

107 "*Godovoi otchet publichnogo aktsionernogo obshchestva, "Nauchno-proizvodstvennoe ob"edinenie 'Saturn' za 2015 god*," p. 65.

ernized replacement for the RD95-300 engine employed in older missiles such as the Kh-55. The RD95-300 was made by Motor-Sich in Ukraine, and while the TRDD-50 is reputed to be superior Russia continued to import it until the 2014 annexation of Crimea. Russian defense commentators noted at the time that an importation substitution program would need to make up for the loss of Ukrainian engines, which were still being employed in the Kh-35. In 2014 Poliakov's predecessor asserted that the plant was "making over 300 small jet engines for each year for companies making missiles," and that its "production rate is growing one and-a-half to two times every year."[108]

Outlook

Strike systems are clearly a high priority for the Russian government and are likely to remain so for the foreseeable future. Russia has invested billions of dollars to develop and produce these systems and will continue to seek returns on that investment. Russian political and military thinkers agree that precision conventional strike weapons can supplant nuclear weapons for some purposes. Furthermore, Russia's intervention in Syria has demonstrated how these weapons can be employed to achieve the Kremlin's military and political goals. At the same time, it is unclear whether Russia can afford to procure these munitions in the quantities required to meet its aspirations. Russian leaders may conclude that most of these weapons need to be held in reserve as delivery vehicles for nonstrategic nuclear weapons, and employ them only sparingly for conventional missions.

Doctrine and Operating Concepts

The future of Russian strike systems will depend upon whether the present uncertainty about the role and significance of nonstrategic nuclear weapons in Russian strategic doctrine is resolved. Without a clear understanding of how strike systems would be employed in a nuclear role, it will be difficult for Russian political and military leaders to decide whether to expend them on particular missions. A fully articulated doctrine about nonstrategic nuclear weapons could provide the essential guidance, but at present it is not clear that Russia has a doctrine for NSNW use at all.

Russian doctrine for conventional strike is comparatively well articulated, but it remains aspirational due to both the limited supply of the munitions and the underdeveloped capacities for systems integration, PNT sensing, and C2. As Russia modernizes these capabilities and grows its stockpile of precision weapons, it will be able to actualize its doctrine.

Future Resources and Funding

Despite its present economic difficulties, it seems likely that Russia will not slow down its procurement of new strike systems. Planned deployment of Iskander brigade sets is proceeding as scheduled even as spending on other systems has been pared back. The primary limiting factor in Russian procurement of strike systems is probably production capacity rather than monetary costs. Votkisnkii Zavod and Novator required costly recapitalizations to produce the strike systems prioritized by the Russian government, and they may not have the human or material capacity to produce many more missiles than they presently do.

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[108] *Interfaks-AVN*, 2014.

Systems and Procurement Priorities

At present, there are few qualitatively new strike systems known to be under development in Russia. A major exception to this trend is the Tsirkon hypersonic antiship missile, but this system has been under development since Soviet times. Due to the extensive lead times required for radical new weapons, it seems that, for the foreseeable future, Russian strike systems will be evolutionary improvements upon current ones, with the inclusion of new features to overcome increasingly sophisticated adversary defenses.

Research and Development and Possible Discontinuities

An uncertain factor shaping Russia's development of future strike systems is the 1987 INF Treaty, which forbids the deployment of missiles with ranges between 500 km and 5,500 km. Some Russian strike systems, such as the Iskander-K, may already violate this treaty. So long as the treaty remains in force, however, Russia is unlikely to develop and deploy systems that flagrantly violate it. If the INF Treaty is formally abrogated, it seems likely that Russia will develop new IRBM, MRBMs, and GLCMs with ranges greater than 500 km. These systems would fall into a category between theater delivery systems and strategic nuclear weapons and might become the subject of intensive R&D work should the INF Treaty collapse.

Personnel and Training

Due to the high priority placed on strike capabilities, the Russian military provides additional support to the personnel responsible for them. They are less likely to be conscripts and receive special privileges. These trends are likely to be maintained even as Russia trims back its military spending.

APPENDIX H

Rapidly Deployable Forces

William Mackenzie and Clinton Reach

Overview

Since the end of the Cold War, Russia has consistently invested in its rapidly deployable forces and sees units such as Glavnoye Razvedatel'noye Upravleniye (Main Intelligence Directorate, GRU) Spetsnaz, VDV, and the Komandovaniye Sil Spetsial'nykh Operatsiy (Special Operations Command, KSO) as important organizations in the years ahead.

Spetsnaz is a ubiquitous term across the Russian military and internal security forces, but primarily it is associated with forces that are subordinate to the GRU of the General Staff. The term *Spetsnaz* originates from the Russian word *spetsialnoe naznachenoe*, meaning "special designation." The Spetsnaz's special designation refers to the adaptability of the organization rather than the abilities of a particular soldier. Traditionally, GRU Spetsnaz brigades have focused on limited direct-action missions, deep battlefield reconnaissance missions, and political operations in support of conventional Russian forces.[1] Spetsnaz is composed of seven brigades and one regiment, each of which includes anywhere from 900 to 2,000 operators divided into battalions and special purpose detachments. It is estimated that the Spetsnaz consist of 15,000 to 17,000 operators.

As the fifth branch of the Russian armed forces, the VDV are more explicit in their mission and roles on the battlefield than the Spetsnaz. The VDV are deployed before the outbreak of hostilities to seize critical infrastructure, facilitate the arrival of Russian troops, act as rapid response elite mobile infantry, and disrupt their enemy's command and control capabilities by parachuting behind enemy lines and attacking logistics and communication hubs with precise weaponry. As a branch of the Russian armed forces, the VDV are considerably larger than the Spetsnaz, with nearly 45,000 service members; the VDV has plans to increase its size to 60,000 paratroopers by 2020.[2]

After the Russo-Georgian war in 2008 Russian military leadership embarked on a large-scale reform of the armed services to build a high readiness force capable of quickly responding to local armed conflicts. While this decision was and remains controversial, an important

[1] "The Rising Influence of Russian Special Forces," *Jane's Intelligence Review*, Sec. 26, November 24, 2014.

[2] Dmitry Litovkin, "*Uvelichenie chislennosti Vozdushno-desantnykh voysk otlozheno*" ["Increase in the Number of Airborne Forces Postponed"], *Izvestiya*, February 19, 2016.

component of the reform was the prioritization of elite ground forces considered best suited to react to crises along Russia's periphery. Most notably, a KSO was formed outside of Moscow with the support of former Chief of the General Staff Makarov and the current Minister of Defense Sergey Shoigu. Similar to Western Special Forces like SEAL teams, KSO Special Forces units conduct direct-action missions of high political significance.[3]

Despite some uncertainty as to the relative clout of each of these elite services within the Russian military going forward, recent history suggests that each will continue to a play an important role in future conflicts. Given that each of these services are likely to be involved in any future military—or nonmilitary—confrontations, it is important to understand their current and future capabilities. This section will provide an overview of the VDV, GRU Spetsnaz, and KSO with an emphasis on personnel, equipment, and operational concepts.

Recent History

To outline Russia's likely future deployments of its rapidly deployable forces, it is important to consider its previous trends and its uses of the VDV, GRU Spetsnaz, and KSO teams. The GRU Spetsnaz was a vital component in securing critical infrastructure during the successful, albeit illegal, annexation of Crimea. Billions of rubles have been spent over the past several years to man, train, and equip KSO troops that have publicly been acknowledged as a key piece of the ongoing Russian effort in Syria.[4] The VDV have seen their contract personnel numbers triple since 2010 and have upgraded combat capabilities with investments in tanks, EW, and UAVs.

In 2006 the MOD began to reform the VDV so the force more closely aligned with the current Russian approach to modern warfare. Experience from the Chechen campaigns, along with forecasts of future conflicts that were expected to take place primarily on Russia's periphery, led to the conclusion that professional, permanently ready forces were needed. As such, the VDV began to transition away from conscripted soldiers and toward professionally contracted paratroopers whose units would be fully equipped and ready to move on short notice. A recent change within the VDV was the division into airborne and air assault units. The former will be primarily concerned with large-scale parachute landing operations while the latter are an elite, light infantry that arrives at airfields with equipment to prepare for the insertion of additional forces.[5]

GRU Spetsnaz units have endured a long history of shifting priorities, alternating between tactical and strategic level goals and missions. During the post-2008 reforms, the GRU endured questions about their role, structure, and reporting lines.[6] GRU Spetsnaz commanders lost their special rights to report intelligence findings directly to the Russian president, and it has been reported that some GRU Spetsnaz funding was funneled off to facilitate the creation of

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[3] Tor Bukkvoll, "Military Innovation Under Authoritarian Government—The Case of Russian Special Operations Forces," *Journal of Strategic Studies*, Vol. 38, No. 5, 2015, p. 615.

[4] See Aleksey Nikolsky, "Russian Special Operations Forces," *Moscow Defense Brief*, No. 2, 2016.

[5] Mikhail Barabanov, ed., "Russia's New Army," CAST, 2011, p. 34.

[6] Alexey Ramm, "Russian Military Special Forces," in Ruslan Puhkhov and Christopher March, eds., *Elite Warrior, Special Operations Forces from Around the World*, Minneapolis, Minn.: East View Press, 2017, pp. 4–7.

the SOC.[7] As a result, Spetsnaz units are expected to perform less direct-action and high profile missions and, instead, focus on their ISR role in support of the Russian military.

Doctrine and Operating Concepts

Spetsnaz units focus on ISR missions in the support of conventional ground forces. VDV paratroopers, in contrast, are more offensive and mobile in nature, capable of being deployed anywhere within airlift range with minimal abilities to sustain long-term combat or logistical operations.

VDV Forces

According to the Russian MOD the VDV forces have the following wartime and peacetime missions:

> [The VDV] is a branch of the Armed Forces that is an asset of the High Command that is intended for the envelopment of the enemy from the air and to carry out tasks along the rear of the enemy that involve the disruption of command and control of forces, the destruction of ground elements with precision-guided munitions, the cutting off of movement and deployment of reserves, and the disruption of logistics and communications. [It is also intended for] the coverage (defense) of separate axes, positions, and open flanks as well for the encirclement and destruction of [enemy] airborne forces and enemy force groupings that have broken through . . .
>
> In peacetime the VDV execute tasks related to the sustainment of combat and mobilization readiness at a level that facilitates the successful employment [of the VDV].[8]

VDV paratroopers are the strategic reserve of the Russian high command and the core of Russia's Rapid Reaction Forces. The VDV's high proficiency means they have been used to seize key facilities, parachute behind enemy lines to disrupt enemy movements, and respond to extremely fluid situations, as was the case in the late 1990s at Kosovo's Pristina Airport. However, because the VDV are expected to move quickly and by air, equipment is lightly armored and not well suited for a prolonged combat environment, particularly where the enemy has antitank munitions. As such, VDV units are increasingly utilized as elite mobile infantry rather than as a simple parachute force, as was the case in Georgia 2008 and Kyrgyzstan in 2010.[9]

GRU Spetsnaz Forces

In Russian, the term *razvedka* is synonymous for reconnaissance or intelligence-related matters. In the Russian armed forces, motorized rifle squads or detachments of Spetsnaz brigades typically conduct reconnaissance missions. Spetsnaz operators help Russian commanders acquire tactical intelligence, information on their enemy's chain of command, force composition, and designate enemy targets or terrain that may impede conventional Russian forces.

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[7] Barabanov, 2011, p. 614; Bukkvoll, 2015, p. 613.

[8] "*Vozdushno-desantnye voyska* | *VDV RF*," ["Airborne Forces"], December 2015.

[9] Barabanov, 2011, p. 47.

In a frequently cited article titled "The Nature and Content of a New-Generation War," Colonel S. G. Chudinov and Lieutenant General S. A. Bogdan remark:

> The start of the military phase will be immediately *preceded by largescale reconnaissance and subversive missions conducted under the cover of the information operation*. All types, forms, methods, and forces, including special operations forces, space, radio, radio engineering, electronic, diplomatic, and secret service intelligence, and industrial espionage will be used to detect and map the exact location of key government and military objectives vital to the country's sustainability, designate targets for fire strikes, make digital topographic maps of enemy territory and load them remotely into onboard homing systems, and monitor the efficacy of fire strikes. [emphasis added][10]

Before military operations, Spetsnaz detachments conduct subversive actions and support Russian propaganda campaigns aimed at creating divisions between civilians and their governments. During information operations (IO), Spetsnaz try to create a more accepting environment for Russian influence on foreign soil by buying and recruiting pro-Russian groups active in the region.

Spetsnaz brigades also fund, train, and equip proxy groups, paramilitary groups, and Russian sympathizers to create sympathetic civilian populations as a part of Russia's IOs and destabilizing activities. In a response regarding Russia's role in Ukraine, a member of the Royal United Services Institute stated, "The GRU's duty was to prepare gangs, and the job of the Spetsnaz [Special Forces], controlled by the GRU, was to prepare an insurgency."[11] In Ukraine, former Spetsnaz members from the Chechen Vostok Battalion and Cossack paramilitaries have coordinated with Spetsnaz in Crimea.[12] Additionally, the Night Wolves, a motorcycle club comprised largely of former Spetsnaz operators and members of the Russian army, worked with Spetsnaz units in Crimea to ensure free and fair voting, despite reports to the contrary, during Crimea's referendum.[13] Spetsnaz have also reportedly employed pro-Russian Ukrainian citizens in eastern Ukraine to distract and slow the advance of the Ukrainian military during operations in the Donbass.

Russian Spetsnaz routinely deployed without their proper identification markers. In recent conflicts, Spetsnaz have deployed wearing masks, without insignias, or in unofficial uniforms.[14] Spetsnaz deploy without traditional uniforms to give Russia plausible deniability in military operations. The Russo-Georgian war, annexation of Crimea, and the ongoing conflict in eastern Ukraine have all seen Spetsnaz operators with misleading uniforms. In the earliest days of Russia's invasion of Crimea, GRU Spetsnaz operators were called "little green

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[10] S. G. Chekinov and S. A. Bogdanov, "The Nature and Content of New-Generation Warfare," *Military Thought*, 2013, p. 15.

[11] "Russian GRU Military Spy Chief Igor Sergun Dies," *BBC News*, January 5, 2016.

[12] "'Little Green Men': A Primer on Modern Russian Unconventional Warfare, Ukraine 2013–2014," U.S. Army Special Operations Command, August 6, 2016, p. 44.

[13] "'Little Green Men,'" 2016, p. 44.

[14] "'Little Green Men,'" 2016, p. 43; David Ignatius, "Russia's Military Delivers a Striking Lesson in Crimea," *Washington Post*, March 18, 2014.

men," as countries in the West could not definitively identify the so-called "local self-defense units."[15]

Command and Control

Spetsnaz operators are subordinate to the GRU. The GRU is the MOD's foreign intelligence organization for the General Staff of the Armed Forces of the Russian Federation. The GRU, led by Igor Korobov, performs analysis on tactical intelligence; maneuvers covert agents; collects and manages substantial amounts of signals intelligence, imagery reconnaissance, satellite imagery, and human intelligence; and oversees the military's attaché program.[16]

Spetsnaz brigades have a command, combat support, special radio communication (SRS), supply, logistics, and three Spetsnaz detachments.[17] Brigades are commanded by a headquarters element and supported by communication and intelligence units. For a list of GRU units, see Table H.1. The VDV, led by Colonel General Andrey Serdyukov, is its own military branch of the Armed Forces of the Russian Federation. Comprised of four divisions, four bri-

Table H.1
GRU Spetsnaz

Unit Designation	Military District	Location	Subunits (location)
2nd Independent Brigade	Western	Promezhitsa, Pskov	177th ooSpN (Taibol) 186th ooSpN 1071st Training Regiment (Pechora)
16th Independent Brigade	Western	Chuchkovo/Tambov, Moscow	370th ooSpN (Chuchkovo) 2 x ooSpN
10th Brigade	Southern	Molkino	3 x ooSpN
22nd Independent Guards Brigade	Southern	Stepnoy	173rd ooSpN 411th ooSpN 308th ooSpN 41th ooSpN
25th Independent Regiment	Southern	Stavropol	
24th Independent Brigade	Central	Novosibirisk	ooSpN (Novosibirsk) ooSpN (Berdsk)
3rd Independent Brigade	Central	Tolyatti, Samara Region	
14th Independent Brigade	Eastern	Khabarovsk	

SOURCE: Ramm, 2017, pp. 8–9.

NOTE: ooSpN = Special Purpose Detachment.

[15] "'Little Green Men,'" 2016, p. 31.

[16] Defense Intelligence Agency, 2017, p. 74.

[17] Ramm, 2017, p. 9.

gades, and one special operations brigade the VDV totals 45,000 in service members. For a list of VDV units, see Table H.2.

Table H.2
Russian Airborne Forces

Unit Designation	Location	Military District
7th Guards Air Assault Division	Novorossiysk	Southern
76th Guards Air Assault Division	Pskov	Western
98th Guards Airborne Division	Ivanovo	Western
106th Guards Airborne Division	Tula	Western
11th Guards Airborne Brigade	Ulan-Ude	Eastern
31st Guards Airborne Brigade	Ulyanovsk	Southern
56th Guards Airborne Brigade	Kamyshin	Southern
83rd Guards Airborne Brigade	Ussuriysk	Eastern
45th Special Reconnaissance Brigade	Kubinka	Western

SOURCE: Mark Galeotti, *The Modern Russian Army: 1992–2016*, New York: Bloomsbury Publishing, 2017b.

Personnel and Training

The Russian armed forces still use conscription to fill the ranks. As such, the VDV and GRU Spetsnaz typically select recruits from a pool of Russian conscripts despite their preference to enlist professionally contracted soldiers, or *kontraktniki*. Russian conscripts serve for one year, but once training and other logistical matters are accounted for, the typical Russian draftee is only operational for five months out of that year, which makes identifying and selecting suitable recruits difficult and time consuming for GRU Spetsnaz and VDV units.

Spetsnaz Forces

Despite Russia's optimistic announcement that all Spetsnaz units would be filled with contracted soldiers by 2014, GRU Spetsnaz brigades still have an estimated 20 percent to 30 percent of short-term conscripts.[18] Information regarding Spetsnaz' composition is often difficult to acquire, although some information on trends does exist. For example, in 2011 almost 70 percent of the operators in the 16th Brigade were conscripts; however, in 2013 nearly 50 percent of certain GRU Spetsnaz units consisted of conscripts. This trend suggests that Spetsnaz is slowly but successfully filling its ranks with contracted service members.[19]

Spetsnaz recruits are selected from the greater Russian armed forces based on their superior shooting, orienteering, and leadership skills.[20] Conscripts in GRU Spetsnaz units should not be assumed to be poor quality. According to the former commander of the Tambov Bri-

[18] "The Rising Influence of Russian Special Forces," 2014.

[19] Mark Galeotti, *Spetsnaz: Russia's Special Forces*, Oxford: Osprey Publishing, 2015b, p. 45; Bukkvoll, 2015, p. 607.

[20] Galeotti, 2015b, p. 46.

gade, Konstantin Bushuiev, in the Spetsnaz brigades, being a conscript is not indicative of poor performance; in fact, most conscripts performed "no worse" than any other contracted Spetsnaz operators.[21] This is due, in part, because Spetsnaz recruits, although typically conscripts from the Russian armed forces, still undergo rigorous mental and physical training before becoming operators. Despite Spetsnaz' opaque organizational structure, information regarding its size can be ascertained from the varying amounts of Spetsnaz brigades over time. After the collapse of the Soviet Union, as many as five brigades disbanded between 1991 and 2008. In 2009, after the Russo-Georgian war, GRU Spetsnaz units shrank again from nine to seven brigades.[22] At the same time, Spetsnaz operators stationed at embassies shrank by a third, 80 of its 100 general-rank officers either quit or were fired, and much of the remaining staff was reduced in rank.[23] Today, however, there are an estimated seven brigades and one regiment of GRU Spetsnaz units. Russia's decision to halt the decline of the Spetsnaz brigades and invest in the additional brigade suggest the continued utility of Russian Special Forces and the ISR role played by the Spetsnaz.[24]

It is estimated that KSO is divided into five special operations divisions with approximately 50 service members each. In addition to KSO's 250 operators, there are an estimated 1,250 in support staff. However, due to KSO's secretive nature, limited information is available regarding KSO composition and personnel.[25]

VDV Forces

The key personnel trend within the VDV is the increase of the number of professionally contracted soldiers. In 2010, there were reportedly 35,000 troops in the VDV, with the following allocation: 4,000 officers; 7,000 contract soldiers; and 24,000 conscripts, meaning contract soldiers made up 20 percent of the total force. As of 2015 there were approximately 41,000 nonofficers in the VDV, 52 percent of whom were contract soldiers. By 2020 the hope is to have contract soldiers make up 80 percent of the force. If the total number of VDV remains around 45,000, which based on events described later may be the case, then the force allocation would be the following: 4,000 officers; 32,800 contract soldiers; 8,200 conscripts.

It was initially planned to increase the VDV's force to 60,000 by 2020 through the formation of the 104th Air Assault Division and its three regiments. The increase in manpower and capability was envisioned by former VDV commander Vladimir Shamanov as a key element of a Rapid Reaction Force, which would have based the three regiments in Ulyanovsk, Engels, and Orenburg, respectively, and a new brigade in Voronezh.[26] According to a Russian press report, the focus, instead, will be on equipping existing formations with new equipment and building up a strategic core of forces in areas such as Crimea.[27]

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[21] Bukkvoll, 2015, p. 608.

[22] Bukkvoll, 2015, p. 611.

[23] Mark Galeotti, "The Belligerent Bear: Russia Updates Its Military Doctrine," *Jane's Intelligence Review*, February 3, 2015c.

[24] Mark Galeotti, "Russian Security Reforms Reflect Stability Fears," *Jane's Intelligence Review*, October 26, 2016.

[25] Bukkvoll, 2015, p. 614.

[26] Litovkin, 2016.

[27] Litovkin, 2016.

Current Systems

Due to the necessity to move quickly across vast swaths of Russian territory, the air assault and parachute units of the VDV traditionally have traveled light, although attachments such as air defense and armor can be added as needed. The BMD, or Boyevaya Mashina Desanta, is literally the combat vehicle of the Airborne and is a lightweight, tracked infantry fighting vehicle with a 100mm cannon gun and 30mm autocannon, offering significant firepower and mobility at the cost of protection. As of late 2015, the primary model found within the VDV was the Soviet-era BMD-2 (see Figure H.1).[28] While a few BMD-4 vehicles entered service, it appears that the BMD-4M (produced by KMZ) will be the primary fighting vehicle for the VDV over the next few years.[29]

Also, as of late 2015 the APC for Russian paratroopers was the tracked BTR-D, first produced in 1974 by the Volgograd Tractor Factory. It is set to be replaced by the BTR-MDM, which was first delivered by KMZ to the VDV in 2014. Throughout the course of 2017, Airborne Forces are to receive over 60 of the new APCs.[30] Other weaponry within a typical air assault or parachute unit includes the 2S9 Nona-S self-propelled 120mm mortar (first produced in 1981) and a BTR-ZD antiaircraft gun (1960).

Figure H.1.
VDV Paratroopers Riding BMD-2s During a Training Exercise Near Ryazan

SOURCE: *ria.ru.*

[28] "*Vozdushno-desantnyye voyska | VDV RF*" ["Airborne Forces | Airborne Forces of the Russian Federation"], milkavkaz.net, December 2015.

[29] Nikolai Novichkov, "Russia's VDV to Get Three BMD-4M Battalion Sets in 2017," *IHS Jane's*, March 17, 2017.

[30] Iurii Gavrilov, "*Pod kupolom—v brone*" ["Under the Dome—In Armor"], *Rossiyskaya Gazeta*, March 15, 2017.

In 2009, a separate air defense regiment was created in each airborne division. Initially the air defense assets were taken from the ground forces and transferred to the VDV.[31] As a result, the air defense systems within the regiments are rather dated. These air defense regiments field the self-propelled Strela-10 (SA-13), which was originally produced in 1976, and the BTR-ZD air defense gun that initially entered service in 1984. Also found in the air defense regiments of the VDV are the 9K38 Igla MANPADS (SA-18).

A recent development within the order of battle of the VDV has been the addition of tank, EW, and UAV companies. In late 2016 or early 2017, various air assault units (which do not airdrop but, rather, land at airfields) across the airborne received the T-72B3 tank. This is a departure from the traditional light armament of the VDV that, according to Viktor Murakhovskiy, the editor of the Russian military publication *Arsenal Otechestva* [*Arsenal of the Fatherland*], was based on previous combat experience. Murakhovskiy observed, "In Afghanistan and in other conflicts, including on the territory of the former Soviet Union and in the North Caucasus—in every case it was necessary to reinforce with tanks. The tank is the foundation of combined arms combat; without it you cannot manage anything."[32] That said, by having such heavy tanks, like the T-72, in the VDV's arsenal, it points to possible changes in their imagined mode of employment.[33]

The appearance of greater EW and UAV capabilities in the Airborne Forces reflects broader trends across the Russian armed forces to exploit the reliance on radio-electronic technology on the battlefield, in the case of EW, and the need for greater battlespace awareness beyond line of sight in the case of UAVs. The latter issue of limited reconnaissance capability was revealed during the five-day conflict with Georgia. According to military analyst Anton Lavrov, "The biggest cause for concern [of the VDV in the war with Georgia] was the total inadequacy of the VDV forces' reconnaissance capability in the conflict zone. . . . The Airborne Troops' own reconnaissance capability did not go much beyond their own line of sight."[34] The addition of UAVs will likely help mitigate the reconnaissance problem in future conflicts.

In terms of equipment, little is known about what type of UAVs will be used in the VDV companies. However, based on various sources, there may be a short-distance platoon with assets that operate at a range of approximately ten km, an intermediate-range platoon that covers a 25 km to 50 km radius, and a long-range platoon for reconnaissance out to 100 km or more if more than one UAV is employed.[35] It is likely that the Orlan-10, which has a reported range of over 100 km, would be found in the long-range platoon. Short and intermediate-range systems might include the Granat-1, Granat VA, and Zastava,[36] the latter of which costs approximately 50 million rubles per system ($828,000 at 2017 exchange rates).[37] EW compa-

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[31] "*Den' Vozdushno-Desantnykh Voysk v Rossii*" ["Airborne Troops Day in Russia"], unattributed report, *RIA Novosti*, August 2, 2016.

[32] Yekaterina Zgovskaya, "*Zachem VDV tanki*" ["Why Do the VDV Need Tanks?"], *Gazeta*, June 22, 2016.

[33] Defense Intelligence Agency, 2017, pp. 55–56.

[34] Barabanov, 2011, p. 37.

[35] "*Tyazhelaya motostrelkovaya brigada*" ["Heavy Motorized Rifle Brigade"], unattributed blog post, CAST, February 4, 2012.

[36] "Matrix Games Forums," unattributed blog post, August 9, 2016.

[37] "*Sborka BLA 'Forpost' i 'Zastava' na UZGA*" ["Assembly of the 'Forpost' and 'Zastav' UAVs at the Ural Civil Aviation Factory"], unattributed blog post, CAST, November 13, 2013.

nies likely field the multipurpose Infauna, Leer-2, and Lorandit jammers that are designed to disrupt enemy communications and IEDs.[38]

VDV paratroopers utilize the Arbalet-2 (Crossbow) steerable parachute system. In combination with their oxygen equipment, VDV paratroopers can jump at an altitude of eight km.[39] Additionally, since the annexation of Crimea, Russian Special Forces have increasingly worn the Ratnik uniform, especially the GRU Spetsnaz. The Ratnik uniform is claimed to have at least 40 components, including VKPO camouflage, 6B45 body armor, and a 6B47 helmet capable of being fitted with a thermal night-vision monocular. Weighing in at 40 pounds, Ratnik also includes armored thigh and shoulder plates and an integrated voice, data, navigation, and communication system. Ratnik can operate in temperatures between -58 to +122 degrees Fahrenheit.[40]

A list of the key organic inventory of the VDV air assault and parachute units as of December 2015 is presented in Table H.3.

The BTR-80, GAZ Vodnik, and Tigr-M wheeled multipurpose vehicles are among the most common vehicles associated with the GRU Spetsnaz. The Tigr-M, or GAZ-233114, is an upgraded version of the GAZ-2330 from the Russian defense company Arzamas Machinery Plant. Capable of carrying ten men and a payload of over 3,300 pounds, the vehicle can be modified with 7.62mm Pecheneg machine guns or a 30mm AGS-17 grenade launcher. Similarly, the GAZ Vodnik is a four-wheeled vehicle that can seat up to ten men. The GAZ Vodnik can be armed with a 14.5mm KPVT heavy machine gun and a 7.62mm PKT machine gun. Finally, the BTR-80 is an 8x8 wheeled amphibious APC first created in 1986 by the Arzamas Machinery Plant. Capable of carrying seven men, the BTR-80 protects its occupants from 12.7mm and 7.62 rounds and even artillery shell fragments.[41]

Due to the GRU Spetsnaz' changing and often secretive reconnaissance roles, operators are not assigned specific aircraft; rather, they choose vehicles from various military branches based on their mission needs. The Air Force's Special Purpose Command provides rotary-wing and fixed-wing aircraft for Spetsnaz operators. The 45th, 440th, and the 490th Helicopter Regiments provide the Mil Mi-24 and Mi-8 platforms. The 225th Composite Air Regiment provides the Mi-8, Mi-9 helicopters, and the Antonov An-12, An-26, and the An-30 fixed-wing platforms. Furthermore, the 353rd Special Purpose Aviation Regiment provides the An-12, An-26, An-72, Tupolev Tu-134, and Tu-154 transport aircraft to insert, resupply, and extract Spetsnaz.[42] In Syria, the Mi-28N Night Hunter and the Kamov Ka-52 aircraft currently support Russian SOF.

It was announced on January 6, 2017, that the Russian Armed Forces would establish Special Helicopter Squadrons to support GRU Spetsnaz units with the Mi-8AMT Sh-V Hip and the Mi-8MTV-5 troop carrier aircraft.[43] These aircraft will provide the ability to quickly ingress and egress Spetsnaz units while also providing fire and ISR support.

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38 "*Vozdushno-desantnyye voyska | VDV RF*," 2015.

39 "OE Watch," Foreign Military Studies Office, Vol. 6, No. 4, April 2016, p. 69.

40 Galeotti, 2017b, p. 57.

41 "BTR-80, Armored Personnel Carrier," *Military Today*, undated.

42 "Russia—Special Operational Forces," *Jane's Intelligence Review*, February 14, 2017.

43 "Russia—Special Operational Forces," 2017.

Table H.3
Russian VDV Key Equipment

Name	Type	Producer	Entered Service	Last Produced	Active Inventory (2015)
BMD-1	IFV	Volgograd Tractor Factory (VTF)	1969	1987	50
BMD-1P	IFV	VTF	1977		24
BMD-2	IFV	VTF	1985	~1991	818
BMD-3	IFV	VTF	1990	1997	36
BMD-4	IFV	VTF	2004	In production	28
BMD-4M	IFV	KMZ	2014	In production	32
BMP-2	IFV	KMZ	1980	In production	112
T-72B3	MBT	Uralvagon-zavod	2013	In production	Unknown
BTR-D	APC	VTF	1974		460
BTR-80	APC	Arzamas	1986	In production	54
BTR-DM	APC	KMZ	2014	In production	12
BTR-ZD	Air Defense	Degtyarev Factory	1984		111
Nona-S	Mortar	Motovilikha	1981	1989	240
Sprut-SD	Antitank	VTF	2005	In production	15

SOURCE: "*Vozdushno-desantnyye voyska | VDV RF*" ["Airborne Forces | Airborne Forces of the Russian Federation"].

Estimation of Resources Spent on Rapidly Deployable Forces

Rapidly deployable forces are a high priority for the Russian government. Despite budgetary constraints stemming from the decline in oil prices in the mid 2010s and Western-backed sanctions after the annexation of Crimea, Russia has continued to invest money and manpower into GRU Spetsnaz, VDV, and KSO units. In 2012 the Russian government announced it was spending an estimated 2.7 billion rubles on the procurement of training facilities for Senezh, the original name of the KSO.[44] Furthermore, Russia appears to have prioritized professional manning for the VDV. Indeed, Russia has invested in a "core" of professional and capable units rather than spread its efforts across the nearly two-thirds of Russian conscripts that lack adequate training and capabilities.[45] Additionally, new training companies have been created to help facilitate the growing size of Russia's rapidly deployable forces. For example, Russia recently created two new schools for its Spetsnaz personnel to receive additional training; at the

[44] Alexey Nikolsky, "Little, Green and Polite—The Creation of Russian Special Operations Forces," Minneapolis, Minn.: East View Press, 2015, p. 127.

[45] "Russian Defense Ministry Postpones Expansion of Airborne Force Divisions," *TASS*, February 18, 2016; Mark Galeotti, "The Three Faces of Russian Spetsnaz in Syria," *War on the Rocks*, March 21, 2016b, p. 36.

56th Junior Specialist Training Center in the Leningrad Region and the 476th Junior Specialist Training Center in the Vladimir Region.[46]

Recent Operations

The First Chechen War, 1994–1996

This was the first major conflict for Russia after the Cold War, and the Russian military found itself resorting to Soviet patterns of operation. However, large-scale Soviet mechanized operations proved futile against the Chechens in their mountainous terrain and urban cities. Spetsnaz and VDV detachments acted as elite light infantry units and fought house-by-house in Grozny. After suffering severe losses in their role as shock troops, many of the Spetsnaz and VDV units were withdrawn from Chechnya. The remaining Spetsnaz units, like the 22nd Brigade, conducted ambushes and raids, attacked supply lines, and gathered intelligence.[47]

The Second Chechen War, 1999–2002

The Spetsnaz were much more successful in their implementation during the Second Chechen War. The refined use of Spetsnaz was evident during the battle of Grozny in early 2000. An estimated 400 to 500 Spetsnaz operators conducted reconnaissance, sniper, and counter-sniper activities in support of the larger assault on Grozny. The main body of the assaulting force consisted of some 5,000 troops from the 506th Motor Rifle Regiment. As the main elements of the 506th moved into Grozny with the support of Spetsnaz, Chechen fighters fled the city and suffered serious causalities from Russian artillery fire.[48]

Georgia, 2008

In 2008, early problems in combat forced military leaders to assign Spetsnaz and VDV units to elite light infantry roles. The 10th and 22nd Spetsnaz Brigades as well as the 76th and 98th VDV Divisions did a disproportionate amount of the fighting during the short-lived war. Among their duties, VDV and GRU Spetsnaz units conducted ambushes, raids, attacks on supply lines, and battlefield intelligence. During the war, VDV troops did not perform a single tactical parachute drop behind enemy lines.[49] Despite Russia's victory, incidents of friendly fire and subpar interservice communications came to characterize the war rather than Moscow's use of SOF.[50] For example, GRU Spetsnaz officers and Russian armed forces officers still dispute whether the Russian bombing of empty Georgian airfields was caused by faulty Spetsnaz reports or the misinterpretation of their intelligence by the Russian military.

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[46] Ramm, 2017, p. 14.

[47] Olga Oliker, *Russia's Chechen Wars 1994–2000*, Santa Monica, Calif.: RAND Corporation, 2001, p. 24.

[48] Mark Galeotti, *Russia's Wars in Chechnya 1994–2009*, Oxford: Osprey Publishing, 2015a, p. 60.

[49] Barabanov, 2011, p. 35.

[50] "The Rising Influence of Russian Special Forces," 2014; Christian Lowe, "Georgia War Shows Russian Army Strong but Flawed," *Reuters*, August 20, 2008.

Crimea, 2014

In the days and weeks before Russia's annexation of Crimea, Spetsnaz operators conducted significant IOs against the local Crimean authorities and the Ukrainian government. Spetsnaz operators coordinated with local pro-Russian populations to smuggle arms, created pro-Russian separatist formations, sought to influence the Ukrainian population, and disrupted communication flows between Kiev and Crimea.[51]

On February 27, 50 men, now known as operators belonging to the newly unveiled KSO, seized the Crimean parliament building.[52] Once KSO operators secured the parliament building, parts of the 10th and 25th Spetsnaz Brigades landed at Sevastopol harbor while the 3rd and 16th Spetsnaz Brigades and the 25th special detachment deployed to Crimea.[53] In addition to working with the KSO to secure key government buildings in Crimea, Spetsnaz operators and VDV paratroopers expedited the surrender, cleared barricaded military bases, and used local proxy forces to create legitimacy surrounding their operation in Crimea. The speed and efficiency of VDV paratroopers and Spetsnaz operators allowed Russia to disorient, overwhelm, and surround the numerically superior forces of the Ukrainian army.

Eastern Ukraine, 2014–Present

In addition to the Spetsnaz' traditional ISR roles, they organized and armed local Ukrainians and Russian proxies to fight Ukrainian forces.[54] Parts of the 2nd, 10th, 22nd, and 24th Spetsnaz Brigades and the 346th from the KSO deployed to eastern Ukraine.[55] The 2nd Spetsnaz Brigade, based near Pskov, was tasked with diversionary reconnaissance in Ukraine in 2014. EW and signals intelligence units attached to 2nd Brigade supported operations in the Baltic States, Scandinavia, Chechnya, and Dagestan.[56]

Syria, 2015–Present

It is unclear as to the strength and size of Russia's rapidly deployable forces in Syria. At first, the naval Spetsnaz worked to secure the Tartus port and the airfield at Latakia.[57] It is estimated that 230 to 250 Spetsnaz operators and an additional set of snipers and scouts from KSO deployed to Syria.[58] Spetsnaz units primarily conduct battlefield reconnaissance and special security missions. In the rare acknowledgement of deployed Spetsnaz units, Russia announced that Spetsnaz forces aided in the liberation of Palmyra, although their specific role is unknown.[59]

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[51] "Analysis of Russia's Information Campaign against Ukraine," *NATO StratCom COE*, 2015, p. 28; Ellen Nakashima, "Inside a Russian Disinformation Campaign in Ukraine in 2014," *Washington Post*, December 25, 2017.

[52] Galeotti, 2015b, p. 50.

[53] "Analysis of Russia's Information Campaign against Ukraine," 2015, p. 28.

[54] "OE Watch," Foreign Military Studies Office, Vol. 5, No. 9, September 2015, p. 53.

[55] "The Rising Influence of Russian Special Forces," 2014.

[56] "Russia—Special Operational Forces," 2017.

[57] Thomas Gibbons-Neff, "How Russian Special Forces are Shaping the Fight in Syria," *Washington Post*, March 29, 2016.

[58] Galeotti, 2016b.

[59] Gibbons-Neff, 2016.

Outlook

In 2011, then Chief of the General Staff Makarov said, "The possibility of local armed conflicts virtually along the entire perimeter of the border has grown dramatically."[60] This statement suggests that rapidly deployable Russian forces and other core contingents of professionally contracted soldiers will be important in the years ahead.

Doctrine and Operating Concepts

Russian actions in Ukraine and Syria reflect a prospective future for Russian warfare. As KSO operators increasingly replace Spetsnaz units in direct-action missions, Spetsnaz units will likely continue their former ISR roles in support of conventional Russian forces. In light of Russia's success during the annexation of Crimea, it is probable that Russia will continue to utilize its rapidly deployable forces in the future.

The VDV are likely to play an important role in Russian operations in the former Soviet Union. The VDV's recent procurement of heavier and often-more-difficult-to-airlift vehicles, such as the T-72 series main battle tank, limits their ability to be deployed as Airborne troops.[61] As such, VDV forces will have to rely on ground and rail transport systems, rather than aircraft, to accommodate their heavier weaponry and vehicles. This may indicate that they are more likely to be deployed throughout Russia's near abroad rather than distant theaters that cannot be accessed by ground or rail transport and supply systems.

Finally, in an effort to continually field test KSO operators, Russia has reportedly deployed these units to Libya and western Egypt in its growing role to fight terrorism and support pro-Russian strongmen in the Middle East and northern Africa, another trend likely to continue.[62]

Future Resources and Funding

Looking ahead it is unknown to what degree Russia will invest in its rapidly deployable forces. However, given Russia's recent push to modernize a core element of its military and the success of its recent military operations in Ukraine and Syria, rapidly deployable forces are likely to continue to receive preferential funding and treatment in the years ahead if current trends persist.

Personnel and Training

Spetsnaz Forces

In the coming years the Spetsnaz' officer corps may face several problems as they suffer from a lack of qualified leaders. When a GRU Spetsnaz officer reaches the rank of colonel, they must either move into the GRU intelligence agency or attempt a difficult lateral move to the VDV.[63] As a result, GRU Spetsnaz brigades rid themselves of any self-motivated officers that climb through the ranks, thereby leaving many units without suitable leaders.

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[60] "Border Alert: Nuke War Risk Rising, Russia Warns," *RT*, November 17, 2011.

[61] Defense Intelligence Agency, 2017, pp. 55–56.

[62] Phil Stewart, Idrees Ali, and Lin Noueihed, "Exclusive: Russia Appears to Deploy Forces in Egypt, Eyes on Libya Role—Sources," Reuters, March 13, 2017; Kofman, 2017a.

[63] Galeotti, 2015b, p. 47.

VDV Forces

It is planned that every air assault unit will have a reconnaissance element, perhaps a company, as well as a tank, EW, and UAV company. By the end of 2017, according to the deputy commander of the VDV General Lieutenant Andrey Kholzakov, the air assault units will have formed eight tank companies (80 tanks) and two tank battalions.[64] In terms of personnel, efforts will be focused on improving the readiness of the existing force of 45,000 troops through the recruitment of contract personnel to reach a goal of 80 percent.[65] The postponement of the expansion of the Airborne Forces to 60,000 could be a signal that the General Staff is content with the current force makeup. Another possibility is that the funds were not available to take what would clearly be a costly step of manning and equipping at least three new regiments and a brigade.

Future Systems

The primary rearmament effort for the VDV did not begin until 2014–2015. As already described, as of late December 2015 the overwhelming majority of the primary fighting equipment dated to the Soviet era. As in the rest of the Russian armed forces, within the framework of the SAP-2020, 70 percent of this aged equipment is to be replaced, but it will not be until 2025, at the earliest, before the Soviet equipment has been mostly phased out. By 2025, it is planned that the VDV will receive 1,500 BMD-4M IFVs and 2,500 BTR-MDM APCs.[66] As of spring 2017, approximately 80 BMD-4Ms and 40 BTR-MDMs had been delivered to the VDV with plans to send an additional 120 and 40, respectively, by the end of the year.[67]

Current equipment acquisition suggests that the role of the Airborne Forces is not likely to deviate from the past, although the acquisition of T-72B3 tanks may indicate plans to more closely integrate the VDV into joint operations. On the other hand, the addition of tanks could slow down mobilization times and decrease mobility in theater. Airlift constraints also may lessen the potential benefit of added firepower. In other areas, the VDV should have improved capability on the battlefield relative to what was seen in the 2008 war with Georgia. The addition of reconnaissance and UAV companies should resolve past battlespace awareness issues. EW assets will closer align the VDV with the evolving Russian way of war that places a premium on dominating the electromagnetic spectrum on the battlefield.

The Russian army is also evaluating the potential use of unmanned ground vehicles (UGV), namely, the Kerekhta system for future use in the GRU Spetsnaz brigades. The UGV will conduct ISR related missions and carry a .50-calibre machine gun.[68]

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64 "*V VDV Rossii v 2017 godu poyavyatsya dva tankovykh batal'ona*" ["Two Tank Battalions Will Appear in the Russian VDV in 2017"], unattributed report, *Regnum Information Agency*, September 7, 2016.

65 "*Shamanov nazval optimal'nym sootnowenie kontraktnikov i prizynikov 4:1*" ["Shamanov Called a 4:1 Ratio of Contract to Conscript 'Optimal'"], unattributed report, *RIA Novosti*, August 24, 2015.

66 "*V VDV Rossii v 2017 godu poyavyatsya dva tankovykh batal'ona*," 2016.

67 "*V VDV Rossii v tekushchem godu postupit tri batal'onnykh komplekta boevykh mashin desanta BMD-4M*" ["The Russian Airborne Will Receive Three Battalion Sets of the Airborne Fighting Vehicle BMD-4M"], press release, *Minoborony Rossii* [Russia MOD], March 14, 2017.

68 "Russia—Special Operational Forces," 2017.

APPENDIX I

C4ISR

Dara Massicot

Russia's systems for C4ISR are undergoing many changes. In addition to making changes in command relationships within the Russian military, for almost a decade the Russian government has prioritized the research and fielding of modern automated C4ISR systems and digital networks for the armed forces as part of defense reform efforts. Russia has funded targeted federal programs, allocated healthy sums for procurement, and restructured and consolidated much of the C4ISR sector and domestic electronic subcomponent production. The changes in the command structure and in the technology used to communicate within the forces are interrelated. Some notable successes have been achieved in this field in the last decade in specific force sectors, such as comprehensive reorganization of Russia's military forces into new command relationships, tangible improvements to reconnaissance strike capabilities, and combat performance in Ukraine and Syria. Russia's leadership, funding streams, and military strategies are largely in lockstep on the need for a modern, integrated information space, a pivotal concept for Moscow's visions of future warfare and battlespace management. Since 2010, many new C2 systems have been fielded across all echelons and services. In particular, Russia has achieved rapid progress since 2008 conceptualizing, applying, and fielding modernized C4ISR capabilities into reconnaissance strike complexes in a variety of combat situations from eastern Ukraine and Syria.

Despite this renewed attention and funding, persistent structural challenges remain that threaten to slow development in the C4ISR sector, namely: phasing out a Soviet legacy of analogue, stove-piped C2 systems that do not seamlessly integrate in a digital information space; quality issues stemming from lags in innovation; international sanctions that have unexpectedly reduced access to foreign technology and funding streams; and government sponsored consolidation that improves funding streams but also eliminates competition. The C4ISR industry, more than many others in Russia, is playing "catch up" with its peer competitors' more advanced capabilities. Russia's efforts to resolve challenges in the C4ISR industry are occurring across three main lines of effort: overhauling command echelons and relationships; publishing updated military doctrine and warfighting concepts that provide the conceptual "glue" for these new C2 developments; and reconfiguring and consolidating relevant defense industries to funnel research dollars and better manage inefficiencies and research challenges. Russia's longer-term goals of a whole-of-government "unified information space" for 2020 and beyond will be dependent on continued R&D in this area and keeping several design bureaus afloat that are often not profitable.

Recent History: Late Soviet Ambitions to Twenty-First-Century Mishaps

Russia (and the Soviet Union before it) has historically struggled with developing modern C2 systems and "high technology" electronic components and related materials due to lack of access to foreign technology, materials, or scientific collaboration, state secrecy, and lack of innovation. By the 1970s and 1980s, the Soviet Union had some capability to conduct data processing, computer-assisted planning, combat potential calculations, and secure data exchange through systems like the SPO-397, GLOBUS, ARBAT, and the Data Computation System (DCS). By the early 1980s, the Soviet Union created several automated C2 systems, mostly for the highest echelons of the military and the strategic nuclear triad, while the majority of its C2 remained analog. One of the largest late Soviet-era automated C2 systems was the military district-level mobilization tracking system.[1] In the waning days of the Soviet Union, Russian design firms were experimenting with mathematical software support modeling and upgrading General Staff systems with new software and hardware.[2]

After the Soviet defense industry's collapse, the Russian Federation was left with a scattered C4ISR industrial complex that produced hundreds of stove-piped C2 systems. Russia's strategic-echelon C2 program emerged from the austerity period of the 1990s in the early 2000s in the best shape due to government spending prioritization. At operational and tactical levels, however, C4ISR industry did not receive similar attention or achieve much progress until nearly ten years later, after a poor performance during the 2008 Georgia war and the start of the New Look defense reforms.

After studying Western militaries and combat performance extensively in the 1990s and early 2000s, Russian military strategists and officials set forth clear needs for net-centric warfare capabilities.[3] Since 2004 at least, Russian strategists emphasized the need for a single integrated network or information space for military and civilian agencies alike.[4] By the 2008 war with Georgia, however, few of the C2 systems below the strategic or national echelon could be considered digital or modern.

Russian ISR platforms (space-based and airborne platforms) suffered from a lack of funding and R&D during the austerity period of the 1990s. During this time, Russia was unable to fund satellite launches, construct replacements for satellites or land-based radars, or continue R&D programs. As a result, global ISR coverage lapsed and remaining platforms were extended past their service life. By the early 2000s, the government was able to supply funding to the ISR sector and reverse some of the most severe atrophy in capabilities, starting at the strategic echelon (missile warning and satellite navigation). Over the past decade, Russia has modernized several key space, ground, and aerial ISR systems (although overall numbers are small), deployed new stealth detection radars and new imaging and communications satellites, and is restoring its early warning radar coverage and global satellite navigation through GLONASS.[5]

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[1] V. N. Kargin and V. N. Kozichev, "Evolution of Automated Information Systems in the Armed Forces," *Military Thought*, Vol. 3, July 1, 2009.

[2] Kargin and Kozichev, 2009.

[3] A. V. Khomutov, "The Unified Information and Communications Network: Past Performance and Future Prospects," Candidate of Military Sciences, *Moscow Military Thought in English 01*, Vol. 4, October 15–December 31, 2015.

[4] Khomutov, 2015.

[5] "GLONASS vs. GPS: An Aerospace Forces Colonel on the Status of Russia's Military Space Program," *Zhizn* [*Life*], November 26, 2016. Interview with Russia's Deputy Commander for the Space Troops.

The Georgian Campaign and Effects on Modernization

The 2008 military performance in Georgia revealed how unreliable, cumbersome, and ill suited for modern security requirements Russia's C2 architecture had become. In Russia's post-mortem of the Georgia conflict, military and various think tank strategists concluded that the service branches had insufficient technical means and command relationships to conduct joint or even well-coordinated operations.[6] Russia had too many echelons of command (from service command headquarters in Moscow down to tactical units), which delayed the transmission of combat orders and dissemination of timely reconnaissance and intelligence data. Core competencies such as reconnaissance and suppression of enemy air defenses (SEAD) were found to be lacking, as well.

During a five-day campaign in Georgia, Russian Air Force (RFAF), ground forces, Navy, Airborne Troops, and various Special Forces conducted multiple, largely uncoordinated campaigns from their respective service center headquarters in Moscow, or the 58th Combined Arms Army command in the North Caucasus Military District (for the ground forces only). This lack of communication and coordination resulted in friendly-fire combat losses and near misses; Russian estimates put these losses at up to 50 percent of RFAF losses.[7] Allegedly, none of the Russian Army units that entered South Ossetia were informed the RFAF would be conducting air operations in the area and launched man-portable air defenses or other tactical air defense systems at friendly aircraft.[8] Further, RFAF aircraft attacked a Russian ground forces column on at least one occasion; two groups of RFAF fighters almost entered into an aerial dogfight with each other near South Ossetia until they were able to visually confirm each other as friendly; and bombed empty Georgian airfields based on dated or faulty intelligence.[9] These incidents suggest that Russian identification friend or foe (IFF) systems either failed or were not used; reconnaissance was insufficient for targeting purposes in a rapidly evolving conflict; and RFAF and ground forces were not communicating before or during combat operations.

Georgian forces at times surprised Russian forces during this campaign because Russian forces were operating on incomplete or dated intelligence.[10] While Russian intelligence was aware of Georgian bases and other relevant fixed targets, it did not have a complete picture of Georgian air defense locations at the start of this conflict, and SEAD missions either were not attempted or failed. Russian intelligence regarding maneuvering Georgian forces was apparently worse. In one of the most infamous C2 failures of this campaign, the commander of the 58th Army was injured when Georgian forces surprised his column.[11] This general was forced to use his cell phone during combat to call in support from the North Caucasus Military District headquarters due to military communication equipment failures.[12]

Following this combat performance, Russian defense and civilian leadership promptly announced an overhaul of the military and defense industry in what came to be known as

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6 Anton Lavrov, "Timeline of Russian-Georgian Hostilities in August 2008," and "Russian Air Losses in the Five Day War Against Georgia," in Ruslan Pukhov, ed., *Tanks of August*, CAST, 2010a.

7 Lavrov, 2010a.

8 Lavrov, 2010a.

9 Lavrov, 2010a; Galeotti, 2017b, p. 21.

10 Lavrov, 2010a.

11 Lavrov, 2010b.

12 "The Akatsia Didn't Smell," *Vremya Novosti*, November 6, 2009.

the New Look reform program to 2020. This reform program set ambitious defense spending programs; restructured the military; ushered in changes to military doctrine; consolidated command echelons; and prioritized development of automated digital C2 systems across all echelons and services.

Since that time, Russia has worked to address C4ISR shortcomings, as discussed in the following sections.

Reform of C4ISR

Russia is currently trying to overcome a generation-sized lag in C4ISR technology as rapidly as possible and has prioritized development in this sector with state funding and organizational changes. Efforts today focus on establishing automated C2 across multiple forces and echelons (with a particular focus on tactical and operational echelons), and creating new secure networks that allow for encrypted communications, digitally assisted planning, and automated targeting solutions. Russia's efforts to resolve C4ISR challenges are occurring across three main lines of effort: since 2010 overhauling command echelons and relationships; in 2010 and 2014 publishing updated military doctrine and warfighting concepts that provide the conceptual "glue" for these new C4ISR developments; and reconfiguring and consolidating relevant defense industries to funnel research dollars and better manage inefficiencies and research challenges. The next phase of C4ISR modernization will occur after 2020–2025, when Russia will start preparing the force for integration into a "unified information environment," with a common network for the military and other civilian agencies responsible for national defenses.

Doctrine and Operating Concepts

Russian military doctrine was revised in 2010 and 2014 to emphasize net-centricity and the importance of a common information space and unified command for battlefield awareness.[13]

In 2010, then Chief of the General Staff Nikolay Makarov stated that transitioning to net-centric warfare was the top priority for the Russian military by 2015, to meet twenty-first-century security challenges.[14] This transition would be accomplished through changes in doctrine, command relationships, and the fielding of modernized, digital, and automated C4ISR systems. President Vladimir Putin in 2010 also signaled his support and criticized the C4ISR industry's efforts in this regard:

> A general designer has still not been appointed to supervise the development of the armed forces automated command and control system. No integrated structure has been set up to work out and put into practice a common science and technology policy in the defense industry. No comprehensive program has been developed to accumulate funds or minimize and optimize public spending to make it more effective.[15]

C4ISR Restructuring

As part of the New Look reforms, by 2010 the military streamlined and consolidated its command relationships and began equipping new command echelons with new equipment. Russia established four combatant command-like Joint Strategic Commands at the military

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[13] "Military Doctrine of the Russian Federation 2014," President of the Russian Federation website, December 2014.

[14] Roger McDermott, *Russian Perspective on Network-Centric Warfare: The Key Aim of Serdyukov's Reform*, Ft. Leavenworth, Kan.: Foreign Military Studies Office, 2011.

[15] McDermott, 2011.

district echelon better to prosecute joint operations, and it gave those commanders operational control over most nonnuclear assets in their districts. This reorganization was a significant departure from precedent, because Army, Navy, and Air Force service branches formerly controlled their forces directly from Moscow down to different service-specific field headquarters. Russia then merged the Air, Air Defense, and Space forces into the Aerospace Forces (VKS). In 2014, Russia established the National Defense Management Center (NDMC) at the MOD in Moscow. The NDMC is whole-of-government crisis monitoring center, charged with a variety of roles to include threat assessment, daily oversight of military and key civilian sectors, and real-time monitoring of combat operations. Russia is now in the initial stages (year seven) of joint command and joint operations, experimenting with these new command relationships in Ukraine in 2014 and in Syria since 2015. Some C2 sectors have seen more progress than others (like strategic echelon C2 systems for the General Staff and nuclear forces, fixed site C2 systems, and the Airborne Forces). Russian officials admit that digitizing and automating C2 at the tactical level has proven to be the most problematic and expensive, largely due to scale (thousands of units) and integration challenges with higher echelon C2 systems.[16]

Russia has long held a distinct vision for a unified C4ISR architecture, what it calls a unified information space, and has been approaching the construction of this architecture methodically over the last decade. A modern, whole-of-government C4ISR architecture is a crucial requirement for Russia's vision of net-centric or "non-contact" warfare.[17] Russian military writings stress the requirements for reconnaissance and targeting support at strategic, operational, and tactical echelons. Further, these data must then be integrated into a battlespace awareness and decisionmaking architecture to allow Russian leaders to make decisions marshaling Russia's whole of government resources at a faster rate than their enemies. DIA has noted that Russia's C4ISR systems as of 2017 have six general characteristics: they are centralized, redundant, geographically dispersed, secure, reliable, and survivable.[18]

Estimation of Resources

Russia set a targeted goal for 70 percent new or modernized weapons and C2 systems by 2020, ambitiously decreeing that precision munitions and automated C2 systems were to be the second highest priority for the defense industry (to the nuclear triad, of course).[19] This stated prioritization did not necessarily translate into higher SAP funding. As part of the SAP-2020, Russia prioritized strong investment, testing, evaluation, and in some cases, series production and fielding of new C2 systems. CAST, a Russian think tank, suggests that 14 percent of SAP-2020's budget was allocated for new C4ISR systems (R2.7 trillion, or $46 billion of nearly R20 trillion).[20] For the upcoming SAP-2025, Russian defense leadership continues to prioritize automated C2 systems, battlefield visualization support, and electronic hardware and software

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16 Khomutov, 2015.

17 Chekinov and Bogdanov, 2013; Gennadiy Gorchitsa, "*Realizatsiya Stetsentricheskoy Doktrinii, Na Osnovye Razvedyvatel'no-udarnykh Deystviy*" ["Realization of Netcentric Doctrine: On the Basis of Reconnaissance-Strike Operations"], *Voyenno-Promyshlenny Kuryer*, Vol. 28, September 2012; "Military Doctrine of the Russian Federation 2014," 2014.

18 Defense Intelligence Agency, 2017.

19 Oxenstierna and Westerlund, 2013, pp. 1–24.

20 "Russian Federation State Armaments Programs: The Problems of Execution and the Optimization Potential," CAST, Moscow, April 21, 2015.

for defense needs.[21] The Russian government heavily subsidizes the C4ISR industry through the SAP, annual SDOs, and other Federally Targeted Programs to modernize machine tooling and R&D; however precise data about the percentages of direct government investment are not available. SIPRI has ranked the United Instrument Manufacturing Corporation (UIMC, the holding company of most of Russia's C4ISR industry) in the top 50 largest arms sales companies since 2014. However, analysis of sparsely available sales data suggests that only 6.4 percent of UIMC's sales revenue in 2014 came from exports.[22] Subordinate companies may have different export/import ratios, but details are lacking. UIMC's parent company, Rostec, claims it is spending 11 percent of revenues on R&D in 2015 in its last available annual report.[23]

Current Systems

C4ISR Industry Overview

As discussed elsewhere in this report, Kremlin leadership created the state holding company Rostec in 2007 to consolidate and manage an unwieldy defense industrial complex.[24] The C4ISR industry, in turn, was consolidated under one company in 2014, the UIMC, controlled by Rostec.[25] UIMC was created to facilitate development and fielding of digital communications equipment to the Russian military, and controls around 50 firms of varying size.[26]

Data are sparse on Russian C4ISR production capacity and cost. Comprehensive information about production capacity and unit pricing for C2 systems is often sporadic or lacking in detail, probably due to the low percentage of exports and the sensitivity in protecting C2 networks from foreign exploitation. In terms of prioritization of effort, Russia has sought to fill gaps at the operational and tactical echelons as quickly as possible, while ensuring that its strategic C2 (nuclear forces and military and civilian leadership) remain adequately funded and protected. A list of some of the newest automated systems fielded since 2010 can be found in Table I.1.

Current Systems

The main manufactures of modern Russian C2 equipment (all held by UIMC) are the Sozvezdiye Concern, Sistemprom, Vega Radio Engineering, the TsNII (Central Scientific Research Institute of Economics and Systems Management), the Rubin Design Bureau, Radioavionika, and many others. Publicly reported data suggest over 40,000 personnel work in UIMC-held

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[21] According to Deputy Prime Minister Dmitry Rogozin in 2012. "Russian Federation State Armaments Programs: The Problems of Execution and the Optimization Potential," 2015.

[22] SIPRI reported $1,666 million in UIMC sales in 2014. Aude Fleurant, Sam Perlo-Freeman, and Pieter Wezemann, "The SIPRI Top 100 Arms Producing and Military Services Companies, 2015," Stockholm International Peace Research Institute (SIPRI), December 2016. UIMC's CEO reported $107 million in exports for 2014. "The Corporation Entered 2015 Increasing Volumes of Production and Exports," official website of UIMC, January 22, 2015.

[23] Rostec, "ROSTEC State Corporation Annual Report for 2015," June 2016.

[24] Keith Crane and Artur Usanov, "Chapter 5: Role of High-Technology Industries," in *Russia After the Global Economic Crisis*, Peterson Institute for International Economics, Center for Strategic and International Studies, May 2010, p. 119.

[25] Rostec, "United Instrument Manufacturing Corporation," undated-a.

[26] "United Instrument Corporation: Navy Will Receive First Sixth-Generation Communication Systems in 2016," *RIA Novosti*, December 30, 2015.

Table I.1
Select New Russian C2 Systems

System Name	Service	Echelon	Status
Akveduk	Army	Tactical	Fielded
Akatsiya	Military district/ leadership	Operational Strategic	Fielded
Antey	Military leadership	Strategic	Fielded
Andromeda-D	Airborne	Tactical/Operational	Fielded
Polyana-D	VKS	Operational	Fielded
Barnaul-T	Tactical Air Defense	Tactical	Fielded
RATNIK (with Strelets datalink)	All infantry and SOF	Tactical	Fielded
REDUT-2US	Army, Airborne	Tactical	Fielded
FUNDAMENT	Air Defense (VKS)	Operational	Fielded
SZS (secure network)	Defense industry	N/A	R&D
YESU-TZ	Ground forces	Tactical	Limited field trials
Zarya-25	Ministry of Defense	Secure computing	R&D
Atlas and Portal	Military leadership	Strategic	R&D

SOURCES: "Russian Armata Combat Vehicles to be Integrated into Real-Time Control Network," *Sputnik*, August 24, 2016; Roger McDermott, "Russia's Armed Forces Await Automated Command and Control—In 2015," *Eurasia Daily Monitor*, Vol. 10, No. 51, March 19, 2013; Timothy Thomas, "Russia's Information Warfare Strategy: Can the Nation Cope in Future Conflicts?" *Journal of Slavic Military Studies*, Vol. 27, No. 1, 2014, pp. 101–130; "Akatsiya-ME Corps-Level C2 System," *Jane's*, November 17, 2017; "Defense Enterprises to Get Their Own Internet—Secret Technical Information to be Shared on the Protected Network," *Izvestiya*, October 31, 2016; "Polyana-D4M1 9S52M1 Air Defense Command Post," *Jane's*, June 19, 2017; "Strelets Individual Soldier C2 System," *Jane's*, June 19, 2017.

companies, while a few corporations remain outside of UIMC's direct control.[27] UIMC was the 48th largest defense firm globally in 2015, with annual sales of $1.8 billion.[28] UIMC's stated top priorities are development of "sixth generation" C2; new, secure telecommunications; high-density electronics and compact 3D microsystems; and manufacturing and maintaining automated C2 systems for the government. The director of UIMC claims there are "hundreds" of unique C2 systems across echelons and services as of 2016.[29]

In 2010, the deputy head of Sozvezdiye said it would cost R8 billion to furnish one brigade with Yesu-TZ (3,000 radio sets, 4,000 computers, EW equipment, and vehicles) and the company could produce five to six brigade sets per year. For comparison, a battalion of T-90 banks would cost R1.8 billion or a Su-34 Fullback bomber R900 million, in 2010 terms, according to reputable reporting from Voyenno-Promyshlennyy Kuryer.[30] Assuming

[27] Rostec, "United Instrument Manufacturing Corporation," undated-a.

[28] Fleurant, Perlo-Freeman, and Wezemann, December 2016.

[29] "United Instrument Corporation: Navy Will Receive First Sixth-Generation Communication Systems in 2016," 2015; "Russia Creating Integrated Command Network Software for Forces," *TASS*, November 19, 2015.

[30] "*Tsena Komplekta Sredstv Upravleniya Dlya Brigady—8 Milliardov Rubley*" ["The Cost of a Command and Control Communications Suite for a Brigade Is Eight Billion Rubles"], *Voyenno-Promyshlennyy Kuryer*, January 27 2010.

50 brigades, the cost would escalate to R400 billion.[31] Cost and production estimates for the Yesu-TZ are difficult to assess because the system has not been accepted into series production as of 2017.

At a year-end press conference in 2016, the Russian military announced it had supplied the ground forces with "22,000 units of communication" and one complete unit set of unidentified C2 equipment (3,000 pieces, system unspecified). This is possibly a reference to the Ratnik or the Strelets systems, which were likely used by "little green men" in Ukraine in 2014.[32] The head of the military's communication department claims that 100 percent of fixed command posts across the military are now digital and that, in 2017, the primary objective will be to provide mobile digital C2 systems at the tactical level.[33] In this respect, the Western and Southern MDs have been prioritized in the 2017 SDO. Over 60 percent of the Southern MD's communications gear was allegedly modernized by 2014, (primarily with systems like Akveduk, Redut, and Strelets systems).[34]

Russian ISR platforms are primarily space-based, land-based, and air-based, with some underwater reconnaissance capabilities in select areas. Russia's space constellation provides global satellite navigation, missile launch early warning, remote sensing (electro-optical, radar, and terrain mapping), electronic intelligence collection (ELINT), satellite and space object tracking, and secure communications for military and civilian leadership.[35] Russian ground-based radars provide ballistic missile early warning (BMEW), over-the-horizon warning, and detection of stealth or low-observable objects notices to Russian leadership.[36] Russian aerial ISR platforms perform Airborne Warning and Control (AWAC) missions, remote sensing, and reconnaissance for battlespace awareness. Russia has incorporated multiple UAV variants into its battlefield reconnaissance strike complex that it has used in Ukraine and Syria.[37] Russia has a robust counterspace program designed to deny or degrade an adversary's space-based ISR constellation of reconnaissance, positioning, or communication satellites. Although much of the counterspace program is sensitive and rarely discussed in public, recent developments include testing of the Nudol missile defense system for Moscow and the Central Industrial Region (a system that reportedly has a direct-ascent antisatellite role) and the fielding of ground-based SATCOM jamming capabilities.[38]

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[31] "Matter of Urgency: Why No Whiff of Acacia? New Army Command and Control Systems Malfunction and Breakdown on 140 Occasions," *FK-Novosti*, January 22, 2010.

[32] "Rearmament Proceeding in the Prescribed Manner," *Zhizn* [*Life*], October 23, 2016; "Putin Chairs Video Conference on Military Output Acceptance Day," *Krasnaya Zvezda*, March 14, 2016.

[33] "Ground Troops Signals Chief Maj-Gen Galgash on New Communications Systems at Kavkaz-2016 Exercise," *Zhizn* [*Life*], October 23, 2016.

[34] Russian MOD, "Sixty Percent of Russian Southern Military District Communications Equipment Is New," press release, October 13, 2014.

[35] "United Instrument Corporation: Navy Will Receive First Sixth-Generation Communication Systems in 2016," 2015; "Flotilla of Space Spies," *Argumenty Nedeli*, August 11, 2016; "Russia Launches Three Rodnik Military Satellites into Orbit," *Spaceflight Insider*, September 25, 2015.

[36] "Russian Aerospace Forces' Radio-Technical Troops Get over 70 New Radars Annually—Troops' Chief," *Interfax*, December 19, 2016.

[37] "How Russia Plans to Catch Up with the US in AWACs Capabilities," *Sputnik*, June 27, 2016.

[38] "A-235 Nudol: Killer of US ICBMs and Satellites: New Missile Defense System Will Cover Not Only Moscow, but Also the Regions Against Nuclear Attack," *Svobodnaya Pressa*, May 30, 2016.

New space-based ISR platforms will reportedly have longer ranges, greater precision, and longer service lives due to smaller sizes and technological advancements.[39] Russia is also testing other joint communications satellites, but these projects are in R&D. Key Russian initiatives for its ISR platforms in the next five to ten years include upgrading its 24 GLONASS-M satellites with the GLONASS-K variant (better technology and longer service life [seven to ten years]) while ensuring that GLONASS-K satellites have no foreign-made subcomponents by 2018[40] and launching a new space-based BMEW constellation (Unified Space System [EKS]) by 2022, composed of ten TUNDRA satellites (currently one in orbit).[41] Russia claims its new EKS system will have the capability to detect ballistic missile launches and also possibly detect short-range launches and possibly missiles. The EKS will allegedly have a C2 function to assure retaliatory nuclear strikes in the event that Russia's terrestrial nuclear triad is incapacitated, although we cannot confirm these claims;[42] replacing KOBALT and PERSONA electro-optical satellites with new RAZDAN satellites in 2019–2024;[43] launching and maintaining RODNIK military communications satellites (12 currently in orbit);[44] possibly building a second sea-based ISR ship to track descent-phases of ballistic missiles (Project 18290, currently in R&D);[45] fielding ten VORONEZH land-based BMEW radars (6,000 km range and ability to track up to 500 objects at once). Four of these radars are operational, and several others in various stages of testing.[46] Russia is deploying multiple over-the-horizon (OTH) radars like Kontayner OTH radar and Podsolnukh radars to track inbound cruise missiles and other airborne or sea-launched objects at a range of 2,000 km or more.[47]

Reconnaissance-Strike Modernization

Russia is fielding a variety of new systems to improve reconnaissance strike capabilities across multiple echelons. Russian defense leaders have publicly lauded improvements to Russian reconnaissance strike capabilities during operations in Syria. For example, Russia has some capabilities to integrate data collected from signals or communications intelligence, space-based ISR, Special Forces, and UAVs to plan strikes against fixed targets or human networks in Syria.[48] Russian

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[39] "Russia's Advanced New Surveillance Satellites to Keep an Eye on US Carriers," *Sputnik*, July 29, 2016; "Flotilla of Space Spies," 2016.

[40] "Flotilla of Space Spies," 2016.

[41] Russian MOD website, "In 2016 the Aerospace Forces' Space Troops Detected All Missile Launches in the Russian Missile Attack Warning System's Zone of Responsibility," January 8, 2017.

[42] Russian MOD website, January 8, 2017; "Russia to Launch Nine Military Satellites by 2022," *Rossiyskaya Gazeta*, January 13, 2017.

[43] "Russia's Advanced New Surveillance Satellites to Keep an Eye on US Carriers," 2016; "Flotilla of Space Spies," 2016.

[44] "Flotilla of Space Spies," 2016.

[45] "I Spy with My Big Eye: How Will Russia's New Missile-Tracking Ship Look?" *Sputnik*, July 3, 2016.

[46] Russian MOD website, January 8, 2017. The Voronezh-DM target acquisition range is allegedly up to 6,000 km horizontally and up to 8,000 km vertically, capable of detecting and tracking up to 500 targets simultaneously. "Russian Missile Defense Advances, Status of A-235 Nudol Advanced Missile Defense System Described," *Gazeta.ru*, August 27, 2016.

[47] "*'Podsolnukhi' Apokalipsisa: Rossiya Sozdayet Gruppirovku RLS dlya Obnaruzheniya Krylatykh Raket za 2 tys. km ot Granits*" ["Sunflowers of the Apocalypse. Russia Is Creating a Radar Grouping to Detect Cruise Missiles 2,000 Kilometers from Our Borders"], *Gazeta.ru*, February 3, 2017.

[48] "*'Podsolnukhi' Apokalipsisa: Rossiya Sozdayet Gruppirovku RLS dlya Obnaruzheniya Krylatykh Raket za 2 tys. km ot Granits*," 2017.

Spetsnaz teams have been equipped with digital targeting and reconnaissance equipment (such as the Strelets system) and are using this equipment to vector air and artillery strikes on the battlefield in Ukraine and Syria.[49] Russia has a variety of national-level airborne ISR platforms: the IL-20M (COOT-A) and IL-22 (COOT-C) reconnaissance aircraft, the SU-24MR (FENCER-E), and smaller numbers of advanced platforms like the TU-214R reconnaissance platform.

Russia's UAV program, in particular, has seen expansive growth since the late 2000s. The Defense Ministry claims it has received over 1,500 UAVs between 2012 and 2016.[50] Since that time, Russia has purchased, constructed, and fielded hundreds of small- to medium-range UAVs for reconnaissance and targeting, such as the Eleron, Orlan-10, Zastava, and Forpost UAVs.[51] These UAVs have been incorporated into existing units and also into new UAV units like those in Crimea.[52]

Russia does not yet have an armed UAV (like the U.S. Predator or Reaper), although several platforms are in the final stages of research and development. The Zenitsa UAVs (Kazan Simonov Design Bureau) shows the most promise, while Russia has reportedly scaled back its financial support for the medium-weight Altair (Simonov), or the lightweight Inokhodets (Gromov Flight Research Institute) and medium-weight reconnaissance strike Dozor-600 UAV (Konstradt). The Zenitsa is scheduled for state testing and possibly serial production in 2018.[53]

C4ISR Software

Russian software is considered to be one of the most open, innovative, and successful high technology industries in Russia. Still largely private, it enjoys both government and private investment. The Russian software industry is "younger" than more traditional fields of the defense industry, not overly regulated, and is not capitally intensive, which can foster healthy competition.[54] The government has an interest in developing all Russian-produced software, electronic subcomponents, and operating systems for national security and defense systems and has increased its investment in the software industry since 2011. For defense needs, RTI Sistemy is a leading firm that installs all domestically produced software and communications networks for the National Defense Management Center in Moscow. RTI Sistemy was tapped for this task after it successfully integrated the hardware and software for the Russian Ministry of Emergency Situations (MChS, formerly helmed by Defense Minister Shoygu).[55] Russian companies are also working

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[49] Russian MOD, "*Nachal'nik Glavnogo Operativnogo Upravleniya Genshtaba VS RF Andrey Kartapolov Rasskazal o Rezul'tatakh Rrimeneniya Krylatykh Raket po Boyevikam v Sirii*" ["Chief of the Main Operational Directorate of the General Staff of the Russian Armed Forces Andrei Kartapolov Told About the Results of Usage of Cruise Missiles Against Militants in Syria"], October 8, 2015.

[50] "Russian Army Gains Over 1,500 Modern Drones in 4 Years—Defense Ministry," *Sputnik*, January 9, 2016.

[51] Ministry of Defense of the Russian Federation, "*Ukrayins'ki Viys'kovi Zbyly Cherhovyy Rosiys'kyy Bezpilotnyy Lital'nyy Aparat u Zoni ATO*" ["Ukrainian Soldiers Shot Down Another Russian Unmanned Aerial Vehicle in the ATO Zone]," July 23, 2014. Ukraine's MOD claims it shot down a Russian Orlan-10 UAV.

[52] Dmitri Boltenkov, "*Za God na Poluostrovye Sozdana Boyesposobnaya Gruppirovka Sil i Sredstv*" ["For a Year on the Peninsula, a Battle-Worthy Grouping of Forces and Assets], *Voyenno-Promyshlennyy Kuryer,* December 19, 2015.

[53] "*Tyazhelyy Udarnyy Dron 'Zenitsa,' on zhe—'Al'tair' Zatyanuvshayasya Istoriya Razrabotki v Rossii Bespilotnykh Hositeley Krylatykh Taket*" ["Heavy Strike Drone 'Zenits'—Alias 'Altair' The Long History of the Development of Unmanned Cruise Missile Carriers in Russia"], *Svobodnaya Pressa*, June 11, 2017.

[54] Crane and Usanov, 2010, pp. 99–100.

[55] V. Tsymbal and V. Zatsepin, "A New Russian National Defense Control System: Reform or Imitation?" *Russian Economic Developments*, Vol. 5, 2015, pp. 45–47.

on updating electronic maps for their new automated C2 systems that take full advantage of the GLONASS constellation; the maps were last updated in 2007.[56] Russia also has a variety of military and scientific research institutes that help create digital planning support software.

Personnel

The C4ISR industry faces many of the same personnel challenges as the larger defense industry: an aging workforce (to a lesser degree), labor pool competition with private sector companies, and talented engineers leaving Russia for careers abroad. Salaries in the C4ISR careers are typically slightly above the national average. The Russian education system remains internationally competitive in fields such as science, math, and engineering, and Russia has seen an increase in college graduates with engineering fields, in particular (146,000 in 1990 to 207,000 in 2007), that can support this field.[57]

Within the MOD, new cadets at military academies are now being instructed how to use automated C2 systems.[58] Revised training for signals units emphasizes operating new C2 systems at multiple echelons, and many facilities have been upgraded with new computing suites to facilitate C4ISR training.[59] Russian officials acknowledge that specialists (officers or professional enlisted soldiers) are required to operate the newest C2 systems and digital architecture.[60] Russia has a few different pathways to train enlisted personnel and officer cadets. Conscripts with technical skills can compete to enter "scientific battalions," where they complete their military service while researching tasks in select defense industries rather than serving in combat units.[61] Officer cadets could enroll at military training centers (separate from the military academies) to be trained in EW or other high-tech specialties.[62] Female soldiers are a small percentage of Russia's active duty personnel currently and cannot serve in combat positions, but they are a potentially large pool of labor for signals intelligence fields.

Defense Industrial Trends and Challenges

Challenges and Role of Imported Technology

Russia has known for many years that it must break its dependency on foreign electronics and other hardware required for modern C2 and digital networks. For example, in 2009, 90 percent of Russian domestic electronics used imported subcomponents, according to statements from

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[56] "Russian Military to Produce Electronic Topographic Map," *Izvestiya*, April 18, 2013.

[57] Andrew Kuchins, S. M. Guriev, and A. Åslund, *Russia After the Global Economic Crisis*, Peterson Institute for International Economics, Center for Strategic and International Studies, May 2010, p. 98.

[58] Russian MOD website, "Unique Automated Command and Control System Used in Russian Logistics Command Staff Exercise," April 22, 2016.

[59] "Integrated Training Event Held in Eastern Military District for Signals Troops," *TASS*, December 27, 2016.

[60] "Major General Aleksandr Rubis Reveals How Information Is Encrypted in the Russian Federation Armed Forces," *Russkaya Sluzhba Novostey Online (RSN)*. Interview with Major General Aleksandr Anatolyevich Rubis, chief of the Armed Forces General Staff Main Communications Center, March 29, 2015.

[61] "Wanted: An Increase in the Share of Professionals in the Troops," 2017; "Shoygu Discussed the New Contract Servicemen Recruiting Procedures," 2017; "Two Years for One. For the First Time, Conscripts Given Right to Turn Down Draft Service Immediately and Sign Two-Year Contract," 2016.

[62] Karlova, 2013, pp. 27–41.

industry leaders.[63] Russia has taken several steps to consolidate domestically produced electronics and associated hardware needed for C2 systems and integrated defense networks. One of Russia's leading electronics companies, Roselectronika, was formed in 1997 and acquired by Rostec in 2009; Roselectronika is 100 percent state owned. The company claims it supplies "80 percent of all electronic components" to defense and national security clients, but we cannot verify these claims.[64] The MOD does have Russian computing for its most sensitive systems (like the Elbrus-3M and others) that likely operate on a Linux-based operating system.[65] The military has assigned tasks to the industries to develop Russian-manufactured electronic subcomponents like computer chips. While they have noted progress, officials do note a lag in domestic technology and lack of emerging technologies as of 2016.[66]

The issue of self-reliance in the electronic hardware industry took on greater urgency following the 2014 international sanctions for Russia's role in the Ukrainian conflict. The Russian government is highly motivated to develop domestically produced C2 systems and related software, hardware, and electronic subcomponents to protect critical infrastructure from cyber intrusion; the question becomes whether funds and innovation are sufficient.[67] Following the sanctions, Russia set a goal to produce 95 percent of hardware domestically for defense needs.[68] Sanctions have affected the C4ISR industry's ability to access Western subcomponents and financing. U.S. sanctions targeted Rostec, Sozvezdiye, other firms, and Russian banks, which has affected these firms' ability to finance research projects while making them more reliant upon direct government financial assistance.[69] In particular, sanctions have limited the electronic hardware industry by restricting access to Western electronic subcomponents. To cope, Russia has turned to Asian markets to fill some gaps while accelerating efforts already underway to produce key subcomponents domestically.[70] Rostec has signaled its interest in international joint ventures in high technology areas to gain managerial experience and technological exposure, to speed up its own domestic development.[71] Some Western estimates suggest that Russia might not be self-sufficient in this area until 2018 or 2019.[72] Russia has made significant and concentrated investments in the related field of nanotechnology and hopes to eventually become a world leader in this field in the long term.

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63 "A Person from a PR Organization Will Head the Roselektronika Holding Company," *Kommersant*, Feburary 27, 2009.

64 Rostec, "The Furtherance of State Policy for Industrial Development and Modernization," undated-b.

65 V. Meshcheryakov, "The 100 Percent Russian Computer was Revived," *Military Industries and Conversion*, No. 69; "*Zashchishchennaya ot Shpionazha Operatsionnaya Sistema "Zarya" Gotova Poyti v Syriyu*" ["The Spyware-Free Operating System Zarya Is Ready to Go to Series Production"], *TASS*, September 24, 2015.

66 "Ground Troops Signals Chief Maj-Gen Galgash on New Communications Systems at Kavkaz-2016 Exercise," 2016.

67 "United Instrument Corporation: Navy Will Receive First Sixth-Generation Communication Systems in 2016," 2015.

68 Igor Sheremet, "Cyber Threats to Russia Grow. The Situation in This Sphere Is Changing for the Better Far More Slowly Than the Development of the Geopolitical Situation Requires," *Voyenno-Promyshlennyy Kuryer*, Feburary 11, 2014.

69 Artis Pabriks and Andis Kudors, eds., *The War in Ukraine: Lessons for Europe*, Center for East European Policy Studies, Riga: University of Latvia Press, 2015.

70 "WSJ Q&A with Sergei Chemezov," *Wall Street Journal*, March 1, 2016. Pabriks and Kudors, 2015.

71 "Russia's Rostec Denies Major Impact from U.S. EU Sanctions," *Aviator International News*, August 3, 2015; "WSJ Q&A with Sergei Chemezov," 2016.

72 Malmlof, 2016, pp. 1–22.

Political Protections and Government Subsidies

On the whole, the C4ISR defense industries have a relatively protected status with the Russian government. Russian civilian and defense leadership has repeatedly prioritized the development and fielding of C2 equipment and an integrated and automated network for the military since 2010.[73] As mentioned, government investment constitutes the majority of the C4ISR's funding stream, which flows through Rostec. Rostec CEO Sergey Chemezov has over two decades of executive experience with the Russian defense industry and a close relationship with Russian civilian and military leaders. The CEO of UIMC is Alexander Yakunin, another former government official with experience in trade and industries.[74]

Individual companies have not been above criticism. Most notably, the Sozvezdiye Concern, one of the largest manufactures of Russian communications equipment (Andromeda-D, Polyot-K, and Ratnik tactical C2 systems), faced intense criticism over problems and delays in the Yesu-TZ system (Tactical Echelon Integrated Command and Control System). Yesu-TZ has been in development since the early 2000s and was initially considered to be the future bedrock C2 system for the ground forces, so much so that the military wanted to approve series production for ground forces brigades as early as 2010.[75] However, the system ran into development problems and programmatic delays. Sozvezdiye claims that during this time period the MOD (which was overhauling its military doctrine at the time) changed battle management guidance many times, which in turn forced Sozvezdiye engineers to make repeated rounds of software revisions to various algorithms.[76] Quality issues, user interoperability challenges, and larger concerns over high equipment prices came to a head during one of the first test runs for the system in a deployed unit in 2010, when around 140 malfunctions were noted.[77] During this exercise, a ground forces brigade was given Yesu-TZ to use with only a few months of training (for conscripts and contract soldiers alike).[78] User ratings, in front of General Staff commanders, were, unsurprising, poor. Field officers complained that connectivity was patchy and that the user interface was too cluttered and complicated for their soldiers to use. Sozvezdiye was then forced to provide updates directly to President Putin on the status of the system.[79] Series production remains delayed to date, while other options were considered as replacement, such as the experimental Zarya-25 tactical system.[80] Russian officials state that currently the Akveduk and Redut systems are the lead portable communications equipment and the "basis" of tactical C2 currently.[81] As of

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[73] "Russian Federation State Armaments Programs: The Problems of Execution and the Optimization," 2015.

[74] Rostec, "Rostec Has Created a New Holding Company in Communications," April 29, 2014.

[75] "Putin Seen Pressuring Sozvezdiye Developer of Tactical-Echelon Troop C&C System," *Agentstvo Biznes Novostey*, August 8, 2014.

[76] "Defence Ministry Killed 'Military Internet' Programme: Acceptance of Digital Combat Command and Control System into Inventory Delayed until Next Year," *Izvestia*, August 4, 2011.

[77] "Matter of Urgency: Why No Whiff of Acacia? New Army Command and Control Systems Malfunction and Breakdown on 140 Occasions," 2010.

[78] "Russian Defense Shuffle Said Tied to Automated Control Kit Failures," *Nezavisimaya Gazeta*, November 12, 2012.

[79] "Putin Seen Pressuring Sozvezdiye Developer of Tactical-Echelon Troop C&C System," 2014.

[80] "Newest Frigate Admiral Gorshkov Should Be Transferred to Navy in November 2016," *TASS*, July 16, 2016.

[81] "Ground Troops Signals Chief Maj-Gen Galgash on New Communications Systems at Kavkaz-2016 Exercise," 2016; "Staff Vehicles with Much Improved Communications System," *Rossiyskaya Gazeta*, June 23, 2016.

2016, Yesu-TZ is reportedly improved in many respects but has yet to be accepted into series production.[82]

Russia's Airborne troops can be considered a C4ISR success story. The Airborne Forces enjoy a unique and consolidated command chain and are a much smaller service. Most forces have been recently supplied with the Andromeda-D automated C2 system (also designed by Sozvezdiye). Andromeda-D is reportedly interoperable with higher echelon C2 systems and is claimed to be compatible with Yesu-TZ and Russia's newest combat vehicles like the Armata tank or the Bumerang and Kurganets armored vehicles.[83]

Production Challenges

As some in Russia have noted, it is difficult to make a unified, interoperable C2 system when so many of the subcomponents are made by different companies. When these systems are not developed with a common operating environment in mind and, instead, are manufactured separately or inherited from legacy defense contracts, they do not work well in the aggregate. Interoperability between these disparate C2 systems currently is further challenged when considering all the subcomponents of C4ISR, like different software programs, GLONASS connectivity, friendly and enemy force tracking capabilities, multiple echelons, and service-specific technologies.[84] Once a new generation of C2 is developed with a unified information system in mind, some of the interoperability challenges are expected to recede. As of 2016, Russia does appear to have a successful enough integration capacity at both national levels and military district headquarters echelons.

Cost is another constraining factor. While comprehensive data are elusive on equipment set costs, there have been a few public discussions of price. For example, Russian state policy has set a goal of 70 percent modernized C2 equipment for the armed forces by 2020. This is a very broad figure that comes at a cost of R280 billion for ground forces alone.[85] Advocates argue that the cost is worth it, due to positive effects on command dissemination speed, joint force capabilities, and secure communications. Further, they argue, the new C2 technologies are smaller and lighter and use less energy than their analog predecessors, which allows for reductions in deployment footprints and energy consumption, according to General Staff Main Directorate for Communications.

ISR Sector Challenges

Although Russia is restoring and expanding key space-based capabilities, many coverage gaps remain and certain aspects of the constellation remain fragile, in particular, Russia's reconnaissance satellites and space-based missile warning. Russia only has two of its most modern military electro-optical satellites in orbit (PERSONA), in addition to less capable electro-optical (EO) satellites. Russia's EO constellation has reportedly been insufficient for supporting combat opera-

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[82] "Major General Aleksandr Rubis Reveals How Information Is Encrypted in the Russian Federation Armed Forces," 2015.

[83] "Russian Paper Profiles New Control System for Armata Tanks," *Izvestia*, August 23, 2016.

[84] "Daily Says Russia Lagging Behind in Network-Centric Warfare Capability," *Isvestiya*, January 12, 2010.

[85] "Russian Federation State Armaments Programs: The Problems of Execution and the Optimization Potential," 2015. This is assuming 35 brigades with a full YESU-TZ equipment set of 4,000 computers, 3,000 radios, vehicles, and encryption, per Sozvezdiye's 2010 price estimates, at a cost of R8 billion per set. Other Russian think tanks have said a brigade set will cost R4.5 billion. "Russian Expert Warns of High Cost of Modern Communications for Army," *Interfax*, January 18, 2010.

tions in Syria, forcing Russia to supplement with domestic civilian satellites, according to nongovernmental sources in Russia.[86] Senior officials acknowledged that Russia had no space-based early warning capabilities from 2014 to November 2015, when the last Soviet-era BMEW satellite went offline and before the first launch of the TUNDRA BMEW satellite.[87] Russia can support its current fragile space-based BMEW capability with its new land-based radars, although warning time is likely reduced.

Outlook

Doctrine and Operating Concepts

By 2020 to 2025, Russia will attempt to create a secure digital environment to integrate military services and related federal agencies while automating decisionmaking in a secure environment.[88] The system is sometimes referred to as the Integrated Information Environment of the Russian Federation Armed Forces' United Information and Communications Network (UICN).[89] The UICN is broadly described as "an integrated automated digital communications system, divided into . . . a space echelon, an air echelon, a ground echelon, a sea echelon, an automated systems of communication control, and an information security system"[90] that will be redundant, repairable, and survivable. Russia currently has an interim step toward this future environment within the NDMC in Moscow, where it has the ability to aggregate a variety of data from force readiness, logistics status, regional threat reporting, space surveillance, and other databases.[91] Russian defense leadership since 2015 has been holding conferences hosting interagency, industry, and academic centers on the topic of integration into a common information space.[92] In 2017, Russia will be creating another "cluster" or regional group of enterprises, to focus on communications technology for this and other projects.[93]

Systems and Procurement Priorities

Weaknesses that impede Russian C4ISR development include isolation from portions of foreign technology and collaboration (Russia is offsetting this through outreach to Asian countries), particularly in the electronics and related subcomponent domains. The duration of this isolation will likely affect the nature of C4ISR development to 2035, as Russia decides which domestic research avenues to fund at the expense of others. Russia's C4ISR industry is attempting

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[86] "Flotilla of Space Spies," 2016.

[87] "Russia to Launch Nine Military Satellites by 2022," 2017; Russian MOD website, January 8, 2017.

[88] Kargin and Kozichev, 2009.

[89] N. I. Razroyev, et al., "Integrative Role of Electronic Cards in the Processes of Automated Control of National Defense," *Military Thought*, Vol. 2, April–June, 2016; "United Instrument Corporation: Navy Will Receive First Sixth-Generation Communication Systems in 2016," 2015.

[90] "Major General Aleksandr Rubis Reveals How Information Is Encrypted in the Russian Federation Armed Forces," 2015.

[91] "Russia Creating Integrated Command Network Software for Forces," 2015; Kh. I. Mikhailovsky and A. B. Sayfetdinov, "Russia: Computer Training of Officials at the Russian Federation National Defense Control Center," *Military Thought*, Vol. 2, April 1, 2016–June 30, 2016.

[92] Russian MOD website, "Defense Minister Army General Sergey Shoygu Participated in the Work of the First Interdepartmental Conference on Information Cooperation," November 19, 2015.

[93] "United Instrument Corporation: Navy Will Receive First Sixth-Generation Communication Systems in 2016," 2015.

to overcome legacy challenges in innovation (particularly for hardware, electronic subcomponents, and related materials for C2 systems) and a lack of free market competition and underinvestment that impedes innovative development. Downward pressure on the defense budget would likewise force a prioritization of C4ISR systems back toward strategic nuclear and strategic conventional echelons at the expense of tactical C2 systems.

Work is underway to develop "sixth generation" C2 systems. Specifically, UIMC says it will begin R&D on "sixth generation" communications technology (defined as software-defined radio [SDR] and other digital technology) by 2018, with plans to deploy the first batch of SDR technology in 2021.[94] The Russian Navy is allegedly the first service to be improved, then the Aerospace Forces.[95] Other identified priorities from Russian C2 industrial leadership include developing a unified information system specifically for the Arctic to track sea, air, and space objects and enemy locations and to make targeting recommendations, while integrating all armed forces into a common network. Some Russian strategists believe that between 2020 and 2030 traditional semiconducting microcircuits will reach their physical limits for computing, and by 2030 scientific breakthroughs in nanotechnology or other unspecified "new physical principles" will help phase out traditional electronic semiconductor components.[96]

Conclusion

Russia's longer-term goals of a whole-of-government unified information space beyond 2020 will depend on continued research and development in this area and keeping several design bureaus afloat that are often not profitable. The C4ISR industry is considered by the Russian government to be highly sensitive for national security reasons. In recent years, Moscow has shown its willingness to trade efficiency and access to modern technologies for self-reliance and self-sufficiency.

Russia will try to close a generational gap in C4ISR technology as quickly as possible. Three main factors will likely shape the trajectory of the Russian C4ISR complex to 2035 and beyond: continued support from national and senior military leadership; prioritized defense funding at current levels; and successful development of domestic C2 and electronic technology (or failing that, access to foreign technology). Other than technical requirements in software and hardware, personnel training will also be pivotal for advanced C4ISR proficiency. For the foreseeable future, Russian industry will not be able to produce a more advanced C4ISR network than the United States but is strong in some smaller sectors, like missile warning, computing, and specific subsystems of C2. Ultimately, Russia will be willing to trade modernity for self-sufficiency and limiting foreign dependence. It is likely that Russia is not aiming to achieve total parity with its peer-competitors in C4ISR but, rather, to achieve a level of sufficiency in designated sectors while employing asymmetric measures in combat, like EW, cyber, or counterspace capabilities, to level the playing field.

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[94] "Russia's Concern Sozvezdiye to Build Super-Secure Digital SDR Sets by 2021," *Izvestiya*, November 30, 2016.

[95] "United Instrument Corporation: Navy Will Receive First Sixth-Generation Communication Systems in 2016," 2015.

[96] "Growing Cyber Threats to Russia's Critical Infrastructure Examined, New Technologies Described," *Voyenno-Promyshlennyy Kuryer*, February 11, 2014.

APPENDIX J

Russian Air Defense

Clinton Reach

The topic of Russian air defense (PVO) is broad and complex. Air defense platforms consist not only of TELs but also the missiles, radars, and other surveillance assets that make up an integrated system. These air defense platforms are found across the armed forces, including the ground troops, VKS, Navy, Strategic Rocket Forces, and Airborne Forces. As this appendix is intended to provide a general overview of the Russian air defense industry for the U.S. Army, several aspects should be kept in mind. First, the primary focus is on the air defense systems found in the ground forces and VKS. Neither naval air defense nor air defenses for the other branches are examined in great detail. Intercept aircraft, which are thought of as part of the integrated air defense system, are also not considered within the framework of this appendix. In-depth discussion of the various missiles that may be found on Russia's strategic SAMs, which are important in considering air defense capabilities, is also beyond the scope of this appendix. Finally, missile defense is often difficult to separate from air defense since the overall commander of air defense is also the commander of missile defense, and air defense systems often have dual capability to shoot down aircraft and cruise and ballistic missiles. The missile defense capability of Russian air defense systems is superficially discussed, while the A-135 and A-235 Nudol missile defense systems are not considered here.

Recent History

Before 2011, tactical air defenses for the ground forces were last delivered to Russian troops in significant numbers (greater than one or two) in 1993, according to former Commander of the Tactical Air Defense Forces of the Ground Forces (PVO SV) General-Colonel Nikolay Frolov.[1] This slow rate of delivery has resulted in a situation in which the inventory of the tactical air defense units contains a large number of aging systems. According to one estimate, as of late 2011 more than 80 percent of Russian tactical air defense systems were more than 20 years old with an annual loss rate of 10 percent.[2] Interesting, as will be shown, filling this gap was not prioritized by the SAP-2020, which first and foremost sought to ensure the procurement of the

[1] Oleg Falichev, "*Chto pokazhet eksperiment*" ["What Will the Experiment Show?"], *Voenno-promyshlennyi Kuryer* [*Military Industrial Courier*], October 11, 2006.

[2] Anatoliy Gavrilov, "*Na zadvorkakh voyskovoy PVO: v chem prichina ee razvala*" ["Tactical Air Defense on the Backburner: What Is the Reason for Its Collapse"], *Voenno-promyshlennyi Kuryer* [*Military Industrial Courier*], November 21, 2011.

S-400 and the Pantsir-S1. At the same time, tactical air defense systems have not been completely ignored, with upgrades of the Tunguska-M1 (SA-19) and procurement of the Tor-M2U (SA-15). In all, only around 30 percent of tactical air defense weapons under the SAP-2020 will be new, while the remainder will be upgraded or serviceable, according to the former head of the Russian Tactical Air Defense Military Academy Anatoliy Gavrilov.[3] This information is consistent with a recent statement by the current PVO SV commander, Aleksandr Leonov, who noted in late 2016 that the rearmament of his troops was only in the early stages.[4]

In terms of aging stock, the situation was relatively similar with long-range air defense systems. As of 2014 SAM regiments of the air defense divisions were largely outfitted with many S-300 variants, including the S-300PS system (SA-10D), which first entered into force in 1983.[5] The S-400 (SA-21), which entered into serial production in 2011, is currently replacing many of the S-300s, while the S-300PS systems will eventually be replaced with the S-350 Vityaz. The S-350, however, was still undergoing state trials as of mid-2017. The procurement of the S-500 is also part of the modernization plan, though it also has run into continued delays in the testing process.

Doctrine and Operating Concepts

Russian ground-based air defense systems are primarily found in the ground forces and the VKS. While some overlap of systems occurs—they each have variants of the S-300, for example—with few exceptions the ground forces have tactical systems that operate at short and medium ranges and lower altitudes. The VKS primarily has or will have systems designed to engage targets as distant as near-Earth orbit.

The purpose of air defense within the ground forces is to protect ground troops from air attack on the battlefield.[6] To carry out this mission, each maneuver brigade has organic air defenses that carry out different missions at various echelons. Close- and short-range systems are placed at their assigned positions to provide protection to brigade subunits on the offensive and in the defense.[7] Modern tactical air defense systems provide the capability to engage targets at a range of up to 20 km at an altitude of ten km or less. The most likely targets at this range are enemy helicopters, air-launched missiles, and unmanned aircraft systems (UAS). For extended range against a more advanced adversary, independent air defense battalions and brigades can bring greater capability to the fight with mobile systems such as Buk and the S-300V4, which can, reportedly, threaten enemy airborne assets at ranges of 70 km and 400 km, respectively.

Strategic air defenses, which are ultimately subordinate to the VKS commander, have a broad mission set that includes repelling aerospace attacks and defending a wide breadth of strategic civilian and military assets such as state and military C2 points, force groupings,

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3 Gavrilov, 2011.

4 Aleksey Durnovo and Anatoliy Ermolin, "*Perevooruzhenie voyskovoy PVO Sukhoputnykh voysk na novye obratsy vooruzheniya*" ["Rearming the Tactical Air Defense of the Ground Forces with New Types of Arms"], *Echo Moskvy*, December 24, 2016.

5 Sergey Linnik, "*Sovremennoe sostoyanie sistemy PVO Rossii*" ["The Current Condition of Russia's Air Defense Forces"], *Voennoe Obozrenie* [*Military Review*], March 10, 2015.

6 Durnovo and Ermolin, 2016.

7 Grau and Bartles, 2016, p. 101.

and industrial regions against enemy air strikes.[8] Strategic SAMs, which to an increasing extent consist of the S-400 Triumf system as well as older S-300 variants, are set up in a ring all around Russia and Moscow to deter and repel an enemy air invasion. The S-400 TELs are four- and five-axle vehicles whose mobility, along with mobile radars, make them difficult to track and target. S-400s, if equipped with the 9M96M or perspective 40N6 missiles, have antiaircraft and ballistic and cruise missile defense functions.[9] In early March 2017, Defense Minister Sergey Shoigu hinted that state trials on the 40N6 had not been fully completed, though he only referred to the missile as a "future long-range guided air defense missile [*perspektivnaya zenitnaya upravlyaemaya raketa bolshoy dal'nosti*]."[10]

A2/AD in Kaliningrad and Crimea

The Russian military has long maintained an air defense capability along its periphery. Throughout much of the post-Cold War period, for example, there were six long- and intermediate-range SAM sites in Kaliningrad that included five S-300PS units and one S-200 (SA-5) unit.[11] The latter system provided engagement coverage from 180 km to 300 km (depending on the missile deployed) while the former could destroy targets at a range of up to 90 km. In 2012 Russia deployed the S-400 system to Kaliningrad to replace the dated S-200 that had been located there previously. The addition of the new S-400 system in Kaliningrad marginally increased the A2/AD cordon to 200 km to 250 km while providing increased detection, mobility, survivability, and lethality relative to its predecessor.[12] The delivery of the S-300V4 to at least one regiment of the 44th Air Defense Division of the Baltic Fleet in early 2017 increased the range of air defense systems in Kaliningrad out to 400 km.[13] If the remaining three S-300PS battalions are eventually upgraded with the S-350 and 9M96E2 missile, this will increase the engagement capability of these units from 90 km to 120 km.[14]

In Crimea prior to the 2014 annexation of the peninsula, Russia had comparatively little A2/AD capability due to the absence of strategic SAM systems and coastal defense missile systems, a result of the 1997 Agreement Between the Russian Federation and Ukraine on the Status and Conditions of the Russian Federation Black Sea Fleet's Presence on the Territory of Ukraine. Since 2014 the Russian military has gradually added considerable firepower to Crimea to include a regiment of S-400s (two battalions of eight TELs each) and a regiment of the S-300PS, each of which are ultimately subordinate to the 4th Air Force and Air

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8 "*Voyska PVO-PRO*" ["Air Defense and Missile Defense Forces"], website, undated-a.

9 "*Sistema S-400 / 40R6 Triumf, kompleks 98Zh6—SA-21 GROWLER*" ["S-400 System / 40R6 Triumf, 98Zh6 System—SA-21 GROWLER"], unattributed blog post, militaryrussia.ru, 2017.

10 "*Novaya dal'nyaya zenitnaya raketa postupit na vooruzhnie armii RF v blizhayshee vremya*" ["A New Long-Range Air Defense Missile Will Soon Enter the Armament of the Russian Military"], unattributed press report, *TASS*, March 7, 2017.

11 Sean O'Conner, "Kaliningrad's Strategic Air Defenses." *IMINT & Analysis* blog, August 21, 2008.

12 Aleksandr Lemanskiy, et al., "*ZRS S-400 'Triumf:' Obnaruzhenie—dal'nee, soprovozhdenie—tochnoe, pusk—porazhayushchiy*" ["SAM System S-400 'Triumf:' Detection Range—Greater, Tracking—Accurate, Launch—Destructive"], *Vozdushnaya Kosmicheskaya Oborona* [*Aerospace Defense*], No. 3, 2008, pp. 68–76. Also, the upgrade in engagement range depends on the types of missiles present with the S-200 system as well as the missiles currently deployed with the S-400.

13 Aleksey Ramm and Evgeniy Dmitriev, "*Baltiyskomu PVO uvelichili dal'noboynost'*" ["Baltic Air Defense Increased Its Range"], *Izvestiya*, April 24, 2017.

14 As of late 2015 there were three S-300PS units remaining from the five in 2008.

Defense Army based in Rostov-na-Donu. Additionally, the S-300V4, Buk-M2, and Pantsir-S1, all deployed since 2014, provide increased protection of the airspace around the peninsula.[15]

In addition to expansive coverage of the air domain, the Bastion and Bal coastal defense missile systems, deployed to Crimea in 2016 and to Kaliningrad in 2017, can engage sea-based targets at ranges of 300 km and 260 km, respectively.[16]

Recent Operations

Syria

Russian air defense in Syria is limited to the coverage of strategic infrastructure such as the Tartus naval base and the Hmeymim air base, which are protected by the S-300V and S-400 systems, respectively. According to General-Lieutenant Aytech Bizhev, the former commander of the CIS air defense system, the S-300V is intended to protect Russian ships and naval facilities against attacks from cruise missiles.[17] The S-400 provides coverage of the air base against possible air-based attacks at a range of approximately 250 km. Other potential purposes for the deployment of these systems might be to preclude the creation of a no-fly zone in northern Syria, to observe air defense detection capabilities against modern U.S. fighter and surveillance aircraft, and to train air defense personnel on the S-300V and S-400 systems in a combat environment.

Exercises

Going back at least a decade, a key priority for Russian tactical and strategic air defense has been the integration of air defense assets with aviation, reconnaissance, and EW assets (passive radars in particular). In 2005 General-Lieutenant Nikolay Frolov, former commander of the tactical air defense forces, asserted that the tactical defense forces would have an automated C2 system to integrate disparate elements of Russian air defense as of 2012.[18] A similar emphasis on integration at the strategic level has also been a long-standing vision among senior commanders. Also in 2005 Deputy Air Force (VVS) Commander General-Colonel Anatoliy Nogovitsyn noted that the "tasks of air defense at the present time must be addressed jointly: not only with air defense assets, but with the application of all types of offensive assets in the interest of suppressing an [enemy] air force grouping, and its command and control and navigation systems."[19] Nearly a decade later, Russian military analysts were attempting to address some of these issues by calling for "an automated aviation and air defense command and control system that integrates respective elements into a unified high-speed network."[20] In 2016, the General Staff for the first time tested a complete integrated air defense system in an exercise

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15 Vladimir Pasyakin, "*Prikryli s moray*" ["Protected Against Sea Threats"], *Rossiyskaya Gazeta*, November 3, 2016.

16 Pasyakin, 2016.

17 "*Batereya S-300 v Sirii mozhet bklyuchat' bolee chetyrekh puskovykh ustanovok*" ["An S-300 Battery Can Include More Than 4 Launchers"], unattributed report, *Interfax*, October 4, 2016.

18 Falichev, 2006.

19 A. A. Nogovitsyn, "*Opyt voyn i sposoby boevogo primeneniya VVS i voysk PVO v sovremennykh operatsiyakh*" ["The Experience of Wars and the Methods of Combat Employment of the Air Force and Air Defense Forces in Modern Operations"], *Military Thought*, No. 6, 2005.

20 "*Vnedrenie informatsionnykh tekhnologiy v sistemu upraveleniya aviatsiey i PVO*" ["Implementation of Information Technology into an Aviation and Air Defense Command and Control System"], *Arsenal Otechestva* [*Weapons of the Fatherland*], May 15, 2014.

directed from the National Defense Management Center that included fighter-interceptors, air defense systems, radars, and long-range early warning aircraft (DRLO) operating in various locations across southern and central Russia to repel a "mass raid of enemy aircraft, UAVs, and cruise missiles."[21] What was not mentioned in the report of the exercise but possibly included was the use of EW assets in coordination with air defense systems to detect and disrupt airborne radars and missile guidance systems, a common point of emphasis in Russian military writing.

Current Systems

Ground Forces Air Defense Systems

Motorized rifle and tank brigades have two organic air defense battalions: an antiair missile-artillery battalion and an antiair missile battalion. The former battalion is primarily responsible for frontline defense of forward elements at close range. Assets defined as "close-range" (*blizhnoe deystvie*) are expected to engage enemy targets at no more than 12 km, while "short-range" (*malaya dal'nost'*) assets such as the Tor-M2 will have a range up to 20 km. Air defense units in this frontline air defense battalion are, thus, equipped with close-range systems such as the Strela-10M3 (SA-13), the Igla (SA-18) or Igla-S (SA-24) MANPADS, and the Tunguska-M1 (SA-19) rocket artillery gun. These systems can engage targets at a range of approximately five km and an altitude of no more than four km. In 2014, air defense forces began to receive an upgraded MANPADS known as the Verba (SA-25), which is reported to have a range of greater than six km and also found in the Airborne Forces. As of 2015, though many can still be found in the inventory of ground forces' units, production of the Strela-10 system and its missiles had been suspended, and it is not clear whether this system will be replaced or modernized.[22]

Most short-range battalions are equipped with 12 Tor-M2U (also known as the Tor-M1-2), which is an upgraded version of the Tor-M1. A fully modernized brigade will be equipped with 12 short-range Tor-M2 (SA-15) systems to protect second and rear echelon assets from air strikes emanating from higher altitudes (eight km to ten km) and longer ranges (up to 15 km). The Tor-M2, which is produced within the Almaz-Antey Concern, is the intended successor of the Osa system (SA-8) and may eventually phase out the Tor-M2U, although MOD plans are currently unclear.[23] Large-scale serial deliveries of the Tor-M2 began in 2016, with 24 units delivered that year.[24] According to the Moscow-based CAST, over the course of 2017–2018 another 48 systems, which would fill out four battalions, are planned for delivery.

To provide coverage of troop groupings and other vital military assets at the intermediate range (20 to 70 km), air defense brigades currently field the Buk-M2 (SA-17) system and

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[21] Aleksey Ramm, "*Minoborony ispytalo edinuyu integrirovannuyu sistemu PVO*" ["The Ministry of Defense Tested the Unified Integrated Air Defense System"], *Izvestiya*, August 31, 2016.

[22] Aleksandr Luzan, "*Borba nad perednim kraem—chast' II*" ["The Fight Above the Most Forward Edge—Part II"], *Voenno-promyshlennyi Kuryer* [*Military Industrial Courier*], November 25, 2015.

[23] Aleksandr Luzan, "*Eshche raz o 'kirpichakh' i 'kirpichkakh' PRO/PVO na teatre voennykh deystviy*" ["Once Again on the Big and Little Building Blocks of Missile Defense and Air Defense in the Theater of Military Activity"], *Nezavisimoe Voennoe Obozrenie*, June 8, 2012.

[24] "*Nachaty postavki zenitnykh raketnykh kompleksov 'Tor-M2'*" ["Deliveries of the 'Tor-M2' Air Defense System Have Begun"], unattributed blog post, CAST blog, January 10, 2017.

as of late 2016 began receiving the Buk-M3, which is intended to eventually fully replace its M2 predecessor.[25] One of the primary distinctions of the Buk-M3 is the container storage of the missiles, whereas the missiles of the Buk-M2 are housed without protection from the elements. The container storage is intended to increase the life of the missiles and reduce upkeep and replacement costs.[26] Both systems can engage a variety of airborne targets, including tactical ballistic missiles, cruise missiles at lower altitudes, tactical and strategic aircraft, and helicopters, though the Buk-M3 has a longer range of target engagement of 70 km.[27] According to retired General-Lieutenant Aleksandr Luzan, a Russian expert on tactical air defense, the Buk systems are at times preferable to strategic SAMs due to their higher probability of hitting cruise missiles at half the cost.[28]

To protect large force groupings at long range from air attack, additional air defense brigades possess the S-300V4 system in addition to its earlier variant, the S-300V.[29] The reported destruction range of the system, which entered service in 2014, is 350 km to 400 km when equipped with the 9M82MD missile. According to the chief designer of Almaz-Antey, Pavel Sozinov, one of the key missions of this system is to deny access to reconnaissance aircraft such as AWACs within a 400-km radius.[30] Interesting, the system's characteristics look very similar to the S-400, which will have an identical target destruction range if and when the 40N6 missile comes online. Yan Novikov, the general director of Almaz-Antey, described the overlap as a legacy of previous military force structure responsibilities, noting, "Historically it happened that we had two various 'tryokhsotki' [S-300s]. In the air defense forces of the country there was the S-300P, which protected large industrial and administrative structures. In the PVO [air defense] of the Ground Forces there was the S-300V, whose function was to protect ground formations, including while on the march."[31] Thus the ground forces retain the S-300V and the follow-on S-300V4, each of which is distinguished by an ability to stop and launch relatively quickly, unlike the less mobile S-300P. In Russian air defense parlance, the S-300V/V4 systems are considered "tactical" despite their long range. Table J.1 lists the ground force systems, when they entered the inventory, how many remain active, and, for some, the unit price.

Aerospace Forces

Each military district and the North Joint Strategic Command has an air force and air defense army that is responsible for protecting Russian air space along strategic axes and around Moscow and important industrial areas. Each army, except for the North, which has one, consists of two air defense divisions made up of SAM regiments. As of late 2015 these regiments

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[25] Sergey Ptichkin, "*Rossiyskaya armiya otkazalas' ot ZRK Buk-M2*" ["The Russian Military Moves Away from the Buk-M2 Anti-Air System"], *Rossiyskaya Gazeta*, December 24, 2016.

[26] Ptichkin, 2016.

[27] "*9K317M Buk-M3, raketa 9M317M*" ["9K317M Buk-M3, 9M317M Missile"], unattributed blog post, *Military Russia* blog, March 30, 2017.

[28] Luzan, 2012.

[29] Durnovo and Ermolin, 2016.

[30] Olga Shilova, "*Pavel Sozinov: S-300V4, sistema s novymi vozmozhnostyami*" ["Pavel Sozinov: S-300V4, A System with New Capabilities"], *National'naya Oborona* [*National Defense*], undated.

[31] Sergey Ptichkin, "*Antirakety idut na proryv*" ["Air Defenses Are Headed for a Breakthrough"], *Rossiyskaya Gazeta*, December 18, 2014.

Table J.1
Russian Air Defense Systems: Ground Forces

Name	Lead Developer	Entered Service	Active Inventory	Unit Price In Rubles/USD at Current Exchange
Tor-M2U (SA-15)	Almaz-Antey	2012	120+ (2017)	394M (2013)/$6.5M
Tor-M2 (SA-15)	Almaz-Antey	2013	24 (2016)	
Tunguska-M1 (SA-19)	KBP	2003	162 (2015)	
Strela-10M3 (SA-13)	KB Tochmash	1989	400 (2016)	
Igla (SA-18)	KBM	1981		
Igla-S (SA-24)	KBM	2004		
Verba (SA-25)	KBM	2014	270 (2016)	
Buk-M1 (SA-11)	Almaz-Antey	1983	138 (2015)	
Buk-M2 (SA-17)	Almaz-Antey	2008	18 (2015)	
Buk-M3 (SA-17)	Almaz-Antey	2016	4 (2016)	
S-300V4 (SA-23)	Almaz-Antey	2014	48 (2015)	

SOURCES: IISS, 2016, p. 213; "*Novyj Kontrakt Na ZRK 'Tor-M1-2U'*" ["New Contract for the 'Tor-M1-2U' Air Defense System"], unattributed blog post, CAST blog, January 26, 2013; On Tor-M2, "*Nachaty postavki zenitnykh raketnykh kompleksov 'Tor-M2,'*" 2017; On Verba, "*Rossiyskaya armiya poluchila 10 komplektov PZRK 'Verba'*" ["The Russian Army Received 10 Sets of MANPADS 'Verba'"], *VPK Novosti*, April 13, 2012.

NOTES: On Tor-M2U: A Russian blog, milkavkaz.net, stated there were 72 Tor-M2U in the inventory as of December 2015, but as of spring 2017, all the content of the site had been removed. According to another source, an additional 24 systems were received in 2016, and 48 systems were to be delivered in 2017–2018. Planned 2017 deliveries (19 in all) are reflected in the table.

There is an assumption of 27 launchers in a brigade/battalion set.

Unless otherwise specified, "unit price" refers to the entire system: platform, radars, missiles, etc. It does not include service vehicles or command and control points.

were primarily equipped with S-300PS and S-300PM systems (SA-10D/E). These systems date to 1982 and 1993, respectively, and were entering the end of their service life by 2015. They are to be replaced by the S-400 and the intermediate-range S-350 Vityaz. For nearly two decades the MOD has funded research and development of the Vityaz to replace the S-300PS.[32] The development of the S-350 has been delayed on multiple occasions but is expected to enter into the force in 2017 or 2018.

[32] Svetlana Khramova, "*Razrabotchik rasskazal, kogda zakonchatsya ispytaniya ZRS S-350 'Vityaz'*" ["Developer States When the Trials for the Air Defense System S-350 'Vityaz' Will be Completed"], *Izvestiya Online*, April 24, 2017.

In keeping with the echelonment approach that applies to Russian air defense systems across the board, VKS SAM regiments are also equipped with the longer-range S-400 Triumf system (SA-21) that will eventually have the capability to destroy targets at 400 km at altitudes as high as 30 km. These strategic SAM systems are placed in a ring around Moscow as well as around likely entry points around the country of enemy aircraft and missiles.

While the system officially entered into force in 2007, serial production did not begin until 2010. Since 2007 approximately 39 battalions (312 TELs) have been delivered to the air defense units by Almaz-Antey. Point defense of the strategic SAMs is provided by the short-range missile and artillery weapon system Pantsir-S1 (SA-22). There are plans to purchase 100 of these systems for the VKS under SAP-2020. Additionally, the Pantsir-S2 is an updated version of the Pantsir-S1 that can attack aircraft, helicopters, or mobile ground objects and effectively protect against UAVs or cruise missiles.[33] Table J.2 shows the systems, service entry date, number in inventory, and unit costs for some systems.

Airborne Troops

Tass, the Russian news website, reported that the Airborne troops (VDV) will soon receive the world's first air droppable air defense missile system. Code-named Ptitselov (Fowler), this system is a hybrid of the Pantsir-S1 cannon-missile system and BMD-4M armored vehicle.

Table J.2
Russian Air Defense Systems: VKS

Name	Lead Developer	Entered Service	Active Inventory (TELs)	Unit Price (Rubles)/USD at Current Exchange Rates
S-300PS (SA-10B)	Almaz-Antey	1982	277 (2015)	
S-300PM (SA-10B)	Almaz-Antey	1993	228 (2015)	
S-300V (SA-12)	Almaz-Antey	1988	64 (2015)	
S-350	Almaz-Antey	~2018 (planned)	0	
S-400 (SA-21)	Almaz-Antey	2007	312 (2016)	6.2B (battalion, 2011)/$102M
S-500	Almaz-Antey	~2017 (planned)	0	
Pantsir-S1	KBP	2008	60 (systems, 2015)	451M (system, 2010) /$7.4M
Pantsir-S2	KBP	2015	1	

SOURCES: The source of much of the order of battle information in this table is in unattributed blog post, undated. As of spring 2017, all the content of the site had been removed. On S-400: http://militaryrussia.ru/blog/topic-593.html; on S-400 unit price, 765 million rubles is the average price of one S-400 TEL and accompanying equipment. For a battalion set of eight TELs and accompanying equipment, the price is 6.12 billion rubles.

[33] Dmitry Sergeev, "*Neprobivayemyy 'Pantsir'-S2': chto umeyut obnovlennyye zenitnyye raketnyye kompleksy*" ["Impenetrable 'Pantsir-S2': What Are the Updated Anti-Aircraft Missile Systems"], *Tvzvezda.ru*, March 3, 2016.

Two Fowlers, with the crew already inside, can be airdropped from the Ilyushin Il-76 military cargo plane.[34] Previously VDV troops used MANPADs to defend themselves from aerial attacks. Over the next three years the Russian Defense Ministry will receive up to 250 Fowlers and armored personnel carriers.[35]

Estimation of Resources Spent on Air Defense

Comprehensive data on the amount of resources currently allocated to the purchase of air defense systems for the ground forces and VKS under the SAP-2020 are not available. However, there are pieces of information, particularly regarding strategic SAM systems, that offer some perspective on resource allocation to air defense.

A BBC report from 2011 asserted that the price of a S-400 battalion, which consists of eight TELs and accompanying equipment, was approximately $200 million, or 6.12 billion rubles at the average dollar/ruble exchange rate for 2011.[36] SAP-2020 calls for the purchase of 56 battalions of the S-400 Triumf system. At 2011 prices Russia will spend approximately 343 billion rubles over ten years on the S-400 if it reaches the 56-battalion target. This is approximately 2 percent of the 19 trillion rubles estimated to be spent on SAP-2020. In 2010, according to the Russian military publication, *Voennoe Obozrenie* [*Military Review*], the MOD ordered 175 Pantsir-S1 systems (100 for the VKS) at a total cost of $2.5 billion, or 79.1 billion rubles at 2010 ruble to dollar exchange rates.[37] Per unit at the same exchange rates, the system costs approximately 451 million rubles, or $14.3 million. Spending on key systems in 2016 is presented in the Table J.3.

Table J.3
Estimated Air Defense Spending on Key Systems 2011–2020

System	Unit Cost (Rubles)	Total Planned Deliveries	Total (Rubles)/USD at Current Exchange Rate
S-400	6.1B (per battalion, 2011)	56 (battalions)	(343B)/$5.7B
Pantsir-S1	451M (per system, 2010)	175 (systems)	(45B)/$751M
Tor-M1-2U	394M (per system, 2012)	216[a] (systems)	(85B)/$1.4B
Total			(473B)/$7.8B

NOTE: [a]This is a projection based on an average of 24 systems per year (which was the actual average from 2012–2016) from 2012–2020. S-400 and Pantsir planned deliveries through 2020 are known.

[34] "World's 1st Para-Drop Air Defense Complex to Protect Russian Forces," *RT*, May 6, 2016.

[35] "New Missile System for Russian Airborne Forces May Get Combat Module from Sosna System," *TASS*, May 5, 2016.

[36] "*Minoborony: tri polka S-400 zashchityat Moskvu k kontsu goda*" ["Ministry of Defense: Three S-400 Regiments Will Be Protecting Moscow by the End of the Year"], unattributed report, *BBC Online*, July 22, 2011.

[37] Roman Dzhereleyko, "*Zenitnyj pushechno-raketnyj kompleks blizhnego deystviya 'Pantsir-S1' 96K6*" ["Artillery-Rocket Short-Range Air Defense System 'Pantsir-S1' 96K6"], *Voennoe Obozrenie* [*Military Review*], August 17, 2012.

Defense Industrial Trends and Challenges

The most important trend in the Russian air defense industry is the emphasis on increased range of systems. At the tactical level, the observation that standoff weapons can accurately strike targets beyond the range of some current Russian air defense systems led to the conclusion that more work will need to be done to deny access to those threats. For example, in late 2015 retired General-Lieutenant Aleksandr Luzan described problems facing the industry, citing the need to increase the range of the Tunguska-M1 missiles to mitigate the threat from advanced Hellfire missiles launched from Apache Longbow helicopters. He noted that the "'Tunguska' in any modification cannot defeat [the Apache] to an acceptable extent without significant remodeling of the missile system, but no one is engaged in modernizing that anti-aircraft missile and gun system's missile armament."[38] Exacerbating the situation with the Tunguska, according to Luzan, was the fact that the developer of the overall system, KBP, had been transferred to a subsidiary of Rostec while the gun and missile system developer was under Almaz-Antey concern, leaving open the question of which entity would be responsible for the modernization. An alternative option might be a tracked version of the Pantsir-S1, which has a longer range, of up to 20 km, and has been mentioned as a possibility for the ground forces by the head of Russian tactical air defenses.

A similar quest for extended range, as well as greater detection capability, is underway at the strategic level under the ten-year armaments program with a focus on mitigating threats from advanced militaries like those of the United States. In 2012 former Commander of the Aerospace Defense Forces Oleg Ostapenko stated that new air defense weapons being procured under the SAP-2020 would allow strategic SAM units "to defend against intermediate-range ballistic missiles, effectively resist hypersonic flying vehicles and space-based reconnaissance systems."[39] In April 2017, the head of the Air Defense and Missile Defense Forces of the VKS, General-Major Viktor Gumennyj, noted that the S-400 (and likely the prospective S-500) will be equipped in the near future with missiles capable of reaching targets in near-Earth orbit.[40] A key obstacle in this vision is the development of the 40N6 missile, which has faced significant delays due to the "low quality of manufacture of purchased integrated parts and materials" on the part of its developer, MMZ Avangard.[41] The missile was supposed to complete state trials in 2010.[42]

Another challenge for the military-industrial complex will be maintaining the capacity and personnel to keep up with the demand from the MOD. If plans hold, Almaz-Antey through its subsidiaries will soon be serially producing the S-350 Vityaz, the S-400 Triumf, and the S-500 systems, which are supposed to work side-by-side with the S-400s. This production is in addition to the Buk-M3, Tor-M2, and S-300V4, key pieces of Russian tactical air defense. While new factories are being built, the company may have to find innovative solu-

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38 Luzan, 2015.

39 Oleg Ostapenko, "*Sistema Vozdushno-Kosmicheskoy Oborony Rossiyskoy Federatsii*" ["Air Defense System of the Russian Federation"], *Vestnik Akademii Voennykh Nauk* [*Military Sciences Academy Journal*], Vol. 2, No. 39, 2012, p. 55.

40 Anatoliy Ermolin, "Interview with Viktor Gumennyj," *Ekho Moskvy* [*Echo of Moscow*], April 8, 2017.

41 Yuriy Borisov, "*V gosoboronzakaze proizoshli revolutsionnye peremeny*" ["Revolutionary Changes Have Occurred in the State Defense Order"], *Oborona Rossii* [*Russian Defense*], March 28, 2014.

42 Anton Lavrov, "*Voenno-vozdushnye sily Rossii: Davno nazrevshie reform*" ["Russia's Air Force: Long Overdue Reforms"], *Vozdushnaya Kosmicheskaya Oborona* [*Aerospace Defense*], No. 4, 2011, p. 15.

tions to hit its targets within budget and on time. A closer examination of the primary developer and manufacturer of Russian air defense systems, Almaz-Antey, follows.

Almaz-Antey

JSC Kontsern VKO Almaz-Antey, renamed in 2015 to reflect a broadening mission from "air defense" to "aerospace defense," is a holding company of air defense enterprises formed in 2002 to consolidate a wide range of firms engaged in every aspect of air defense from research and design to radar manufacturing to system and missile production. The creation of the company took place within the framework of a program known as the Reform and Development of the Military-Industrial Complex (2002–2006), part of which was meant to address issues relating to the formation of capital stock and corporate management.[43] It is by far the largest producer of air defense assets in the country and has over 125,000 employees. The current chairman of the board of directors is Mikhail Fradkov, the former head of the Foreign Intelligence Service (SVR).

According to *Defense News*, in 2016 Almaz-Antey was the 11th largest defense company in the world by revenue and the largest defense company in Russia. The company's 2015 revenue was approximately 443 billion rubles, or $6.9 billion, 100 percent of which was the result of defense-related sales in the domestic and export markets.[44] It is important to note that the *Defense News* data are presented in U.S. dollars, which in the case of 2015 significantly obfuscates the situation with Almaz-Antey and other Russian companies. For example, the company's revenue decreased by over 24 percent from 2014 if represented in dollars; however, according to a company press release, Almaz-Antey revenue, when represented in rubles, increased by 37 percent in comparison with 2014.[45] See Table J.4.

Despite the substantial increase in revenue over the past six years, the company is not without its challenges. As mentioned, production capacity will be tested as new systems head into serial production. Two new factories have been opened since 2016, at a cost of 74 billion rubles (over $1 billion at 2016 exchange rates), presumably to address this issue.[46] Indeed, one

Table J.4
Almaz-Antey Revenue: 2010–2015 (in Billions)

	2010	2011	2012	2013	2014	2015
Rubles (Almaz-Antey Data)	134.7	127.4	190.8	272.1	Not Available	Not Available
Rubles[a]	123.4	107.1	184.6	275.2	369	439.1
Dollars (*Defense News* Data)	$3.9	$3.5	$5.7	$8.3	$9.2	$6.9

SOURCE: *Defense News*, Top 100 Defense Companies Rating; Almaz Antey 2013 Annual Report.

NOTE: [a]Numbers in this row were calculated by applying average ruble/dollar exchange rate to *Defense News* data (in dollars) for respective years.

[43] Almaz-Antey, "*Istoria*" ["History"], undated.

[44] "Top 100 for 2016," unattributed report, *Defense News*, undated.

[45] Almaz-Antey press release, "*Kontsern VKO 'Almaz-Antey' sokhranil liderstvo sredi rossiyskikh kompaniy v mirovom reytinge krupneyshikh proizvoditeley oruzhiya*" ["Concern VKO 'Almaz-Antey Preserved Its Leadership Among Russian Companies in the Global Rating for Largest Weapons Producers"], press release, September 12, 2016b.

[46] Almaz-Antey press release, "*Gendirektor 'Almaz Antey:' V stroitelstvo novykh zavodov vlozheno 74 mlrd*" ["The General Director of Almaz-Antey: 74 Billion Rubles Invested in the Construction of New Factories"], press release, March 30, 2016a.

of the new factories, located in Nizhny Novgorod to the east of Moscow, will be responsible for assembling the S-400 Triumf and the S-500 systems once the latter is ready for serial production. In terms of numbers, it is known that the SAP-2020 calls for the delivery of an additional 17 battalions of the S-400 and 5 battalions of the S-500, which would mean a total of 176 TELs produced between 2017 and 2020. Additionally, approximately 30 TELs of the S-350 Vityaz are called for in the same time period,[47] for a total of 206 complex and expensive systems, two of which have never been produced before and have experienced various delays in the R&D process over the past few years (see below). This is not to say that it cannot be accomplished but, rather, to highlight the fact that the productive capacity of Almaz-Antey or its individual predecessors has not been tested to this extent in terms of breadth of production since the collapse of the Soviet Union.

Perhaps more significant than potential capacity constraints are problems relating to the management of key Almaz-Antey subsidiaries. In particular, NPO Almaz, a scientific R&D center that plays an important role in the ongoing development of the S-350 and the S-500, has seemingly become an Achilles heel of the air defense modernization effort. The company, whose general director was fired in 2016, was sued three times by the MOD in 2015 for the recovery of damages totaling 180 million rubles, which equaled the net profit of NPO Almaz for that year. In a five-year period from 2011 to 2015, profitability decreased drastically as production costs rose.[48] Corresponding with that, announcements of the completion of trials of the S-350 and S-500 have continued to be pushed back, with 2018 perhaps an optimistic timeline at this point.

Also potentially disruptive for Almaz-Antey is the fact that it has been under sanctions from the United States and the EU since 2014 based on its assessed indirect role in the destabilization of Ukraine, which involved "shooting down airplanes."[49] Sanctions on the part of the EU involved the freezing of Almaz-Antey funds within the jurisdiction of the EU. U.S. sanctions, dismissed by senior Almaz-Antey representatives in mid-2014,[50] involved the blocking of assets and the prohibition of U.S. persons from dealing with the company. The implementation of Western sanctions combined with a decrease in the availability of federal resources ultimately have had a negative effect on the company. According to the general director of Almaz-Antey, Yan Novikov, from a 2016 interview:

> Sanctions pressure from the West without question had an impact on the economic activity of [Almaz-Antey]. Our expenditures on the import substitution of components and materials and on research and development projects significantly increased. In 2014, financing for R&D within the framework of the Federal Targeted Program, "Development of the Military-Industrial Complex of the Russian Federation from 2011–2020," cost a bit less than 2 billion rubles, and 50 percent of these R&D projects were conducted using federal funds. In 2015 the share of R&D financing from the state was reduced by several times,

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47 "*S-350 / 50R6 / 50R6A Vityaz*," unattributed blog post, *militaryrussia.ru*, April 1, 2014.

48 Pavel Ivanov, "*Almaz vypal iz ruk ogranshchikanedouchki*" ["The Diamond Fell from the Hand of the Diamond Cutter"], *VPK*, September 7, 2016.

49 General Court of the European Union press release No. 6/17, "The General Court Upholds the Freezing of Funds of the Russian Company Almaz-Antey," press release No. 6/17, January 25, 2017.

50 "*Gendirektor kontserna PVO 'Almaz-Antey:' sanktsii SShA ne povliyaet na rabotu predpriyatiya*" ["General Director of Concern PVO 'Almaz-Antey': U.S. Sanctions Will Not Have an Impact on the Work of the Enterprise"], unattributed report, *TASS*, July 17, 2014.

> and the volume of work, to put it mildly, did not decrease. [In 2016] financing for R&D of [the company] is being taken almost completely from our own resources. At the same time, we are increasing competencies in many areas that before we did not deal with.[51]

The decrease in federal funds for R&D was at least in part the result of a planned reduction in state participation in funding for such projects as opposed to simply being a consequence of sanctions. Prior to 2014, the state was funding 60 percent of the R&D budget for enterprises such as Almaz-Antey. In 2014, the number was reduced to 50 percent with a planned decrease to 32 percent by 2016 to stimulate greater initiative by increasing the defense company's skin in the game.[52] Based on the previously cited comments by Novikov, it is possible that these planned reductions were sped up because of external factors. Furthermore, analysts have noted that sanctions could, indeed, have a greater effect in the years ahead in the sense that the continued wall around Western capital may increase the pressure on a company like Almaz-Antey to find financing, especially if economic pressures on Russia do not subside.

Despite these challenges, the company continues to be the largest defense enterprise by revenue in the country. Exports as well as domestic systems will continue to be in high demand at least in the near term. Domestically, Almaz-Antey has manufactured and delivered 39 battalions of the S-400 as well as dozens of short- and intermediate-range systems to fill out the air defense units of the ground forces and the VKS in accordance with the ambitious SAP-2020 to modernize at least 70 percent of the key weaponry of the Russian armed forces. This level of production will need to continue to keep pace with the increasing demands of the MOD, which, among other goals, seeks to replace over 200 S-300PS SAMs with the S-350, a system being developed by a subsidiary company with a host of issues.

Outlook

In the near term to 2020 the outlook for Russian air defense is relatively positive with a few unresolved problems. As stated, the plan is to have at least 70 percent modern and new systems in the tactical and strategic inventories by the end of 2020. As of late 2016, the upgraded tactical air defense inventory of the ground forces stood at 36 percent, or around halfway to the stated goal.[53] The same number in the VKS air defense units was 55 percent as of April 2017, according to PVO/PRO commander General-Lieutenant Viktor Gumennyj.[54] The disparity between tactical and strategic systems is because procurement of the S-400 system, and the Pantsir-S1 to protect it, was prioritized above other air defense systems. If these numbers are accurate it is probable that the strategic air defense systems will reach the required benchmark of 70 percent by January 1, 2021, while tactical system production will need to increase substantially from previous levels.

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[51] Almaz-Antey, 2016b.

[52] Sergey Druzin, Vasiliy Dobriden, and Boris Gorevich, "*Systema upraveleniya nauchno-tekhnicheskoy deyatel'nostyu predpriyatiy integrirovannoy struktury radioelektronnoy otrasli obronno-promyshlennogo kompleksa (na primere Kontserna PVO 'Almaz-Antey')*" ["Management System of the Scientific-Technical Activity of Integrated Enterprises in the Field of Radioelectronics of the Military-Industrial Complex"], *Vooruzhenie i Ekonomika* [*Arms and Economics*], No. 3, 2014, p. 10.

[53] Durnovo and Ermolin, 2016.

[54] Ermolin, 2017.

Even in the case of the strategic systems, however, there is some cause for caution. The delays in production of the 40N6 missile, the S-500—and the S-350 Vityaz in particular—raise some questions about the ongoing modernization effort. Hundreds of S-300 variants in the VKS stocks dating to the 1980s and 1990s are scheduled to be replaced by the S-350, which was supposed to begin production in 2015. If the rollout of the system continues to be pushed back, it is possible this could delay the optimistic timeline presented by General-Lieutenant Gumennyj. Continued problems with the 40N6 missile will mean the S-400 and S-500 will not have a 400 km destruction capability until it is finally delivered. On a positive note, the current production levels of the Pantsir-S1 and S-400 are moving steadily toward stated goals: 100 systems and 56 battalions (448 TELs and accompanying equipment), respectively.

Resources and Funding

Little is officially known about the content of the SAP 2018–2025. However, the speculation in the Russian military press is that less money will be available on an annual basis than in the SAP 2011–2020. It is not clear exactly how much this will affect the procurement of current systems and the development of new ones. According to *Voennoe Obozrenie*, within the PVO of the VKS the emphasis will remain on the delivery of the S-400 system while the S-500 may not be delivered in large numbers "until things become more stable."[55] According to the same source, air defense systems for the ground forces—such as the Tor-M2, Buk-M3, Tunguska, and S-300V4—will be delivered in greater numbers than under the previous SAP.

Systems and Procurement Priorities

The Russian MOD prioritized the procurement of strategic SAMs, in particular the S-400, in the realm of air defense under the SAP-2020. This prioritization reflected the assessed need to deter an air attack against Russia now and in the future. Tactical air defenses continue to be modernized and procured, although at a slower pace through 2020 in the case of new Buk systems. The Buk-M1, as opposed to the Buk-M2 or Buk-M3, is still overwhelmingly the dominant intermediate-range air defense system in the Russian inventory. While the Buk-M3 likely will be the intermediate-range system at least through 2025, it is yet unknown how many the MOD will purchase under the next SAP. The Verba, Tor-M2, modernized Tunguska variants, and perhaps a ground forces variant of the Pantsir[56] will fill out the rest of the new tactical air defenses through 2025. Into the 2030–2035 timeframe, initial indications are that Russia will seek to develop "robotized" air defense systems more capable of detecting and countering advanced aircraft, UAVs, and precision guided munitions.[57]

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[55] Roman Skomorokhov, "*'Armaty' vmesto korabley: podrobnosti programmy GPV*" ["Armatas Instead of Ships: Details of the State Armaments Program"], *Voennoe Obozrenie*, April 11, 2017.

[56] Tactical PVO Commander Aleksandr Leonov stated that the Ground Forces were interested in a modified Pantsir (Pantsir-SM-SV), whose technical characteristics would make it more appropriate for air defense units of the Ground Forces. Typically, this means the ability to deploy quickly and fire or even fire on the move. Because this system so closely resembles the Tunguska artillery gun, it is possible that the new Pantsir-SM-SV would ultimately replace the Tunguska. See Leonov's interview with *Echo Moskvy* from December 24, 2016, in which he discusses rearmament of the Ground Forces air defense troops.

[57] Russian MOD press release, "*Perspektivy zenitnogo raketnogo kompleksa voyskovoy PVO maloy dal'nosti obsudili na voenno-tekhnicheskoy konferentsii v Izhevske*" ["Future Short-Range Air Defense System of the Tactical Air Defense Troops Discussed at a Military-Technical Conference in Izhevsk"], press release, March 26, 2017.

There will be few surprises over the next eight years within strategic air defense and perhaps into 2030, given the extended delays in bringing new long-range systems from R&D to serial production. In general, known systems are likely to be the backbone of strategic air defense for the foreseeable future. There is emphasis on the ability to push the limits of new missiles to bring near-Earth into play. This is one of the key advertised capabilities of the perspective S-500 system. Until that system is fully online, the centerpiece of strategic Russian air defense strategy will be the S-400, which relies not only on these systems but also the missiles they fire. The 40N6, still in development, is a key component of Russia's area denial strategy, which seeks to push the enemy as far from its border as possible. The second layer of defense, should longer-range systems prove incapable of defeating all incoming targets, will be provided by the S-350 Vityaz and the modernized S-300PM2. Strategic SAMs will be protected by the Pantsir-S1 and Pantsir-S2.

APPENDIX K

Russian Electronic Warfare

Clinton Reach

The Russian EW industry traces its roots to 1904 when tsarist sailors employed newly developed jamming technology to disrupt Japanese naval communications during the raid on Port Arthur during the Russo-Japanese war. The Soviets continued to emphasize EW as an important tool to mitigate the threat from a technologically advanced adversary during WWII and the Cold War. Beginning in the late 1940s, the Soviet MOD and General Staff ordered the creation of Scientific R&D Institutes (NII), Experimental Design Bureaus (OKB), and manufacturing companies to work on behalf of the EW needs of all branches of the Soviet military.[1] Many of these enterprises, such as AO TsNIRTI and NII Ekran among many others, continue to play a role in building modern EW equipment for the Russian armed forces today.

Throughout the Cold War the Russian EW industry evolved along with technological advancements in warfare. The appearance of jam-resistant antiaircraft radars in the 1960s required the development of Soviet antiradiation missiles with passive radar-seeking warheads. In the 1980s the threat of portable guided missiles led to optical-electronic jamming capabilities installed on aircraft and helicopters, which reduced their vulnerability to antiaircraft missiles in Afghanistan. More recently, the introduction by Western militaries of tactical integrated C2 systems resistant to HF and VHF jamming led to the modernization of Russian ground-based jamming systems such as the R-378B and R-330B.[2]

After the collapse of the Soviet Union, the EW industry, like much of the Russian military-industrial complex, entered a period of severe stagnation due to the economic crisis of the 1990s. Defense orders for EW largely dried up, with limited production of legacy Soviet systems and practically no innovation.[3] As Sergey Skokov, the deputy CEO of United Instrument Manufacturing Corporation, stated in 2015, "The armed forces are undergoing a full-scale updating of their EW technology for the first time in 20–25 years."[4] When a leading

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1 Mikhail Lyubin, "*Radioelektronnaya Borba v Deyatel'nosti Rukovodstva Vooruzhennykh Sil*" ["Electronic Warfare in Support of the Leadership of the Armed Forces]," Directorate of the Chief of EW Forces of Russian Federation, 2014.

2 Lyubin, 2014.

3 N. A. Kolesov and I. G. Nasenkov, eds., *Radioelektronnaya Borba: Ot eksperimentov proshlogo do reshayushchego fronta budushchego* [Radio-Electronic Warfare: From the Experiments of the Past to the Decisive Front of the Future], CAST, Moscow, p. 143.

4 Rostec, "UIMC has Delivered the First Set of Borisoglebsk-2 Electronic Warfare Systems," press release, April 20, 2015.

Russian technology holding company conducted a study in 2009 of its EW-related enterprises, it identified dated factory equipment, limited productive capacity, and serious morale issues.[5]

Today, Russian EW companies that survived the period of stagnation have been consolidated primarily within two holding companies responsible for the supply of EW systems to the Russian Armed Forces: Radioelectronic Technologies Concern (KRET) and Sozvezdie Concern. In 2016 KRET accounted for 60 percent of the EW systems delivered to the Russian armed forces.[6] Sozvezdie Concern, which produces some of Russia's most advanced ground-based jamming systems such as the Borisoglebsk-2, controlled 20 percent of the domestic EW market in 2016.[7] KRET and Sozvezdie, both of which were subject to U.S. sanctions in 2014,[8] fall under Rostec, the state-owned technology conglomerate formed in 2007 to "promote the development, production and export of high-tech industrial products." The production levels and amount of investment in EW capability demonstrate that the Russian military leadership firmly believes it to be an important element in how Russia intends to wage war in the twenty-first century.

Recent History

As mentioned, the Russian EW industry went through a "fight for survival" in the 1990s and early 2000s. Beginning around 2010, backed by a political leadership flush with oil revenue and a desire to modernize the military, the Russian MOD began spending hundreds of millions of dollars per year on the design and manufacture of EW equipment.[9] This investment went into R&D of new systems that, in many cases, were upgraded versions of equipment built in the Soviet era. From 2010–2012, state trials were conducted on more than a dozen EW systems that were later accepted into the Russian armed forces.[10] From 2013 to the present, the Russian MOD has been consistently buying all types of EW systems that provide offensive and defensive capability across the electro-magnetic spectrum at the tactical, operational, and strategic echelons.

Doctrine and Operating Concepts

Russian thinking on EW, or radio-electronic combat as it is known in Russian, is heavily influenced by Soviet practice, a more comprehensive approach than Western analogues. The Soviet concept of EW combine[s] signals intelligence, direction finding, intensive jamming, deception, and destructive fires to attack enemy organizations and systems . . . to limit, delay, or nullify the enemy's use of his command and control systems while protecting [friendly] systems

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5 KRET, 2010 Annual Report, p. 6.

6 KRET, 2015 Annual Report, 2015.

7 Vladimir Teslenko, "*Hauchnye printsipy radioelektronnoy borby*" ["Scientific Principles of EW"], *Kommersant*, February 24, 2017.

8 United States Treasury, Ukraine-related Sanctions: Publication of Executive Order 13662 Sectoral Sanctions Identification List, July 2014.

9 In 2015 the number was at least $300M and possibly quite a bit higher. KRET alone received $277 million (17.5B rubles) from EW sales to the Russian Armed Forces in 2015. The exact amount from 2010–2014 is not known.

10 Tim Thomas, *Russian Military Strategy*, Ft. Leavenworth, Kan.: Foreign Military Studies Office, 2015, p. 153.

by electronic counter-countermeasures."[11] The same can be said of Russia today, which defines EW as a "a set of interrelated activities of troops (forces) . . . to identify enemy radio-electronic systems and to destroy, disrupt or suppress them with all types of weapons . . . to disorganize enemy C2 systems . . . and to ensure the reliable employment of friendly C2 systems."[12]

Beyond definitions and historical legacy, the present emphasis on the development of EW capability in the Russian military is driven by an analysis of modern warfare, which is seen as overly reliant on radio-electronic technology.[13] The observance of the American way of war in the Middle East and the Balkans demonstrated to Russia's military leadership both the technological superiority of the U.S. military and its potential vulnerability to electronic disruption of C4ISR.[14] That observation (along with the combat experience gained in the Chechen and Georgia wars) continues to inform the development of current EW systems and was a driving factor behind the central EW development planning document titled "Foundations of Russian Federation Policy in the Area of EW System Development for the Period Up to 2020," which was confirmed by President Medvedev in January 2012.[15] Chief of the EW Directorate of the Russian General Staff General-Major Yuri Lastochkin concisely summarized the essential factors underlying the emphasis on EW in Russian warfare, stating:

> the high saturation of troop and weapon control systems of the armed forces of leading countries with radio-electronic and informational components makes these systems potentially vulnerable to radio-electronic attack. In these conditions, it is EW as an asymmetric response that will be able to lessen the advantage or even nullify the decades-long efforts of western countries to develop high-tech forms of weaponry.[16]

Recent Operations

Ukraine

It is too early and there is too little reliable information to accurately assess the tactical employment or effectiveness of Russian EW systems in Crimea and Donbas. Additionally, Russia often denies the presence of forces in eastern Ukraine and does not report on military operations there. What can be said with some certainty is that Russia has deployed at least one such system to Ukraine. The R-330Zh Zhitel, noted for its GPS-denial capability, was observed in Crimea not long after the referendum on the Russian annexation of Crimea in 2014.[17] The OSCE Special Monitoring Mission for Ukraine also noted the Zhitel in the Donbas region

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[11] U.S. Army FM 100-2-1, *The Soviet Army: Operations and Tactics*, Headquarters Department of the Army, Washington, D.C., July 16, 1984, p. 178.

[12] Encyclopedic Dictionary, "*Radioelectronnaya borba*" ["Radioelectronic Combat]," Russian MOD, 2007.

[13] Yuri Lastochkin, "*Rol i mesto radioelektronnoy borby v sovremennykh i budushchikh boevykh destviyakh*" ["The Role and Place of Electronic Warfare in Modern and Future Wars]," *Military Thought*, December 2015, p. 16.

[14] Mary FitzGerald, *Russian Views on Electronic and Information Warfare: Volume 1*, Washington, D.C.: Hudson Institute, 1996. "Today actions against the enemy's reconnaissance and control of troops and weapons, as well as protection of one's own troops against the enemy's high-precision weapons and radio interference are becoming the most important tasks of forces."

[15] Lastochkin, 2015, p. 16.

[16] Lastochkin, 2015, p. 16.

[17] C. J. Chivers, "Is That an R-330Zh Zhitel on the Road in Crimea?" *New York Times*, April 2, 2014.

in mid-2015.[18] The Ukrainian government, for its part, has asserted that the following EW systems have been observed during the conflict in eastern Ukraine: RB-341V, Leer-3, R-378B, Borisoglebsk-2, R-934UM, R-330Zh Zhitel', Torn, Rtut'-BM, RB-636AM2, and Svet-KU.[19]

Syria

Since officially entering the Syrian conflict in September 2015 Russia has deployed an array of ground- and air-based EW systems. They include the Krasukha-4, Borisoglebsk-2, Vitebsk, and Khibiny EW complexes. While some of these assets are meant to bring an offensive capability, such as jamming enemy communications, the bulk of Russian EW hardware in Syria is intended for protective purposes.

The Krasukha-4 ground-mobile complex, observed at air bases in Syria as early as fall 2015, is intended to protect Russian air facilities against reconnaissance from Western intelligence platforms such as Lacrosse satellites (S-band), drones (J-band), and AWACS and Sentinel aircraft (S-band and X-band, respectively). According to British EW expert David Stupples the Krasukha system is capable of first identifying the frequency used and then disrupting the intelligence picture of Russian activities.[20] According to Russian reports, the maximum range of the system reaches 300 km.

Russian airborne EW systems have also been noted in the Syrian conflict, installed both on helicopters and fighter aircraft. The Khibiny system, designed to jam the guidance systems of ground-based or air-based antiair missiles, figured prominently in a MOD video promoting the service of Russian fighter pilots in Syria.[21] The Vitebsk, manufactured by the primary Russian EW contractor KRET, is a standard feature of the new Ka-52 attack helicopter, which made its combat debut in the Syrian conflict.[22] The purpose of Vitebsk is to create an "electronic canopy" around the helicopter to protect it from antiair missiles such as MANPADs.[23]

As for offensive EW capabilities, multiple Russian ground jammers have allegedly been seen in Syria. The most notable is the Borisoglebsk-2, which entered the Russian armed forces in 2015 and has been billed by the MOD as a considerable upgrade from the system's predecessors.[24] The jamming stations of the Borisoglebsk-2, if deployed with all nine vehicles, would provide the ability to disrupt frequencies across the electro-magnetic spectrum, from at least HF to VHF.[25]

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[18] Organization for Security and Co-operation in Europe, "Latest from OSCE Special Monitoring Mission (SMM) to Ukraine Based on Information Received as of 19:30 (Kyiv Time), August 16, 2015," press release, August 17, 2015.

[19] Statement by the Delegation of Ukrainian the 835th FSC Special Meeting, November 16, 2016.

[20] David Stupples, "How Syria Is Becoming a Test Bed for High-Tech Weapons of Electronic Warfare," *The Conversation Online*, October 8, 2015.

[21] Russian MOD, "*Budni istrebitelnoj aviatsii VKS RF na Aviabaze Kheymim v Sirii*" ["Everyday Life of Fighter Aviation of the Russian Aerospace Forces in Syria"], YouTube video, October 22, 2015.

[22] Unattributed, "Russia Deploys Helicopter Gunships with Electronic Warfare Systems. Syria's Forces Advancing in Aleppo," *Southfront Online*, January 18, 2016.

[23] KRET, "KRET Electronic Warfare Systems Provide Reliable Defense for Russian Aviation," *Kret.com*, September 30, 2015.

[24] Russian MOD press release, "*Unikalnyj Kompleks REB 'Borisoglebsk-2' Postupit v Soedinenie Vostochnogo Voyennogo Okruga v Buryatii*" ["The Unique EW System Borisoglebsk-2 Will Be Delivered to a Unit in the Eastern Military District in Buryatiya"], December 30, 2015.

[25] The JSC Concern Sozvezdie website, at "EW Export Standard Set Composition," shows the Sozvezdie export model of a system that resembles descriptions of the Borisoglebsk-2, which is built by the JSC Concern "Sozvezdie."

Exercises

Russian EW units regularly participate in exercises from the tactical to strategic levels. A notable recent event was the Elektron-2016 EW research exercise held in the summer of 2016 in the Southern Military District at ranges in Crimea and Krasnodar Krai. It involved the ground forces, the Black Sea Fleet, and the 4th Air Force.[26] According to Major-General Lastochkin, the scale of the exercise was the largest at the strategic echelon since 1979.[27] The purpose of the exercise was to explore the interaction of new EW systems with other warfighting capabilities, the coordination of strategic command and control of EW as part of a larger force grouping, and to examine the creation of an "EW grouping along a strategic axis."[28] What was innovative from a tactical perspective was the use of the Orlan-10 drone to send text messages to enemy units instructing them to withdraw to an area against which a Russian 220mm TOS-1(A) strike had been prepared. The 4th Air Force also participated, using aircraft to allow coastal EW forces to test capabilities against an enemy air operation.

In general, exercises test EW units' ability to quickly mobilize and arrive to a given location and execute assigned EW tasks in support of a force grouping. Based on reporting of these training events, Russia is training to fight against adversaries with varying degrees of technological sophistication. Common tasks include providing protection against UAVs, enemy aircraft radars, and precision-guided munitions; electronic disruption of enemy control, command, and communication (C3) assets and GPS navigation systems; direction finding for kinetic strikes; and *maskirova* operations, from the creation of false targets to the emissions control of friendly forces. Russian EW forces also serve as a "blue" adversary to train friendly troops how to operate in an electronically degraded environment.[29]

Current Systems

An assessment of the current modern inventory of Russian EW systems demonstrates a relative consistency between doctrine and practice. As will be demonstrated, a force commander in the Russian military today has at his disposal an array of systems to attack the radio-electronic assets of the enemy at various depths and protect a large swath of the electromagnetic spectrum, assuming the systems have been delivered to his forces. In fact, modern EW assets have only recently begun to arrive to the armed forces and the inventory. As of 2016, 45 percent of the EW units across the Russian armed forces had been re-equipped with modernized systems.[30] Soviet-era systems are still part of the EW mix until they can be completely replaced.

A comparison of the previous generation of Soviet-era systems with those being produced today shows incremental change over the past two decades with an emphasis on better

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[26] Anton Valagin, "*Voyska REB unichtozhili protivnika smskami*" ["EW Forces Destroyed the Enemy with Text Messages"], *Rossiyskaya Gazeta*, August 21, 2016.

[27] Gennadiy Miranovich, "*Na ostrie tekhnologiy*" ["On the Cutting Edge of Technology"], *Krasnaya Zvezda* [*Red Star*], April 13, 2017.

[28] Miranovich, 2017.

[29] Stanislav Ryazantsev, "*Rota REB YuVO*" ["EW Company of the Southern Military District"], *Sbornik Radioelektronnoy Borby v Vooruzhennykh Sil Rossiyskoy Federatsii—2017* [*Journal of EW in the Armed Forces of the Russian Federation—2017*], March 2015.

[30] "*V rossiyskikh voyskakh REB dolya sovremennoy tekhniki sostavlyaet 46%*" ["The Share of Modern Equipment in the Russian EW Forces Is 46%"], *RIA Novosti*, April 15, 2016.

efficiency and range. To give one example, according to Colonel Vladislav Kharchenko, the chief of the EW forces in the Eastern MD, the modern Borisoglebsk-2 jamming complex is distinguished from its predecessor, the Mandat, by its "increased frequency spectrum scanning speed, a reduction of the reaction time against unidentified frequencies, [and] a higher accuracy of triangulating the source of a radio emission."[31] Mobility remains a key element of EW, with many new platforms, as before, mounted on wheeled or tracked vehicles. Multifunctionality, such as the capability to conduct electronic surveillance and suppress in one system, is also being prioritized, as it enables a reduction in the overall number of systems required.

Ground-Based EW

Ground Forces

Russian ground forces have approximately 50 EW units, including the independent brigades whose lettered battalions are organized by function: antispace, antiair, and anti-C3. The K battalion, for example, is equipped with *kosmicheskie sredstva*, or space assets, and is likely responsible for the antispace EW mission.[32] Known brigade-level systems with antispace functions include the Krasukha-4[33] and R-330Zh Zhitel, the latter of which targets Western satellite communications (GPS/INMARSAT/IRIDIUM).[34] The Krasukha family of jamming stations along with the passive radar and C2 station Moskva-1 perform the suppression of aircraft radar missions. The Krasukha systems are ground-based jammers that target reconnaissance aircraft such as AWACS and E-8 JSTAR as well as tactical aviation radar and satellites that provide guidance to precision munitions.[35] Brigade-level systems with C3 jamming functions include the Leer-3 system and the "strategic bomber" of the Russian EW forces, the Murmansk-BN, whose intended target-set is reported to include the High Frequency Global Communications System.[36] A list of known brigade-level assets and selected characteristics is provided in Table K.1.

EW companies of the motor rifle and tank brigades also are organized according to function, with subordinate squads responsible for missions such as VHF jamming, radio-controlled fuse jamming, and GPS jamming, among others.[37] See Table K.2. All EW companies will eventually be equipped with modernized systems such as the Rtut-BM, Borisoglebsk-2, and the R-330Zh Zhitel, the latter two of which might also be found within an independent

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[31] Vladimir Pylayev, "*Kak i prezhde, na perednem krae*" ["As in the Past, on the Front Lines"], *Suvorovskiy Natisk*. May 23, 2015.

[32] Mikhail Lokutov, "*Deviz batalyona REB-K: 'My—kollektiv, i v etom nasha sila'*" ["The Motto of EW Battalion-K: We Are a Team, and in that Is Our Strength"], *Radioelektronnaya borba v Vooruzhennykh Silakh Rossiyskoy Federatsii* [*Journal of EW in the Armed Forces of the Russian Federation*], March 28, 2016.

[33] Denis Peredrienko, "*Modul pomekh 'Krasukha-4' prikryl aviabazu v Sirii ot radarov E-8 JSTARS i sputnikov razvedki*" ["The Jamming Station 'Krasukha-4' Protected the Airbase in Syria from E-8 JSTARS Radars and Spy Satellites"], *Vestnik Mordovii*, November 11, 2015.

[34] "*Avtomatizirovannaya stantsiya pomekh R-330Zh*" ["Automated Jamming Station R-330Zh"], manufacturer website, *protek-vrn.ru*.

[35] Dmitry Grigorev, "'*Moskva' i 'Krasukha' zashchityat ot raket*" ["The 'Moscow' and 'Krasukha' Defend Against Missiles"], *Rossiyskaya Gazeta*, March 29, 2016.

[36] Anton Valagin, "*Strategicheskaya sistema REB podavit svyaz NATO*" ["A Strategic EW System Will Suppress NATO Communications"], *Rossiyskaya Gazeta*, November 14, 2016.

[37] Grau and Bartles, 2016.

Table K.1
Modern Russian EW Systems: Brigade Level

Name	Contractor	Target	Range	Entered Service	Inventory (2016)	Unit Cost
Murmansk-BN	KRET	3–30 MHz	5,000 km	2014	~9	
R-330Zh Zhitel	EGO Holding	100–2000 MHz	30x30 km2	2011		
Leer-3	Special Technology Center	GSM-900/1800	100 km	2015		
Krasukha-20	KRET	Airborne Radar Jammer	250 km	2012		
Krasukha-4	KRET	Air/Ground/ Space Recon	300 km	2013	~28	$3.49M
Moskva-1	KRET	Airborne Signals Radar	400 km	2013	13	~10.5M

SOURCES: For brigade order of battle systems (not detailed inventory), see Yuri Gusarov, "*Napravlenie deyatelnosti otdelnoy brigady radioelectronnoy borby tsentalnogo podchineniya*" ["The Direction of Activity of the Independent EW Brigade Subordinate to the Central Military District"], *reb.informost.ru*, March 2016. See also http://reb.informost.ru/2016/pdf/1-30.pdf; On Murmansk: assume at least one Murmansk system in each of the five brigades as well as the four fleet EW centers; On Krasukha-4 inventory, see Kirill Ryabov, "*Kontsern 'Radioelektronnye tekhnologii': postavki i razrabotki*" ["Radioelectronic Technologies Concern: Deliveries and Designs"], April 21, 2014. See also KRET 2014 Annual Report and http://militaryrussia.ru/blog/topic-742.html; On Kraskukha-4 unit price, see "*1RL257 Krasukha-4*," unattributed blog post, *militaryrussia.ru*, 2014. On Moskva-1 unit price, see "1L267 Moskva-1," unattributed blog post, *militryrussia.ru*, 2015. Blog states that a 3.5B ruble contract for Moskva-1 was signed possibly in late 2013 for the delivery of more than ten systems by the end of 2016, to be delivered at an exchange rate of 33.16 rubles to the dollar (average 2013 exchange rage), to come up with $10.5M.

Table K.2
Modern Russian EW Systems: Company Level

Name	Contractor	Target	Range	Entered Service	Inventory (2016)	Unit Cost
Borisoglebsk-2	Sozvezdie	3–1000 MHz		2013	24+	
Rtut-BM	KRET	95–420 MHz	0.5 km^2	2013	36	$1.65M[a]

NOTE: [a]"1L29 Rtut-B / 1L262 Rtut-BM," unattributed blog post, *militaryrussia.ru*, 2014; 2014 dollars (average exchange rate in 2014: 40.11 rubles to 1 dollar).

brigade. According to the MOD, the Borisoglebsk-2, which consists of four pairs of various jamming stations and one C2 vehicle,[38] offers the ability to jam mobile satellite communications and radio-navigational systems as well as to surveil and suppress radio communications at the tactical C2 level.[39] The Rtut-BM, also known as SPR-2M, is a ground-based jamming system intended to disrupt electrical proximity artillery fuses, which are designed to detonate the artillery shell at a certain height above the target. According to KRET, the coverage area of the Rtut-BM is 0.25 square kilometers to 0.50 square kilometers.

[38] The other systems of the complex are the R-330-BMV, R-378BMV, R-325BMV, and R-934BMV.

[39] Russian MOD, "*V voyska YuVO postupayut noveyshie kompleksy radioelectronnoy borby*" ["New EW Systems Are Being Delivered to the Southern Military District Troops"], press release, October 6, 2014.

Strategic Rocket Forces

The SRF were one of the first buyers of the Krasukha family (Krasukha-20 and Krasukha-4) of jamming stations. The Krasukha-4 system may be intended to protect silo and mobile ICBM bases from precision guided munitions as well as intelligence gathering satellites. Russian military observers have questioned the need for the Krasukha-2 at silo installations because it is primarily intended to disrupt early warning aircraft radar.[40] The SRF also possess EW equipment whose function is to disrupt the communications of potential terrorists or Special Forces saboteurs. These systems are the portable RP-377L Lorandit multipurpose jammer and the Dzudoist electronic reconnaissance platform.[41]

Airborne

In contrast to the ground forces, Russian Airborne troops traditionally have not been known for robust EW capability. In 2016, however, the commander of the VDV, General-Lieutenant Nikolay Ignatov, announced that EW and UAV companies would be formed within Airborne units.[42] Given that the VDV has approximately seven brigades, it is possible there would be up to seven EW companies in the VDV by 2020 if they follow the same organizational structure as the ground forces. As for equipment, the multifunctional Infauna counter-IED and VHF-jamming system has been fielded in the VDV since at least 2012,[43] in addition to the counter-IED system Lesochek, the Lorandit VHF jammer, and the Leer system, which is designed to disrupt cellular communications.[44] See Table K.3 for information about the Infauna system.

The North, Black Sea, Baltic, and Pacific Fleets are home to so-called EW centers that are mostly outfitted with the Murmansk-BN to protect strategic axes in the north, east, south, and west. In the case of the Black Sea Fleet, the EW center in Sevastopol boasts much more diverse capabilities, which could be the result of the potential need to insert ground EW capability quickly should hostilities break out in the restive region. The EW center fields, as of late 2015, the

Table K.3
Modern Russian EW Systems: Airborne

Name	Contractor	Target	Range	Entered Service	Inventory (2015)	Unit Cost
Infauna	Sozvezdie	25–2500 MHz		2012	12	

SOURCE: "*Mnogofunktsionalnyj kompleks radioelektronnogo podavleniya sistem radiosvyazi RB-531BE*" ["Multi-Functional Communications Systems Jamming Station RB-531BE"], manufacturer website, sozvezdie.su. For inventory see Russian MOD.

[40] Pavel Grachev, Dmitry Kornev, and Aleksey Ramm, "*Na poslednem rubezhe oborony*" ["On the Final Frontier of Defense"], *Voenno-promyshlennyi Kuryer* [*Military Industrial Courier*], December 25, 2013.

[41] Grachev, Kornev, and Ramm, 2013.

[42] "*Roty REB i bespilotnikov poyavyatsya v VDV do kontsa goda*" ["New EW and UAV Companies Will Appear in the VDV Before the End of the Year"], *RIA Novosti*, August 1, 2016.

[43] Ministry of Defense of the Russian Federation, "*V podrazdeleniya REB VDV postavleny novye kompleksy radiorazvedki i radiopodavleniya 'Infauna'*" ["New 'Infauna' Radio-Intelligence and Radio-Jamming Systems Delivered to VDV EW Units"], press release, January 16, 2012.

[44] "*Pyat' soedineniy VDV do kontsa goda poluchat kompleksy REB*" ["5 Airborne Units Will Receive EW Systems Before the End of the Year"], *RIA Novosti*, October 26, 2015.

Murmansk-BN, Zhitel, R-934BMV, Infauna, Krasukha-4, and eight Leer-3 systems.[45] This lineup of equipment looks very much like what is found the in the independent ground forces' brigades, which were also "centers" before becoming formal brigades.

There are also EW companies within various ground units subordinate to fleets, such as coastal defense brigades, intelligence brigades, and naval infantry elements. Little available information exists on what systems these companies have, although it is possible that their makeup looks like that of ground forces companies, because these naval ground force EW units likely have similar mission sets to their ground forces peers. For example, the Rtut-BM is in the inventory of the Black Sea Fleet and that system is typically, though not exclusively, found in ground forces' EW companies.[46]

Air-Based EW

Russian EW priorities are not limited to ground-based systems. Air-based jamming, protection, and support systems are also valuable on the modern battlefield because they can provide much greater coverage than tactical ground-based systems, which was seen by Russian observers to be particularly true during the war with Georgia in 2008.[47] In part due to that experience Russian helicopters as well as a variety of aircraft are currently being equipped with modern EW systems made primarily by KRET, which has a virtual monopoly on the domestic air-based EW market. KRET is equipping aircraft such as the Su-25, Su-27SM, Su-30, Su-34, Su-35, Il-76, Il-78, Il-96, and Tu-214 with protective EW equipment. Attack and transport helicopters such as the Mi-8, Mi-26, Mi-28, Mi-35, and Ka-52 are also being outfitted with the most up-to-date systems.[48] A list of selected KRET air-based EW systems is provided in Table K.4 with an emphasis on those that could affect the ground fight.

Table K.4
Modern Russian Air-Based EW Systems (KRET)

Name	Target	Platform
L187AE	Ground antiair radars	Helo
SAP-14	Ground antiair radars	Su-30
Khibiny	Guidance system of surface-to-air missiles	Su-34
Prezident-S	MANPADS guidance	Helo/Aircraft
Rychag-AV	Guidance system of surface-to-air missiles	Helo: Mi-8MTPR-1
Vitebsk	Heat-seeking warheads	Helo/Aircraft

SOURCE: For system list, see KRET, "*Radioelectronnaya borba*" ["Electronic Warfare"], manufacturer website; on Rychag AV, see "*Na vooruzhenie voysk ZVO postupili 2 vertoleta-postanovshchika pomekh Mi-8MTPR-1*" ["2 Mi-8MTPR-1 Jamming Helicopters Delivered to Western Military District"], *Voyennoe Obozrenie*, April 15, 2016; on Vitebsk, see "*KRET sozdayot perspektivny kompleks REB, prevoskhodyashchiy po kharakteristikam 'Vitebsk'*" ["KRET Is Creating a Future EW System That Supersedes the Characteristics of the Vitebsk"], *Voyennoe Obozrenie*, August 11, 2015.

[45] Unattributed blog post, undated.

[46] Aleksey Paramonov, "*Novye gorizonty rebovtsev*" ["New Horizons for the EW Troops"], *Flag Rodiny*, September 18, 2014.

[47] Lyubin, 2014.

[48] Teslenko, 2017.

Personnel and Training

In the EW companies organic to the maneuver brigades alone, there are thousands of EW troops[49] in addition to the forces at the brigade and army level, as well as the other services. To ensure that these troops, in particular those that manage ground-based EW, are properly trained on the new equipment being delivered to the forces, Russia stood up the Interbranch Training Center for the Training and Combat Employment of the Armed Forces' EW Units in Tambov, Russia. There, young EW troops in the ground forces and navy coastal units train and study for four and a half months before returning to their home unit. Higher-level training is also provided throughout an officers' career at the General Staff Academy and other MOD educational institutions.[50] In addition to training, the most important personnel effort is to fill the EW ranks with contract soldiers who have a technical educational background. As Colonel Konstantin Karpov, then chief of an EW unit, stated in 2011, "EW specialists have to work with high-tech equipment, various assets. All the technology is computerized today. We can't put a simple guy, who works with the plow, so to speak, on the job."[51] As of 2017, there are no available data as to the status of this effort to professionalize the EW force.

Estimation of Resources Spent on Electronic Warfare

Russian military spending on EW makes up a small percentage of the overall national defense budget. On average since 2012, the MOD has spent approximately $450 million per year on EW (see Table K.5), which likely includes new equipment, modernization, and R&D, although it is unknown what the exact breakdown looks like.[52] This is less than 1 percent of the overall defense budget in each of the past five years from 2012 through 2016. On the other

Table K.5
EW Spending Estimates

	2011	2012	2013	2014	2015	2016
Dollars		$400M		$487M	$446M	$638M
Rubles		12.96B				44.5B

SOURCE: For 2012, "*Rossiyskiy rynok sredstv radioelektronnoy bor'by v 2012 godu prevysil 12 mlrd rubley*" ["The Russian Market of Electronic Warfare in 2012 Exceeded 12 Billion Rubles"], *Voyennoye obozreniye*, April 15, 2013; For 2014, KRET's bimonthly journal stated in early 2015 that KRET owns approximately 74 percent of the market for ground, air, and sea based EW assets, p. 8. In KRET's 2015 annual report, it stated that KRET's EW revenue for 2014 was approximately 14.48B RUB/$361M; FOI, 2016: *Kommersant*; KRET.

[49] The Russian Ground Forces have approximately 35 maneuver brigades, each of which has an EW company of approximately 100 enlisted and officers.

[50] Yuri Lastochkin, "*Ni dnya bez pomekh*" ["Not a Day Without Interference"], *Voenno-promyshlennyi Kuryer* [*Military Industrial Courier*], April 27, 2017.

[51] Konstantin Karpov, "*Na vooruzhenie-radiovolny*" ["Radio Wave Weapons"], interview, *Pskov GTRK TV*, April 15, 2011.

[52] We do not have an estimate for 2013.

hand, as defense spending has increased markedly since 2011, this has meant a drastic increase in EW spending in comparison to the two decades before, assuming a similar proportion of the defense budget was spent on EW during that time.

Defense Industrial Trends and Challenges

The primary trend in the EW sector of the defense industrial complex is the consolidation of designers and manufacturers under Rostec. The two primary players in the industry, KRET and Sozvezdie, were moved under the expanding Rostec umbrella in 2009 and 2014, respectively. The exact reason for the consolidation has not been thoroughly explained officially or in the Russian press. In the case of a recently announced merger that involved Sozvezdie's parent company, United Instrument Manufacturing Corporation, and another technology firm, Roselektronika, an analyst from the Moscow-based CAST, suggested that the move occurred to "keep the best people and get rid of the dead weight."[53]

Going forward, the primary challenge for the Russian radio-electronic industry will be in the recruitment and retention of specialists. As is well known, Russia has demographic challenges to overcome both now and in the future. In the case of KRET, for example, as of 2013, 80 percent of all KRET employees were 45 years or older.[54] As this cadre of Soviet-trained and educated engineers and technicians leaves the workforce, it is important for the industry to attract qualified people to replace them, although demographic as well as educational problems may make that a difficult prospect. In 2012, KRET identified a "severe shortage of staff in scarce professions" including technology, energy, and electronic engineers as well as programmers and developers. The company also noted a "gap between the credentials received in the education system and the needs of [its] factories."[55] Another analysis by the Academy of Military Sciences of the Russian military-industrial complex noted that the share of young workers (under the age of 35) as of mid-2016 "[did] not breach the sociological threshold of 25 percent that is necessary for the transfer of knowledge and experience from the older generation of workers."[56]

A secondary but perhaps equally important challenge is the ongoing sanctions that have cut Russia off from Western technology that could be used in the development of military systems. The two leading firms by market share, KRET and Sozvezdie (see Table K.6), which are examined in greater detail later, both came under U.S. Treasury sanctions in 2014. Industrial leaders claim that import substitution, a program initiated by the Russian government to reduce reliance on foreign technology (in some cases before 2014) and to overcome the effect of sanctions is continuing apace. These leaders assert that import substitution is an opportunity to develop homegrown expertise. However, there were costs in the billions of rubles associated with launching research projects to develop domestic analogues; some Russian EW systems

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[53] Ivan Safronov and Aleksandra Zharkova-Dzhordzhevich, "*V Rostekhe nalazhivayut radioelektronnyj obmen*" ["Rostec Facilitates a Radioelectronic Exchange"], *Kommersant*, January 27, 2017.

[54] KRET, *2012 Annual Report*.

[55] KRET, *2012 Annual Report*.

[56] I. G. Semenchenko, "*Sostoyanie i problemy sokhraneniya i razvitiya obornno-promyshlennogo kompleksa Rossiyskoy Federatsii*" ["The State of and Problems for the Preservation and Development of the Military Industrial Complex of the Russian Federation"], *Vestnik Akademii Voennykh Nauk* [*Journal of the Academy of Military Sciences*], Vol. 3, No. 56, 2016, p. 111.

Table K.6
EW Market Share, 2016

Company	Market Share (percent)
KRET	60
Sozvezdie	20
TsNIRI Berga	10
NTTs REB	5

SOURCE: Teslenko, 2017.

were produced in Ukraine in the early 2000s, for example.[57] Because many EW systems being delivered today were undergoing state trials well before Western sanctions took hold, it could be assumed that this equipment is relatively advanced, especially given that the United States and allies have not prioritized ground-based EW over the past two decades. What is more uncertain is the ability of the Russian EW industry to continue to innovate in an era of sanctions and limited access to the most advanced radio-electronic technology.

Concern for Radioelectronic Technologies

KRET was formed in 2009 by Rostec as a holding company to consolidate disparate Russian enterprises working on military and civilian projects within the field of radio-electronics. Initially the primary areas of radio-electronic research and production were EW, IFF, and Special Purpose Electronic Connectors and Cable Assemblies. Over time, other areas were added to the concern, such as Diagnostic Management, Special Measurement Instrumentation, and Avionics. Today, the primary focus of KRET's business is on EW, IFF, and avionics. In all, KRET oversees 95 subsidiary companies and over 50,000 employees, that in 2015 fulfilled SDO contracts worth 89.7B rubles (approximately $1.4 billion in 2015 dollars).[58]

KRET's EW division consists of 14 companies scattered across western Russia dedicated to the design, development, and manufacture of various EW systems. As of 2015, these EW companies employed more than 10,000 workers, whose average monthly salary was 36,200 rubles ($569/month in 2015 dollars).[59] KRET's EW business generated 18.5 billion rubles ($290.6 million) in revenue in 2015 (see Figure K.1). The vast majority (97 percent) of KRET's EW business produces goods for military use.

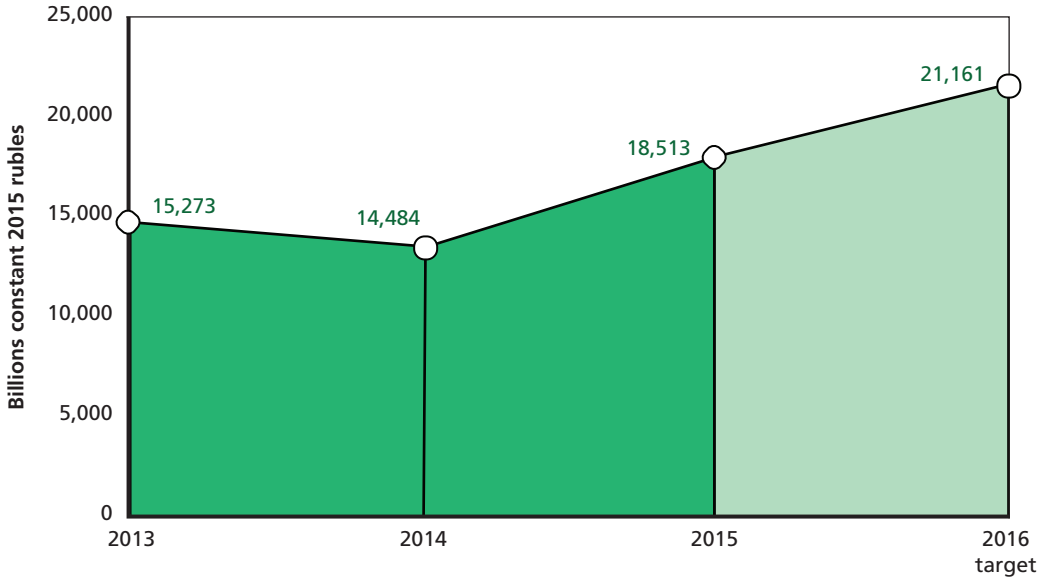
The ground- and air-based EW systems produced by KRET for the ground forces, Navy, and Aerospace Forces fulfill one or more of the three primary EW missions as defined by the company—protection, attack, and support—the latter of which includes functions such as C2 and electronic reconnaissance. In general, KRET's EW business centers on air-based EW systems designed to protect aircraft from guided missile attacks. The concern's subsidiary companies manufacture at least nine such systems that are installed on fighter aircraft and helicopters. One system that has received much attention in the Russian press and has been observed in Syria is the Khibiny, which is mounted in a pod on the wings of

[57] Vladimir Mikheev, "*Razvitie rossiyskoy elektoniki*" ["The Development of Russian Electronics"], interview, *Echo Moskvy* [*Echo of Moscow*], March 21, 2016.

[58] KRET, *2015 Annual Report*.

[59] KRET, *2015 Annual Report*.

Figure K.1
KRET EW Revenue, Billion RUB



SOURCE: KRET, *2015 Annual Report*.

the Su-34 fighter jet and designed to protect the aircraft from enemy air-to-air and surface-to-air guided missiles. KRET also produces several helicopter-based systems, including the President-S system, which is primarily intended to disrupt the guidance system of ground-launched antiair missiles.

KRET produces at least three ground-based EW systems that perform various attack, protect, and support missions. They are known as the Moskva-1, Rtut-BM, and Krasukha, which has two variants, the Krasukha-20 and the Krasukha-4 (also known as Krasukha-4S). Respectively, these systems provide Russia's EW troops with the ability to surveil and direction-find air targets, disrupt electronic artillery fuses and mines and disrupt enemy aircraft surveillance radars and precision guided munitions.

Sozvezdie

The Sozvezdie Concern was formed in 2004 on the basis of the Voronezh Scientific Research Institute for Communications (VNIIS), which was founded in 1958. As of early 2017, the concern comprises 22 enterprises that develop and produce C3, EW, and other specialized military and dual-use radio technology equipment. In 2013, the concern's revenues totaled 13.6 billion rubles with a net profit of 797 million rubles.[60] In addition to KRET, Sozvezdie is one of the leading military EW manufacturers in Russia today. Sozvezdie has not publicly released an annual report since 2011, and those released prior to that year did not provide breakdowns of the company's EW-related business data. Therefore, it is not clear how much of the 13.6 billion rubles of revenue was the result of EW sales.

[60] "Voronezh's Sozvezdiye Concern Has Reached Buryatia with Its Electronic Reconnaissance Complexes," *Agentstvo Biznes Novostey*, February 11, 2015. TRANS OSE. CEL2015021165259260.

In 2012 the concern was forced to lay off 6,000 employees from its main office in Voronezh, Russia, in an effort to reduce redundancy.[61] In 2014 Sozvezdie Concern was transferred to the UIMC, a holding company founded that same year to consolidate a number of radio-electronic enterprises, including Sozvezdie. UIMC is a subsidiary of Rostec, and in 2017 it was merged with another technology firm, Roselektronika.

The companies that focus on EW within Sozvezdie include Tambovapparat, the Tambov factory Oktyabr, the Tambov factory Revtrud, and the Tambov Scientific Research Institute of Radio Technology Efir, each of which manufactured EW equipment for the Soviet military during the Cold War. Despite their long history, the so-called "Tambov companies" have run into recent financial difficulties. In 2016 UIMC, which oversees the Sozvezdia Concern and its subsidiary enterprises, announced it had launched an "anti-crisis plan" for the Tambov companies that consisted of various measures, including consolidation of the four enterprises into a unified NPO along with a "reduction in administrative staff and other expenditures."[62]

The implementation of the anticrisis plan was caused by a particularly acute situation at the Revtrud factory, which had run up a debt to its suppliers and creditors of over 1 billion rubles by 2013. According to UIMC it was discovered in a 2015 audit that, from 2011 through 2013, Revtrud had consistently missed production deadlines, delayed paying its employees, and owed considerable back taxes. UIMC concluded that negligent management, which was subsequently fired, was the root of the factory's problems.[63] It appears as if the consolidation of the four Tambov companies was an attempt to ensure that reliable management would be overseeing the operations of all the companies. Despite recent difficulties, the Tambov group of companies are responsible for the production of some of the Russian military's most modern ground-based EW systems, such as the Borisoglebsk-2, Infauna, and Lesochek jamming stations.

Outlook

Senior members of the Russian General Staff, including Chief of the General Staff Valeriy Gerasimov, have stressed the importance of EW in Russia's approach to modern warfare. According to General Gerasimov:

> At the present time success in warfare to a large degree depends on the reliability of the command and control systems of the warring sides, the technical foundation of which are modern radio-electronic systems and assets. Electronic warfare in modern conditions is one of the most effective tools to neutralize the technical superiority of the opposing side in troop and weapons control.[64]

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[61] Andrey Voronezh, "*Miting oppozitsii v podderzhku rabotnikov OAO 'Sozvezdie'*" ["Opposition Protest in Support of the Workers of OAO 'Sozvezdie'"], *echo.msk.ru*, April 1, 2012.

[62] "*'OPK' realizuet antikrizisnyj plan na oboronnykh predpriyatiyakh v Tambove*" ["UIMC Is Carrying Out an Anti-Crisis Plan for Its Enterprises in Tambov"], *Novosti VPK*, March 23, 2016.

[63] "*'OPK' realizuet antikrizisnyj plan na oboronnykh predpriyatiyakh v Tambove*," 2016.

[64] Valeriy Gerasimov, "*Obrashchenie nachalnika Generalnogo shtaba Vooruzhennykh Sil Rossiyskoy Federatsii—pervogo zamestitelya Ministra oborony Rossiyskoy Federatsii, generala armii V. V. Gerasimova*" ["Letter from the Chief of the General Staff of the Armed Forces of the Russian Federation—the First Deputy Minister of Defense of the Russian Federation, General of the Army V. V. Gersimov"], *Sbornik Radioelektronnoy Borby v Vooruzhennykh Sil Rossiyskoy Federatsii* [*Journal of EW in the Armed Forces of the Russian Federation*], March 27, 2017.

Statements like this one from the most senior Russian military officials, decades of commitment to EW, and hundreds of millions of dollars per year invested in the capability testify that Russia is likely to continue to pursue dominance and deterrence in the field of EW.

This situation largely depends on the ability and willingness of the Russian government to commit to spending relatively large amounts of money on defense. In leaner times, Russia simply did not manufacture many new systems, and those it did build were often exported.[65] While EW is valued at the top levels of the MOD, it will likely take a back seat to other priorities should funding again substantially decrease. That said, Russia's modern EW systems have passed state trials and moved into serial production. If funding were to simply stagnate or decrease slightly, it is assumed that Russia could continue to produce existing modern systems to get its EW units 100 percent modernized by the mid-2020s (should that be the goal) while perhaps sacrificing R&D work on future systems.

Doctrine and Operating Concepts

Through 2020 Russia will continue to deliver modern EW equipment to its forces. Because these are the same systems that have been fielded since 2012 and Russia has demonstrated how it employs these systems in combat situations, a sea change in how Russia approaches and conducts EW is not expected in the near-term. However, lessons learned from the Ukrainian and Syrian conflicts will surely lead to refinement of how commanders employ assets on the battlefield and inform the development of the next-generation systems. In particular, Major-General Lastochkin has indicated that the electronic fight against enemy UAVs will continue to be an important area of emphasis for his forces. He stated in a recent interview that EW offered "practically the only method to effectively combat small UAVs."[66] Additionally on this front, EW units have participated in recent training exercises in close coordination with air defense forces, which locate UAVs through radar and then pass information to EW assets, such as the R-330Zh Zhitel, for jamming.[67]

Another area of focus will be the continued improvement of tactical and strategic command and control. Reportedly, Russian EW troops have successfully integrated their assets into the Unified System of Tactical Troop and Weapon Control, which is an ongoing effort throughout the Russian armed forces to streamline tactical C2. The next step, according to Lastochkin, will be the strategic integration of "EW information resources into the Unified Information Space of the Armed Forces," which will in theory provide senior commanders with much greater insight into the electronic environment in a given theater of operations.[68]

Systems and Procurement Priorities

Research and Development

Through 2020, according to representatives from the 1st Department of the EW Directorate of the General Staff and the EW Research and Development Institute, efforts in Russian

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[65] Aleksandr Palii, "Radioelectronnaya borba: proshloe, nostayaschee, buduschee" ["Electronic Warfare: Past, Present, and Future"], *Military Thought*, No. 4, 2004, p. 50.

[66] Miranovich, 2017.

[67] Russian MOD press release, "*V khode ucheniya podrazdeleniya REB ZVO primenili stantsiyu radiopomekh 'Zhitel' dlya podavleniya upravleniya BLA uslovnogo protivnika*" ["During a Training Exercise EW Units of the Western Military District Employed the 'Zhitel' Jamming Station to Disrupt the Control of an 'Enemy' UAV"], February 4, 2016.

[68] Russian MOD, press release, February 4, 2016.

EW development will be focused across six primary areas, one described as "traditional" and the others as "innovative," quoted in bullet form below:[69]

- **Traditional:** To improve EW systems to counteract C2 and weapons systems, dual-use satellite communication, and real-time navigation support of the enemy; to expand the types of EW systems, including space-based systems; to reduce the number of total EW systems through unification; to increase EW effectiveness against PGMs [precision-guided munitions]; to improve mobility; to improve modernization potential.
- **Innovative:** To create controlled areas of electromagnetic interference on enemy territory with the use of UAS and scatterable jamming emitters.
- **Innovative:** To create [EW] assets to destroy [disable] radio-electronic systems with an electromagnetic beam.
- **Innovative:** "The development of programmable countermeasures equipment, which provides untraceable countermeasures against well-organized enemy C2 systems through disruption of the accessibility, integrity, and confidentiality of information."[70]
- **Innovative:** To develop assets that generate a false radio-electronic environment [for the enemy] and penetrate disinformation into enemy C2 and weapons control systems.
- **Innovative:** To increase the level of information support for EW command stations.

Conclusion

EW has long been a priority for the Soviet and Russian militaries. In the Red Army, there were over 100 EW units across the services. Today the number of units is again growing, with the Airborne adding EW companies to the brigades and the naval fleets standing up EW centers to go along with the organic units found across the ground forces. Updated air-based EW assets are actively being installed on dozens of aircraft and helicopters. Overseeing this effort is a one-star general who leads a dedicated EW directorate on the General Staff, which testifies to military leadership's belief in the relevance of EW on the modern battlefield.

EW development ran into a "means" problem in the 1990s and early 2000s. The ends of developing myriad jamming, protect, and support capabilities with updated technology never went away. Russian designers were putting together plans for systems like the Krasukha just a few years after the collapse of the Soviet Union. There were simply not the resources to realize those plans for well over a decade. Now, as government revenue has increased, EW development is seen as a win-win by the military and political leadership. If EW turns out to be the true game-changer that advocates claim it to be, then Russia will have potentially leveled the playing field for a rather small cost. If it turns out to be only a marginal asset to force commanders then Russia will have sacrificed little, developed potentially dual-use technology, and supported the ongoing training and knowledge development of the next generation of electronic engineers.

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[69] Andrey Lakhin and Andrey Korobeynikov, "*Sostoyanie i perspektivy razvitiya voysk radioelektronnoy borby Vooruzhennykh Sil Rossiyskoy Federatsii*" ["The Present Condition and Future Development of the EW Forces of the Armed Forces of the Russian Federation"], *Sbornik Radioelektronnoy Borby v Vooruzhennykh Sil Rossiyskoy Federatsii* [*Journal of EW in the Armed Forces of the Russian Federation*], March 28, 2016.

[70] Miranovich, 2017.

Despite the relative low cost, headwinds might still exist in the ability of the MOD to procure the necessary funds to invest in new EW technology, which, in turn, would mean the ability of the large firms such as KRET and Sozvezdie to offer competitive salaries to attract the most talented developers. History has shown that economic contraction can lead to a drop-off in investment in EW. Should revenues decrease, it is an open question how much the MOD will be willing to let slide the presently vibrant EW industry. Rhetorically, military leadership implies that this is a critical area of development going forward. Will pronouncements of the value of low-cost, threat-mitigating capability translate into prioritization over other capabilities in a more difficult fiscal environment?

APPENDIX L

Russian Internal Security Forces

Eugeniu Han

In addition to their role in law enforcement, Russia has developed its internal security forces to prevent foreign-backed internal threats to Russia and to support military operations abroad.

Internal security and law enforcement services have been a key power base for the autocratic leaders of Russia with important roles in internal policy and politics. This tradition dates to the beginnings of the Russian state and continues to the present day. Internal security agencies and power ministries were used to enforce current laws, suppress dissent, and even fight wars, with the main goal of securing the incumbent regime.

They also engaged in fierce competition for resources and political influence, often playing key roles in factional politics. To avoid a potential coup, the *siloviki* were usually divided into several competing factions that were powerful enough to deal with the nation's security challenges while keeping each other in check.[1] This political role made them indispensable instruments of the government with responsibilities that often went beyond simple maintenance of legal order, expanding to a wide range of activities from covert operations to open warfighting.[2] On the other hand, division, duplication, and deep institutional rivalry continue to plague the effectiveness of the security community in Russia.[3]

Russia's security and law enforcement services command 2.1 million personnel as of 2015, including a significant number of troops and special units that are not controlled by the MOD. Until recently, internal security forces were prioritized over the regular armed forces in terms of funding and attention from the highest leadership.[4] This attention is partly explained by the fact that the most serious security challenges of the 1990s and 2000s were related to insurgencies in Chechnya, terrorism, and organized crime.

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[1] For example, Stalin used the NKVD to purge the Red Army in the late 1930s, while the legendary rivalry between KGB and GRU was especially pronounced during the Cold War. For an in-depth discussion of the Soviet intelligence agencies, see, among others, Jonathan Haslam, *Near and Distant Neighbors: A New History of Soviet Intelligence*, Oxford: Oxford University Press, 2015; and Christopher Andrew, *The Sword and the Shield: The Mitrokhin Archive and the Secret History of the KGB*, New York: Basic Books, 2000.

[2] The Internal Troops of Ministry for the Internal Affairs of Russia (transferred to Rosgvardia in 2016) were heavily involved in most conflicts in the modern Russia and had a key role in fighting the Chechen wars.

[3] Mark Galeotti, "Putin's Hydra: Inside Russia's Intelligence Services," *European Council on Foreign Relations Policy Brief*, 2016a.

[4] Steven E. Miller and Dmitri Trenin, "The Russian Military: Power and Policy," *American Academy of Arts and Sciences*, 2004, pp. 103–104.

Recent History

The security apparatus has played a major role in the life of the state from the first days of Soviet power. Lenin established Cheka, the first Soviet security agency, a few weeks after coming to power in 1917.[5] Cheka played a key role in the domestic political struggle in the first years of the Soviet regime, and its troops detained and executed political opponents, policed labor camps, and kept in check the Red Army. It was later reorganized several times, eventually into the KGB, penetrating the society at all levels.[6] Other core force-wielding institutions were the MOD and the MVD.

Power ministries declined and fragmented in the last years of the Soviet Union and later, in the 1990s. In 1991, the State Council abolished the KGB and divided its responsibilities among several smaller agencies. Boris Yeltsin created a complicated security system comprised of 15 power ministries to isolate the powerful conservative elements within the KGB and the MOD.[7] Yeltsin also subordinated them directly to the president, with limited oversight from the Duma for annual budgets and virtually no oversight from the government.[8] This structure preserved the role of the power ministries as a "presidential bloc" used for acquiring and holding power.[9]

The fragmentation of the internal security services was also dictated by a number of new challenges. After the collapse of the USSR and the creation of an independent Russian Federation, the country entered a period of disorder during which the old Cold War external security challenges were replaced by internal security challenges such as terrorism and drug trafficking. To deal with these challenges, Russia reorganized its internal security apparatus while preserving most of the assets it had inherited from the Soviet Union.

In 1991 the whole USSR had more than 400,000 internal security troops and paramilitaries—not including the regular police—or one for every 700 citizens and ten regular soldiers. After four years, the Russian Federation alone had over 380,000 security and paramilitary troops, or one for every 392 citizens.[10] These troops were heavily involved in fighting the First and Second Chechen wars and responding to domestic terrorist attacks. At the same time, the precarious state of the Russian economy led to shrinking government finances and, consequently, less funding for the security sector. As a result, many capable officers left the services and joined the private sector. Table L.1 lists the various internal security agencies in place today, which number over 2.4 million personnel.

Government priorities changed after Vladimir Putin came to power as prime minister in 1999 and continued as de-facto leader of the nation thereafter.[11] A former KGB operative,

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5 The All-Russian Emergency Commission for Combating Counter-Revolution and Sabotage.

6 For a detailed history of the reorganizations of Soviet security agencies, see, among others, A. I. Kokurin and N. V. Petrov, "*Lubjanka: Organy VChK-OGPU-NKVD-NKGB-MGB-MVD-KGB. 1917–1991 Spravochnik. M.: Mezhdunarodnyj fond 'Demokratija*,' 2003.

7 John P. Moran, *From Garrison State to Nation-State: Political Power and the Russian Military Under Gorbachev and Yeltsin*, Westport, Conn.: Greenwood Publishing Group, 2002.

8 Thomas Gomart, *Russian Civil-Military Relations: Putin's Legacy*, Washington, D.C.: Carnegie Endowment, 2008.

9 Karin Anderman, Eva Hagström Frisell, and Vendil Pallin, *Russia-EU External Security Relations: Russian Policy and Perceptions*, FOI, 2007.

10 Mark Galeotti, *Russian Security and Paramilitary Forces Since 1991*, New York: Bloomsbury Publishing, 2013.

11 Putin was president from 2000 to 2008, prime minister from 2008 to 2012, and president again since 2012.

Table L.1
Personnel and Troops Belonging to "Power" Ministries and Entities Other Than MOD

Agency	Personnel	Troops/Armed Units
Ministry of Internal Affairs (MVD)	904,871	
Rosgvardiya	340,000	Internal Troops 170,000[a] OMON and SOBR 45,000
Federal Security Service (FSB)[b]	~350,000	Border Troops 140,000–175,000 Special Forces 4000
Ministry of Civil Defence, Emergencies and Disaster Relief (MChS)	288,565	Rescue military units 23,000
Federal Protection Service (FSO)	~50,000	Armed units of 10,000–30,000
Main Directorate for Special Programs (GUSP)	~20,000	
Foreign Intelligence Service (SVR)	~20,000	May have a number of special units
Federal Penitentiary Service (FSIN)	295,967	Special purpose units (Saturn)
Prosecutor General's Office (GP)	47,912	
Investigative Committee	23,190	
Departmental security services[c]	200,000	
Private security and investigative firms[d]	720,000	
TOTAL	~3,2 million	390,000–450,000

SOURCES: Persson, 2016; "*U okhrannikov sotsial'nyi status chut' nizhe uborshchitsy*" ["The Guards Have a Social Status Just Below the Cleaning Woman"], *Kommersant*, August 18, 2014; "*Chto nuzhno znat' pro natsional'nuyu gvardiyu*" ["What You Need to Know about the National Guard"], *Kommersant*, April 6, 2016; "*Terakty mnozhat polnomochiya*" ["Terrorist Acts Multiply Powers of Security Agencies"], *Gazeta.ru*, November 24, 2015; Brian Taylor, *State Building in Putin's Russia: Policing and Coercion After Communism*, Cambridge, U.K.: Cambridge University Press, 2011; B. Renz, "The Russian Power Ministries and Security Services," in Grame Gill and James Young, eds., *Routledge Handbook of Russian Politics and Society*, Abingdon, U.K.: Routledge, 2013; Galeotti, 2013; A. V. Dmitrieva, "Reforming the Office of Private Security in the Context of Developing the Market for Security Services," *Analytical Notes on Problems of Law Enforcement*, SPb: IPP EU SP, 2010. [*Дмитриева, А. В. «Реформирование Управления вневедомственной охраны в контексте развития рынка охранных услуг. Сер.: Аналитические записки по проблемам правоприменения.» СПб.: ИПП ЕУ СПб*, 2010.]; Gomart, 2008.

NOTES: [a]N. Petrov, "Changing of the Guard: Putin's Law Enforcement Reforms," European Council on Foreign Affairs, April 11, 2016.

[b]Gomart, 2008, and Taylor, 2011, estimate the size of FSB at 350,000 employees. Soldatov and Borogan, 2011, provide a more conservative estimate at 200,000. Given that the number of border troops is estimated at 140 thousand to 170 thousand (Persson, 2016), it is likely that the total number of FSB employees is closer to 350,000.

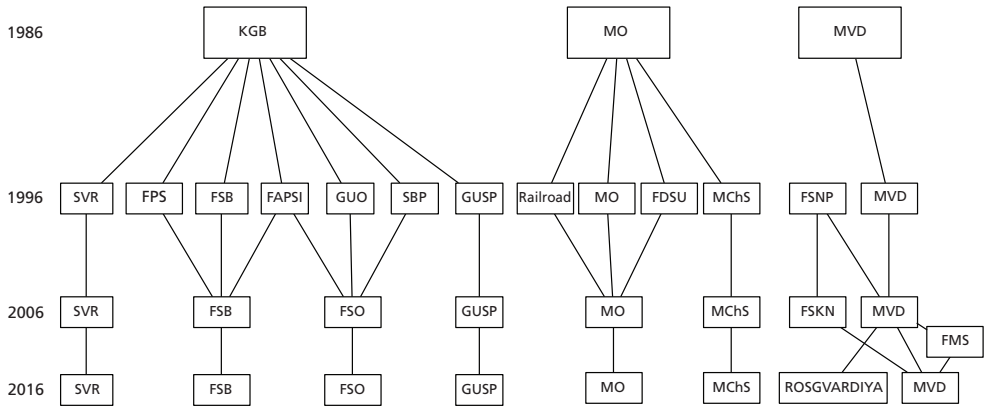
[c]Departmental security services (*vedomstvennaya okhrana*) are security firms established by a number of ministries and state corporations. For example, the security forces of Rosatom, Roskosmos, Rostech, Gazprom, Rosneft, Transneft, and a number of federal ministries would fall under this category. This does not include Federal State Unitary Enterprise (FSUE) Okhrana, and the Police Guard Service (*vnevedomstvennaya okhrana*) that are counted under Rosgvardiya.

[d]Excluding private security under Rosgvardiya (*vnevedomstvennaya okhrana*), FSUE Okhrana (counted under Rosgvardiya), and government and SOE security (*vedomstvennaya okhrana*).

Putin understood the importance of the internal security services and relied heavily on them to accomplish key tasks, such as fighting the active phase of Second Chechen War (1999–2002),[12] and, more important, the subsequent insurgency that lasted until 2009. From the beginning of his rule, Putin steadily increased the budgets and the total personnel in most law enforcement and security agencies. A significant part of these resources went disproportionately to the security services, especially the FSB and numerous elite forces generally known as Spetsnaz. The reemergence of the Special Forces within the security agencies reflected the complex security challenges facing Russia, such as terrorism and organized crime, as well as competition between different security services for influence and roles.[13] Figure L.1 shows the evolution of the various power ministries.

After the wave of civil unrest and Putin's return as president in 2012, internal security agencies kept their existing Special Forces and added new groups at the local level. The decision to create local forces that can be activated within a few hours was justified by growing challenges of terrorism, organized crime, and civil unrest, as well as the difficulty of moving forces from one region to another in a timely manner given the enormous territory of Russia.[14]

Figure L.1
Evolution of Power Ministries



SOURCE: Taylor 2011, RAND Arroyo Center analysis.
NOTE: Key: SVR = Foreign Intelligence Service; FSB = Federal Security Service; FPS = Federal Border Service (an independent agency between 1994–2003, incorporated into FSB in 2003); GUO = Main Guards Directorate; SBP = Presidential Security Service; GUSP = Main Directorate for Special Programs; FDSU = Federal Road Construction Administration (became independent in 1997, included as illustrative); MChS = Ministry of Civil Defense and Emergency Situations; FSNP = Federal Tax Police Service; FSO = Federal Protection Service; FSKN = Federal Service for Control of the Narcotics Trade (abolished and incorporated in MVD in 2016); FMS = Federal Migration Service (became independent in 2012, incorporated in MVD in 2016); Rosgvardiya = Russian National Guard. This figure is not comprehensive but depicts the general trends.

[12] The military phase of the operation ended in 2002, and the subsequent responsibilities to fight terrorists were transferred to the Federal Security Service and later to the MDV.

[13] For example, it is notable the competition between the FSB, MVD, and the Anti-Drug Agency, which ended with the dissolution of the latter, and between FSB and MVD, ended in arrests of top MVD generals in charge of combating internal corruption. Yurii Sterzhnev, "*MVD i t. d. Silovikov ob"edinyayut dlya sokrashcheniya byudzhetnykh raskhodov*" ["Power Ministries Merged to Minimize Budget Expenditures"], *Kommersant*, April 2, 2015.

[14] Galeotti, 2013, p. 6.

Recent Operations

Ukraine

Security agencies and paramilitaries participated in the Ukrainian conflict in a variety of ways. A number of recent studies indicate that FSB and SVR have been heavily involved in the Ukrainian conflict both directly by sending Spetsnaz groups, and indirectly by coordinating separatists, conducting information campaign and cyber attacks, and providing intelligence.[15]

Paramilitary groups such as Cossacks were reportedly used to recruit "volunteers" for the fight in Donbas. Also, paramilitaries played an important role during the annexation of Crimea. The paramilitary group called the Russian Orthodox Army, led by Igor (Strelkov) Girkin, began operating in eastern Ukraine after Yanukovych was ousted. Other paramilitaries involved in the Ukrainian conflict include the former members of the Chechen Vostok battalion, and the Night Wolves motorcycle club.[16] The Night Wolves were especially active in Crimea, where they arrived "to ensure free and fair voting in the referendum for annexation."[17] There are also reports from the Ukrainian government that the Wagner private military company was and remains active in Ukraine, including claimed identification of more than 2,000 individuals associated with Wagner.[18]

Syria

In addition to the regular armed forces, Russia deployed Spetsnaz groups from internal security services and operatives from private security companies in Syria.

According to media reports, operatives from private military companies became involved in the Syrian conflict prior to the active phase of Russia's official military operation. Slavonic Corps, a group of Russian mercenaries, was fighting against Syrian rebels in the surroundings of Homs. However, shortly after the first battle they returned to Russia, and several leaders of the group were placed under criminal investigation.[19] Most operatives participated in the Ukrainian conflict and returned to Syria under contract with the Wagner private military company a few years later.[20] More than 900 mercenaries employed by Wagner were reported to have participated in major battles in Syria, including the battle for Palmyra. Even though Wagner is reportedly operating outside Russian law that does not allow for private military companies, many of its operatives received military decorations for their service in Syria.[21] Russian employees of a private military company, possibly Wagner, were also reported to have been killed in a battle with U.S.-trained forces in February 2018.[22]

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[15] Michael Kofman, et al., *Lessons from Russia's Operations in Crimea and Eastern Ukraine*, Santa Monica, Calif.: RAND Corporation, 2017.

[16] D. Tabor, "*Angely Putina: istoriya o samom skandal'no izvestnom motoklube Rossii*" ["Putin's Angels: The History of Russia's Most Famous Motorbike Club"], Inosmi.ru, October 14, 2015.

[17] Alexander Marquardt, "Night Wolves Join Pro-Russia Side in Southern Ukraine," ABC News, February 28, 2014.

[18] See, for example, "SBU Releases Intercepted Comms Between PMC Wagner Chief, Russian Army General on Donbas Incursion," UNIAN Information Agency, January 23, 2016.

[19] "*Poslednii boi 'Slavyanskogo korpusa'*" ["The Last Fight of the 'Slavic Corps'], *Fontanka.ru*, November 14, 2013.

[20] "'*Slavyanskii korpus' vozvrashchaetsya v Siriyu*" ["'Slavic Corps' Is Returning to Syria"], *Fontanka.ru*, October 16, 2015.

[21] "*Oni srazhalis' za Pal'miru*" ["They Fought for Palmyra"], *Fontanka.ru*, March 29, 2016.

[22] See Michael Kofman, "U.S. Strikes and Russian PMC Casualties in Syria—Fact vs. Fiction," February 14, 2018.

Exercises

The Russian military regularly conducts military exercises with the participation of the Internal Troops, border troops, and MChS. FOI's report on Russian military capabilities emphasizes that the Internal Troops, FSB, and other units were routinely involved in annual strategic exercises, which they interpret, among other evidence, to imply Russia's preparation of Russia for a major operation (in FOI's terms, a "joint inter-service combat operation"). These units have key roles in territorial defense, but may potentially be used as an occupying force following the regular forces.[23]

Main Internal Security Agencies

See Table L.2 at the end of the section for a summary of the roles of major agencies, services, and other groups.

Ministry of Internal Affairs

The MVD (the institutional successor of the Soviet MVD), retains its influence as one of the key power ministries in terms of influence and resources during the Putin era. Until 2016 when the Internal Troops (discussed later) were transferred to Rosgvardiya in 2016, it was a hybrid of a law enforcement agency and a military service. Since 2016 its role appears more focused on law enforcement.

The MVD operates as a central ministry in Moscow combined with ministries, main directorates (*glavnye upravleniya vnutrennikh del*, GUVD), and directorates (*upravleniya vnutrennikh del*, UVD) from each constituent of the Russian Federation. At the provincial level, each nominal ministry of internal affairs is further subdivided into local Internal Affairs Directorates, while the main cities such as Moscow and St. Petersburg have their separate Main Internal Affairs Directorates.

The regular police organization, called *militsiya* until 2011, was formed during the early days of the Soviet Union and was organized under the same principles as the Red Army, including uniforms and rank structure. During the first decade after the collapse of the Soviet Union it remained unreformed, underpaid, and neglected by the central authorities. Rising crime and formation of large, armed, and violent gangs forced regular police to transform into a paramilitary organization.[24] It was commonplace to see traffic police carrying submachine guns, and local police stations sometimes resembled fortified bunkers. Corruption was widespread, and the public trust in the police was very low.

The first two terms of the Putin's presidency brought increasing funds to the police. Wages rose, but the basic organization and practices remained largely unchanged. Reform came in 2011 when president Medvedev introduced the new Law on the Police that changed the official name of the force, imposed a reaccreditation of all serving officers, increased wages by 30 percent, and reduced the force by 22 percent, to 1.1 million officers.[25]

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[23] Persson, 2016, p. 52–53; Johan Norberg, *Training to Fight: Russia's Major Military Exercises 2011–2014*, FOI, 2015.

[24] Olga B. Semukhina and Kenneth Michael Reynolds, *Understanding the Modern Russian Police*, Boca Raton, Fla.: CRC Press, 2013, pp. 95–96.

[25] Galeotti, 2013.

In the latest round of reforms, in 2016, the MVD was stripped of its military arm and given the resources of the Federal Drug Control Service of Russia (FSKN) and the Federal Migration Service in return.[26] These reforms increased the economic intelligence capabilities of the MVD by incorporating FSKN intelligence assets in Central Asia and Afghanistan.

Cyber capabilities of the ministry are concentrated in Directorate K, which deals with information crime.[27] The department has a perceived ambiguous role in terms of which kind of cyber crime it chooses to prosecute and which it allows to continue.[28] With the FSB, MVD is likely instrumental in government's close cooperation with criminal and other hacker groups, which are allowed to continue their criminal activities as long as they provide services to the government when requested.[29] These groups were particularly effective in cyber operations due to the availability of top talent. They also allow the government to deny involvement in a field that is already characterized by difficulty of establishing attribution.

At the local level, the police forces are organized in GUVDs and UVDs, which are further divided into specialized divisions ranging from traffic duties to criminal investigations. Russian police still feature precinct inspectors, policemen who live in large housing estates whose apartments also serve as local police stations. The police departments in large cities have additional elements. For example, Moscow police also have two operational regiments, over 1,000 people each, that have specialized roles in maintaining public order. These regiments are better equipped than the regular police but still less muscular than the Special Purpose Mobile Units (OMON) riot police and the Internal Troops of Rosgvardiya. The key duty of the operational regiments is to prevent and suppress public gatherings and demonstrations.

Policemen most often use Makarov PM and PMM hand pistols, 9mm PP-2000 and PP-19-01 submachine guns, and military-grade AKS-74U assault carbines. Starting from 2008, the police (except special units) was required to exchange Makarovs for Yarygin pistols and stop using the Kalashnikov-based weapons.

National Guard

The National Guard (Rosgvardiya) was created in 2016 as a reorganized, militarized internal security force within Russia.[30] The creation of Rosgvardiya based on the Internal Troops of the MVD was first discussed as early as 1992.[31] The idea to create a new internal security organization was revived in 2014 among fears of a color revolution in Russia. The final decision

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[26] President of Russia, "*Ukaz 'O sovershenstvovanii gosudarstvennogo upravleniya v sfere kontrolya za oborotom narkoticheskikh sredstv, psikhotropnykh veshchestv i ikh prekursorov i v sfere migratsii'*" ["Decree 'On the Improvement of Public Administration in the Sphere of Control over the Circulation of Narcotic Drugs, Psychotropic Substances and Their Precursors and in the Sphere of Migration"], April 5, 2016.

[27] Ministry of Internal Affairs, "*Upravlenie 'K' MVD Rossii*" ["Directorate 'K' of the Ministry of Internal Affairs of Russia"], undated.

[28] Keir Giles, "'Information Troops'—A Russian Cyber Command?" in C. Czosseck, E. Tyugu, and T. Wingfield, eds., 2011 3rd International Conference on Cyber Conflict, Tallinn: CCD COE Publications, 2011.

[29] J. Limnell, "Russia's Cyber-Operations Alter Balance of Power—Tougher Response Called For," June 15, 2016.

[30] We refer to it as Rosgvardiya in part to limit any confusion with the U.S. National Guard, which has very different tasks and structure.

[31] V. P. Vorozhtsov, "Russia's National Guard: Pro and Con," *Military Thought*, No. 1, 1992, pp. 21–25. Cited in Timothy L. Thomas, "Kremlin Control: Russia's Political and Military Reality," Ft. Leavenworth, Kan.: Foreign Military Studies Office, p. 8.

was announced on April 5, 2016, when Putin signed presidential decree 157, which formally brought Rosgvardiya into existence.[32] The main tasks for Rosgvardiya listed in the decree include joint law enforcement with the MVD, to fight against terrorism and extremism, territorial defense, protection of government buildings and establishments, assistance in border defense, participation in peacekeeping operations, and law enforcement with respect to private ownership of firearms. Rosgvardiya was also given a broad array of powers, including the ability to arrest lawbreakers, enter residential and other premises, use physical force, collect intelligence, issue licenses for buying and selling firearms and establishing private security firms, and put down mass protests.[33]

Rosgvardiya is comprised of 340,000 members.[34] The Internal Troops, OMON riot police, and Special Rapid Response Detachment (SOBR) special units form its military backbone. In addition, Rosgvardiya took over the unitary federal state enterprise Okhrana and the Police Guard Service from the MVD.[35] Okhrana is the largest security firm in Russia, with 82 branches and 110,000 employees.[36] Recent media reports suggest that Rosgvardiya will also include a cyber security and cyber intelligence unit that will be tasked with monitoring social networks for "extremist content," a task that is critical in anticipation of the presidential elections in 2018.[37]

General Victor Zolotov, the former commander of the Internal Troops and a long-time associate of President Putin, was named as the head of Rosgvardiya in 2016. Similar to the director of FSB, the head of Rosgvardiya holds a ministerial rank and is appointed by and subordinate to the president.

Internal Troops

Internal Troops (*Vnutrennye voiska*, VV) are a substantial security force that consists of over 170,000 people.[38] It is, in effect, a parallel army that was transferred from the MVD to Rosgvardiya in 2016. The main responsibilities of the Internal Troops include territorial defense, protection of public order and security, peacekeeping operations abroad, and disaster relief. The Internal Troops are organized into seven districts, with units in 85 regions of Russia, including a brigade in Crimea. Together with MChS and GUSP, Rosgvardiya has specially designated roles during mobilization.

The Internal Troops played a significant role in the First (1994–1996), and especially the Second (1999–2009) Chechen wars, where they were employed in coordinated attacks with artillery and air support. The size and effectiveness of various VV units are not uniform.

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[32] "*Voprosy Federal'noi sluzhby voisk natsional'noi gvardii Rossiiskoi Federatsii*" ["Questions of the Federal Service of Troops of the National Guard of the Russian Federation"], President of Russia, Decree nr. 157.

[33] "Powers of the National Guard," Federal Law nr. 226-F3.

[34] "Rosgvardia Reported on the Results of the Work for the Year since Its Inception," *RBC*, undated.

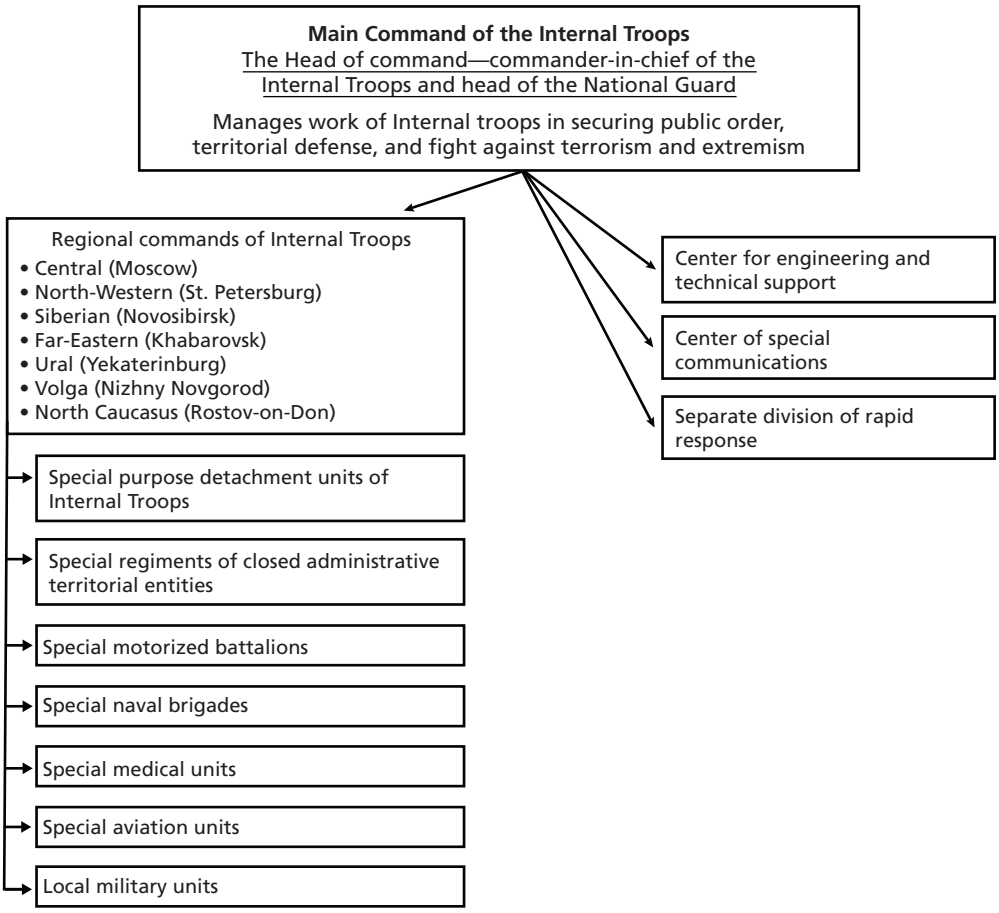
[35] The Police Guard Service (*upravlenie vnevedomstvennoi okhrany*) manages paid security services offered by MVD units for both businesses and individuals.

[36] FSUE Okhrana company website; Dmitrieva, 2010.

[37] Jamestown Foundation, "Russian National Guard: A New Oprichnina, 'Cyber Police' or Something Else?" *Eurasia Daily Monitor*, Vol. 14, No. 38, March 21, 2017; "*Rosgvardija sozdala podrazdelenie po kiberrazvedke*" ["Rosgvardia Has Created a Division for Cyber Intelligence"], Rosbalt.ru, March 16, 2017.

[38] "*S subboty sotrudniki Rosgvardii nachnut perehodit' v ee shtat*" ["Staff Will Be Transferred to Rosgvardi Beginning Next Saturday"], *Inerfax.ru*, October 1, 2016.

Figure L.2
Structure of the Internal Troops



SOURCE: Semukhina and Reynolds, 2011, 2013; RAND Arroyo Center analysis.

For example, the Spetsnaz units and various special-purpose detachments are well trained and equipped, while smaller territorial units are usually employed as police support at public events. The frontline units of the VV are called Special Purpose Brigades, and are comprised of 4,400 troops of motorized infantry armed with AKS-74 and AKM-74 assault rifles, machine guns, RPG-22 and RPG-29 grenade launchers, as well as BTR-80/80A armored personnel carriers, GAZ Tigers, and a limited number of BTR-90 APCs and BMP-2 infantry fighting vehicles. The VV also have specialized aviation units featuring Mi-8 assault and transport helicopters, armed with Mi-24P/V gunships. The 11,000 strong 1st Independent Special Purpose Division headquartered in Moscow also employs several tank and artillery units. In 2016, Rosgvardia stated that about 85 percent of its equipment is modern and that the new BTR-82B armored personnel carrier is expected to be delivered to units during 2017.[39]

The elite VV units are trained for counterinsurgency missions, riot-control, and maintenance of public order and participate regularly in exercise together with the armed forces.

[39] Galeotti, 2016a.

For example, during Zapad-2013 strategic exercises, over 20,000 VV troops participated in a concomitant but nominally separate mobilization exercise, possibly reflecting their role in territorial defense and potential as an occupying force following the regular forces.[40]

The bulk of the Internal Troops is comprised from lower-preparedness motorized infantry, which are used as static security guards and may protect installations, communications, and rear areas from sabotage groups during military operations near Russia's borders.

Special Purpose Mobile Units

Special Purpose Mobile Units (*Otryad Mobilny Osobogo Naznacheniya*, OMON) were created in the 1980s with the special purpose of suppressing public disorder. They were used against protesters all over the Soviet Union and became an important force in military operations in the 1990s. Despite being primarily riot police, OMON units also act as armed-response paramilitaries and counterinsurgency Special Forces. In the past OMON units were used as security forces and sometimes frontline units during the First and Second Chechen wars. The most common task of counterinsurgency units was to perform house-by-house searches (*zachistka*) in communities suspected of housing terrorists. OMON has 160 units totaling 40,000 troops.[41] Moscow, due to its strategic importance, houses over 2,000 OMON troops.

OMON officers are armed with a variety of firearms, including 5.45mm AK-74, AK-107, and 7.62mm AK-103 assault rifles, SVD sniper rifles, AKS-74U assault carbines, numerous varieties of submachine guns, including the 9A-91, PP-19 Bizon, and Kedr, and Makarov PMM or PYa Grach pistols.[42] During counterinsurgency operations, OMON units are equipped with heavier support weapons such as GP-25 grenade launchers, machine guns, and a variety of vehicles ranging from armored personnel carriers, such as the BTR, to lighter armored vehicles like the Tigr. OMON also uses specialized assault vehicles, like the Abaim-Abanat, with extending ramps to board hijacked aircraft, and vehicles equipped with water cannons, such as the Lavina-Uragan. The terrorist attack in Beslan in 2004 created an impetus to develop OMON snipers and specialist firearms units.

OMON usually recruits physically fit men between 22 and 30 who have completed military service. In addition to the mandatory four-month training before joining the force, OMON officers usually spend more time in training and drills rather than actual police duties.

With the creation of Rosgvardiya in 2016, President Putin transferred OMON, SOBR, and the operational regiments under the authority of Rosgvardiya, while certain units will be used for the needs of the MVD. These units will operate under a double command structure that is currently being developed.

Special Purpose Mobile Units

The Special Rapid Response Detachment (*Spetsialnyi otryad bystrogo reagirovaniya*, SOBR) is a type of Special Forces employed for the detention of armed and dangerous suspects. These units proliferated as a response to growing organized crime in the 1980s and, especially, the 1990s. As of 2016, there were 87 SOBR units totaling 5,200 troops.[43]

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[40] Norberg, 2015, p. 35.

[41] "*Chto nuzhno znat' pro nacional'nuju gvardiju*," 2016.

[42] Galeotti, 2013.

[43] "*Verojatnuju chislennost' Nacgvardii v Rossii ocenili v 300 tys. Chelovek*" ["The Probable Number of the National Guard in Russia Eas Estimated at 300 Thousand People], *Interfax.ru*, April 7, 2017.

Recruitment and training are similar to that of OMON, with emphasis on unarmed combat skills and physical strength. SOBR units participated in counterinsurgency operations in the Caucasus region, including deployments as frontline combat troops during the Chechen wars.

Federal Security Service

The Federal Security Service (*Federalnaya sluzhba bezopasnosti*, FSB) is the main internal security agency and one of the successor organizations of the KGB. A director, who has a rank equivalent to a minister and reports directly to the president, heads the FSB. The FSB's tasks include intelligence, counterintelligence, counterterrorism, border protection, combating organized crime, and ensuring information security.[44] Currently, the FSB has all the functions of its predecessor except foreign intelligence (SVR) and Federal Protection Service. Former KGB/FSB officers hold leading functions in the federal and regional governments, Duma, SOEs, and the private sector.[45]

As with other security services, the FSB was suffering from underfunding and loss of its most capable officers in the 1990s but regained its former status under Putin. In 2003, FSB absorbed most of the services of the FAPSI and the border guard troops, greatly increasing its resources, strength, and influence.[46] In addition, the director of FSB became the head of the National Counterterrorism Committee that coordinated the counterterrorism operations of all power ministries. The status of the agency was further solidified by a large and growing number of militarized troops and special forces, such as Alpha and Vympel, employed in combat both inside Russia and abroad.[47] FSB has subdepartments for aviation, science and technology, special training, medicine, and forensics, as well as a developed military security organization that maintains security in the armed forces.[48] The service has also developed a potent cyber and offensive information operations capabilities that were extensively used domestically and abroad.[49]

The border troops under the command of the FSB are comprised of 140,000 to 160,000 officers in charge of protecting Russia's vast borders, including dangerous areas in North Caucasus and Central Asia. Sometimes border troops are deployed for missions abroad; for example, guarding the border between Tajikistan and Afghanistan between 1993 and 2005.

Border troops are organized in eight border districts: Central, Southern, Ural, Volga, Northwest, Siberian, Far East, and Arctic. Each border district employs a number of mobile

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[44] Stephen White, ed., *Politics and the Ruling Group in Putin's Russia*, New York: Springer, 2008.

[45] Alena V. Ledeneva, *Can Russia Modernise?: Sistema, Power Networks and Informal Governance*, Cambridge, U.K.: Cambridge University Press, 2013.

[46] In 2003, the border troops numbered 210,000 officers and staff, and the FSB was estimated to have 80,000 to 90,000 officers (White, 2008, p. 43).

[47] Alpha played a key role in capturing and killing rebel commanders during the Chechen wars, high-profile counterterrorism operations in Nord-Ost in 2002 and in Beslan in 2004, and even in the arrest of Mikhail Khodorkovsky. "*The Times: 'Hodorkovskij. Odin na odin protiv Putina'*" ["The Times: Khodorkovsky. 'One on One against Putin'"], *Open Russia*, May 16, 2014.

Alpha was also involved in a number of high-profile operations abroad. For example, in 1979, Alpha units seized the Afghan president's residence and killed Hafizullah Amin in preparation for the Soviet invasion. Some reports indicate that Alpha operatives may have participated in operations in Eastern Ukraine. Iggy Ostanin, "Russia's Version of the Navy SEALs May Be Fighting in Ukraine," *Bellingcat.com*, August 24, 2014.

[48] Federal Security Service, "*Struktura organov federal'noj sluzhby bezopasnosti*" ["Structure of the Bodies of the Federal Security Service"], undated.

[49] Galeotti, 2016a.

groups that consist of motorized patrol forces and air support mainly consisting of helicopters and light aircraft. Unsurprisingly, the Southern district, which includes North Caucasus, is the most militarized one. Border troops also regularly participate in annual exercises together with the regular armed forces. For example, there are media reports of the border troops participating in the Zapad-2013 final military maneuvers in Kaliningrad.[50]

The FSB is Russia's leading agency for cyber propaganda and disinformation campaigns. FSB maintains and operates the internal cyber surveillance system (SORM) that monitors internet usage, cell phone calls, emails, Skype, text messages, and social networks.[51] FSB, FSO, and SVR establish the parameters of Russian cyber doctrine and coordinate most internal and external cyber activities.[52]

Federal Protection Service

The Federal Protection Service (*Federalnaya sluzhba okhrany*, FSO) provides physical protection to highest leadership and most important government infrastructure. According to various estimates, FSO employs about 50,000 officers, including close-protection operatives, snipers, intelligence and counterintelligence teams, bomb disposal experts, medical teams, divers, and a detachment for mountain operations.[53]

The FSO is yet another element in a complicated system of balances between the power ministries to prevent a potential coup. In addition to providing physical security to the top dignitaries, FSO is tasked with maintaining the political security inside of the country.

Its military arm includes the 5,500 troops-strong Presidential Guards regiment, and a brigade. FSO's Special Communications and Information Service is also responsible for analysis of intelligence from other espionage agencies such as FSB, SVR, and GRU.[54]

FSO has significant cyber capabilities that it initially inherited from the Federal Agency of Government Communications and Information that was dismantled in 2003. The assets of FAPSI were reorganized in the Special Communications and Information Service of the FSO, which is now responsible for the security of the presidential communications and cyber defense.[55] In addition to securing government communications, FSO uses its capabilities to monitor the publications of all Russian bloggers and assess their attitude to power. FSO reportedly created a special database of "negatively-minded citizens" who publish opposing views.[56] In June 2017 Duma granted the FSO the right to take measures to protect the per-

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[50] Alexandr Tikhonov, "*'Zapad-2013': pervye vyvody*," *Krasnaia Zvezda*, September 27, 2013, cited in Norberg, 2015.

[51] Andrei Soldatov and Irina Borogan, *The Red Web: The Struggle Between Russia's Digital Dictators and the New Online Revolutionaries*, New York: Public Affairs, 2015.

[52] Michael Connell and Sarah Vogler, *Russia's Approach to Cyber Warfare*, Alexandria, Va.: Center for Naval Analyses, 2017.

[53] Persson, 2016, estimates the number of armed units in FSO at 10,000 to 30,000, while the *Military Balance* suggests that most of the 55,000 staff of the FAPSI is serving in the FSO since FAPSI's dissolution in 2003. Alexander Korzhakov, the former head of Presidential Security Service, estimated the current size of FSO at 50,000 in a recent interview to *Media Zona*, "*'Znaju ih vseh.' Govorit Aleksandr Korzhakov*" ["'I Know Them All'—Speaking with Aleksandr Korzhakov"], *Mediazona.ru*, September 5, 2016.

[54] Galeotti, 2013, pp. 46–47.

[55] Roland Heickerö, *Emerging Cyber Threats and Russian Views on Information Warfare and Information Operations*, Defence Analysis, FOI, 2010, p. 4.

[56] "*FSO budet sledit' za jekstremistami cherez blogi i socseti*" ["FSO Will Follow Extremists Through Blogs and Social Networks"], *Izvestia*, January 10, 2014.

sonal data of top government officials and their family members.[57] Together with FSB and SVR, FSO is one of the top three agencies that maintain significant cyber capabilities and are involved in establishing Russia's cyber doctrine.[58]

Main Directorate for Special Programs

The Main Directorate for Special Programs (GUSP) was funded as an independent agency in 1994 on the basis of the Fifth Department of the Department of Affairs of the Council of Ministers of the Russian Soviet Federative Socialist Republic (RSFSR) and 15th Directorate of the KGB. GUSP operates a vast network of protected underground facilities and is tasked with coordination in the event of major war. Together with Rosgvardiya and MChS, GUSP has a key role in mobilization activities by ensuring security of the president and other top officials, coordinating the interaction between bodies of state authority and federal and regional bodies of executive authority, and maintaining the functionality of the main C2 facilities governing the state and its armed forces during mobilization.[59]

Ministry of Justice

The Ministry of Justice is not a traditional power ministry, and its functions do not generally involve armed coercion. The ministry's armed forces are mainly concentrated in the Federal Penitentiary Service (*Federalnaya sluzhba ispolneniya nakazanii*, FSIN), which employs about 300,000 officers. The magnitude of FSIN is partly due to a high proportion of the population that remains in prison. In addition to regular guards, FSIN employs a number of special units to deal with the most serious incidents, such as large-scale prison riots and apprehending dangerous fugitives. These units are well trained and equipped and may be employed in operations beyond the authority of FSIN. For example, Saturn, the best-known "jail spetsnaz" unit, has been deployed during the Chechen wars due to its prowess in close-in operations.[60]

Ministry of Civil Defence, Emergencies and Disaster Relief

The Ministry of Civil Defence, Emergencies and Disaster Relief (MChS) was created to deal with natural and man-made disasters in 1994 by merging the Rescue Corps, State Fire Service, and civil defense troops. A recent presidential decree specified the total number of MChS personnel at 288,565 in 2017.[61] This number included 7,200 servicemen in rescue military formations and over 251,000 people in the State Fire Service. Civilian personnel were set at 30,000. The decree did not provide information on the military arm of the MChS—the Civil Defense Troops—estimated at 20,000.[62]

The Civil Defence Troops were a part of the MOD before 1991 and had the task of providing assistance to the population during wartime and in the aftermath of bombings and

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[57] "*Gosduma rasshirila polnomochija FSO*" ["The State Duma Has Expanded Powers of FSO"], *Vedomosti*, June 15, 2017.

[58] Heickerö, 2010.

[59] Russian Government, "Chief Directorate for Special Programmes of the Russian President," undated.

[60] Galeotti, 2013.

[61] President of Russia, "*O nekotoryh voprosah Ministerstva Rossijskoj Federacii po delam grazhdanskoj oborony, chrezvychajnym situacijam i likvidacii posledstvij stihijnyh bedstvij*" ["On Some Issues of the Ministry of the Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters"], Presidential Decree Nr. 386, July 30, 2016.

[62] Taylor, 2011, p. 42.

nuclear, biological, and chemical attacks. They are organized as military personnel, wear uniforms, carry arms, and use military vehicles and aviation. Civil defense troops participated in a number of UN missions as well as humanitarian operations in Chechnya, South Ossetia, and, more recently eastern Ukraine and Syria.[63]

MChS role in military conflicts is mostly confined to delivering supplies and aid, sometimes without the permission from the host government. For example, MChS is reported to have delivered over 60 humanitarian convoys, some of them having more than 200 trucks, to Donbas over the past two years.[64]

MChS also has an important role in organization and coordination of the military forces for civil defense during wartime. A recent nationwide exercise to "rehearse radiation, chemical and biological protection of the personnel and population during emergencies at crucial and potentially dangerous facilities" involved 40 million civilians and 200,000 emergency personnel.[65]

Head of the MChS Sergey Shoigu became one of the most popular politicians in Russia and was rumored to be a candidate for Putin's heir.[66] Shoigu is currently serving as the Minister of Defense.

Private Security Firms and Paramilitary Groups

Two groups are of particular interest for this report: irregular "patriotic" paramilitaries (such as Cossacks) and private military companies because of their involvement in operations in Ukraine and Syria.

Cossacks and other armed "patriotic" groups became a potent weapon against domestic opposition.[67] They also accounted for a significant part of militias and vigilantes that contributed to the annexation of Crimea and the conflict in eastern Ukraine.[68]

Private military companies also became an important instrument of Russian foreign policy, even though Russian law bars mercenaries. Vladimir Putin supported the idea of legalizing private military companies that would act "as an instrument for the realization of national interests without the direct involvement of the state."[69] Sergei Lavrov echoed this statement, calling for legislation to "protect the interests of Russian citizens working for private military companies in foreign countries." Legislative progress has been slow, in part due to opposition from power ministries. Another point of contention is legislating the use of military equipment, including tanks and armored vehicles, employed by Russian private military companies.[70]

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63 "*MChS otpravilo v Donbass 64-ju gumanitarnuju kolonnu*" ["The Ministry of Emergency Situations Sent the 64th Humanitarian Column to Donbass"], *Interfax*, April 27, 2017. See also "*Ajeromobil'nyj gospital' MChS Rossii razvernut v Sirii*" ["Airmobile Hospital of EMERCOM of Russia Deployed in Syria"], *TASS*, December 5, 2016.

64 "Russia Escalates Tensions with Aid Convoy, Reported Firing of Artillery inside Ukraine," *Washington Post*, August 22, 2014.

65 "Large-Scale All-Russian Civil Defense Drill to Take Place from 4 to 7 October," *EMERCOM of Russia*, October 3, 2016.

66 "Russia's Sergei Shoigu—Master of Emergencies," *The Economist*, November 7, 2015.

67 "4 Things You Need to Know About the Cossacks Fighting Russia's Opposition Groups," *Washington Post*, May 18, 2016.

68 "Cossacks Emerge as a Potent Force in East Ukraine," *Financial Times*, June 13, 2014; "Armed Cossacks Flock to Crimea to Help Russian Annexation Bid," *Time*, March 12, 2014.

69 "*Putin podderzhal ideyu sozdaniya v Rossii chastnykh voennykh kompanii*" ["Putin Supported the Idea to Create Private Military Companies in Russia"], *Ria Novosti*, April 11, 2012.

70 "*ChVK v zakone: zachem Sergei Lavrov predlagaet legalizovat' 'soldat udachi'*" ["Legal PMCs: Why Sergei Lavrov wants to Legalize 'The Soldiers of Fortune'"], *Rbk.ru*, January 15, 2018.

Table L.2
Responsibilities and Operations of Russian Intelligence, Law Enforcement, and Security Services and Other Groups

	Political Security	Law Enforcement	Foreign Intelligence	Domestic Intelligence	Mobilization	Measures of Support	Cyber opps.	Ukraine	Syria
Federal Security Service (FSB)	●	❍	❍	●		●	●	❍	
Foreign Intelligence Service (SVR)	❍		●	❍		●	●	❍	❍
Rosgvardiya	●	●		❍	●	●	❍		
Federal Protection Service (FSO)	●	❍		❍			●		
Main Directorate for Special Programmes					●				
Ministry of Internal Affairs	❍	●	❍	❍			❍	❍	
Prosecutor General's Office (GP)	❍	●							
Investigative Committee (SK)	●	●							
MChS					●	❍		❍	❍
Paramilitary groups	❍					❍		❍	
Private military companies						❍		❍	❍

● Main role
❍ Subsidiary role

SOURCES: DIA, 2017; Galeotti, 2016a and 2016b; Kofman, et al., 2017; Connell and Vogler, 2017; RAND Arroyo Center analysis.

Recent media reports indicate that the Wagner private security company has been actively involved in Russian operations in Ukraine and Syria.[71] Contractors perform quasimilitary tasks while avoiding domestic concerns that come over troops casualties. Unlike most Western contractors, who are usually armed with light weapons, Wagner operatives in Syria are reportedly operating T-90 tanks and howitzers.[72]

In addition to paramilitaries and private security contractors, it is worth mentioning a large organized network of criminal organizations that operate in Russia and have an increasingly strong international presence and a massive domestic industry of private security firms. A number of recent studies suggest that Russian organized crime networks are connected with the intelligence services and may be used as agents of influence in Eastern Europe and beyond.[73]

[71] "Ghost Soldiers: The Russians Secretly Dying for the Kremlin in Syria," *Reuters*, November 3, 2016; "*'Slavjanskij korpus' vozvrashhaetsja v Siriju*," 2015; Mark Galeotti and J. Spyer, "Russia to Defend Core Syrian Government Areas," *Jane's Military Review*, September 22, 2015.

[72] "Up to Nine Russian Contractors Die in Syria, Experts Say," *Wall Street Journal*, December 18, 2015.

[73] Ledeneva, 2013; Mark Galeotti, "Crimintern: How the Kremlin Uses Russia's Criminal Networks in Europe," *European Council on Foreign Relations Policy Brief*, 2017a.

Internal Security Trends and Challenges

Military and Internal Security Spending

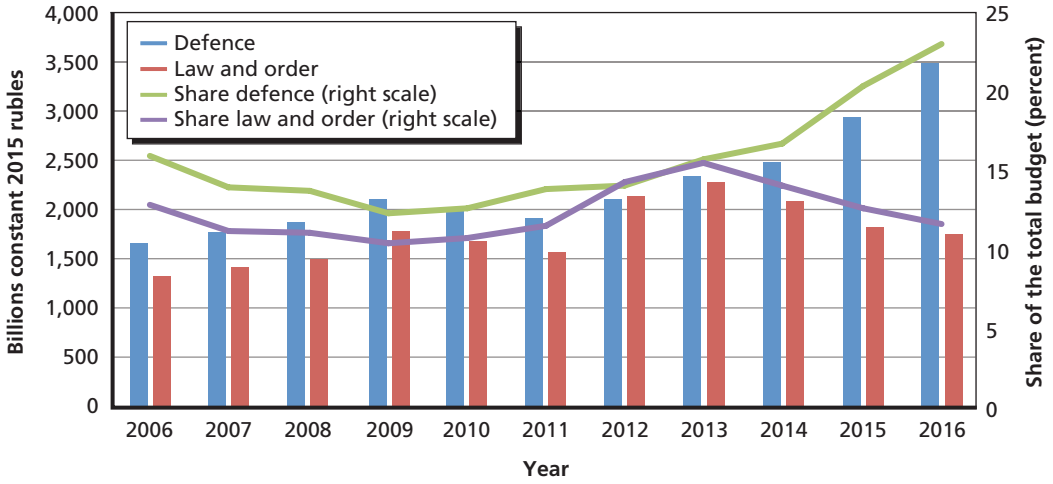
The share of expenditure on national security and law enforcement grew from 1.28 percent in 1999 to more than 2 percent in 2012–2014.[74] This increase was likely caused by terrorist attacks in 2010, fears of Arab Spring, and massive civil unrest after Putin's reelection in 2011. In recent years the government was forced to cut financing on domestic security due to declining oil prices and costly operations in Ukraine and Syria. Figure L.3 shows shares of budget expenditures and trends for defense and internal security.

The future growth dynamics of the domestic security sector will depend on the economic performance and the prevalence of external and internal security threats. Historically Russian government increased expenditures on domestic security during insurgencies in Caucasus region (especially Chechnya), terrorist attacks, and domestic civil unrest. Figure L.4 shows that the overall expenditure on defense and internal security has been growing in the past years and has reached 34.5 percent of the Russian budget. Absent a major uplift in the national economy, it would be hard to increase this share without cutting social spending. All other expenditures (education, health, etc.) account for less than a quarter of the budget and probably cannot provide significant opportunities to further shift resources to the security and defense sector. Therefore the competition for resources between different power agencies is likely to become more intense.

Personnel

Personnel from internal security services tend to receive higher wages and more privileges than personnel of military organizations. Therefore, it is reasonable to assume that there is a certain degree of competition for qualified personnel between the internal security services and

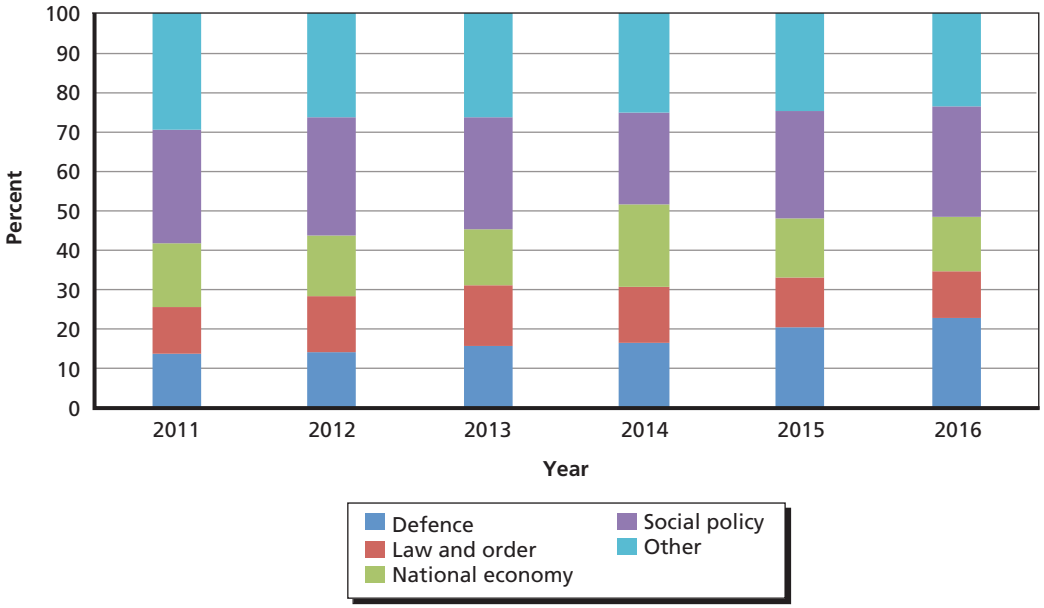
Figure L.3
Budget Expenditure on Defense and Internal Security (Constant 2015 Rubles)



SOURCE: Ministry of Finance, 2017; authors' calculations.

[74] These data account only for the open parts of Russia's budget. It is likely that a significant part of the "secret provisions" (18.7 percent of total budget expenditure) is also geared toward domestic security.

Figure L.4
Share of Budget Expenditure by Major Category



SOURCE: Ministry of Finance 2017; authors' calculations.

the armed forces, especially with respect to personnel qualified to serve in contract service or pursue a military career as an officer.[75]

In addition, several internal security services recruit officers directly from the armed forces. For example, FSB recruits Spetsnaz operatives from officers and sergeants from the regular armed forces as well as cadets from military academies. In this sense, FSB directly competes for personnel with the other armed services.

The troops from Rosgvardiya's special operations forces (OMON and SOBR) recruit only people who have already served in the army as conscripts for one year. Rosgvardiya does not directly compete with the military organizations for conscripts but potentially competes for the same young men who served as conscripts and are considering contract service.

The FSIN recruits men and women age 18 to 40 and provides its personnel a waiver from mandatory conscription. It is likely that FSIN competes with the armed forces for a fraction of new conscripts; however, it does not systematically hire military officers.

The Ministry of Internal Affairs also provides a conscription waiver to its employees. Anecdotal evidence suggests that many young men choose to enroll in institutions of higher education or choose a job in one of the internal security agencies to avoid draft and hazing in the military forces.[76] It is unclear how widespread this phenomenon is.

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[75] Average wages published by Rosstat and cited by *Rosbalt News*; "Rosstat: Salaries of Law Enforcement Agencies in the Russian Federation in 2014 Grew by a Quarter," *Rosbalt*, February 27, 2015. For example, the average wage of a Ministry of Internal Affairs employee is 110,000 rubles, while most contract officers get 30,000 to 40,000. Data on contract officers' wages is available from *Ministerstvo Oborony Rossiiskoi Federatsii*, "*Sotsial'nye garantii voennosluzhashchim po kontraktu*" ["Social Security of Contract Military Personnel"], undated.

[76] E. Braw, "Russians Dodge the Bullet: How Young Russian Men Avoid the Draft," *Foreign Affairs*, November 9, 2015.

Table L.3
Personnel of Select Agencies in 2005 and 2015 (in Thousands)

Agency	2005	2015	Percent Increase
Ministry of Internal Affairs	821,3	1003	+21
Court System and Prosecution Service	189.1	230.1	+21
Federal Prosecution Service	53.7	51	–5
Federal Immigration Service	28.2	37.3	+32
Ministry of Civil Defense (MChS)	350	371	+6
Ministry of Justice	340	365	+7
State Courier Service	4.2	4.7	+11.9
Federal Drug Control Service	33.7	40	+18.6
TOTAL	1,820.2	2,100.1	+15.37

SOURCES: Estimates by Center for Economic and Political Reform, "Threat of Terror: Do Security Agencies Need More Power and Money?" 2015, (in Russian); authors' calculations.

Employment in most government institutions related to national security increased by about 15.3 percent since the mid-2000s. Although personnel data for FSB and other security agencies is classified, it may be reasonable to assume similar growth rates. From 2005 to 2015 the Ministry of Internal Affairs increased from 821.3k employees to 1.03 million in 2015, equivalent to a 21 percent increase.[77]

Outlook

Russian internal security services are built on the doctrines and capabilities of the former Soviet Union. These agencies developed strong military components that have been instrumental in fighting internal insurgencies in the 2000s. More recently, internal security services have been incorporating asymmetric weapons such as cyber, propaganda, and other indirect actions as seen in Ukraine.

Russia has been relying on internal security services for political stability and has channeled significant resources to that purpose. As foreign military operations take a more prominent role in Russia's foreign policy, the competition for resources between internal security services and the armed forces will intensify.

While Moscow has been working on developing a more modern military force capable of regional (and perhaps global) power projection, the internal security services remained instrumental in recent military operations in Ukraine, and to some extent in Syria. The main capabilities of the internal security services include intelligence collection, propaganda and information campaigns, coordination of criminal and paramilitary groups, covert operations, cyber operations, and support operations during the active phase of military operations and/or insurgency.

It is likely that internal security services (FSB and Rosgvardiya in particular) will invest in modernizing and expanding their indirect action capabilities while maintaining strong military components.

[77] The discrepancy with data from the first section comes from a 10 percent cut in the Ministry of Internal Affairs personnel in 2016. There were no known cuts to the FSB.

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