UNITED STATES ARMY WAR COLLEGE PRESS
Carlisle Barracks, PA
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RUSSIAN BALLISTIC MISSILE DEFENSE: RHETORIC AND REALITY

Keir Giles

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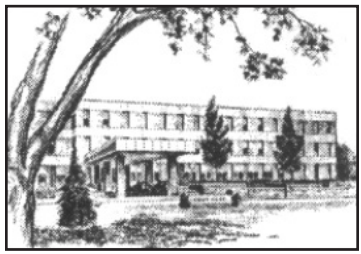

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June 2015

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This manuscript was funded by the U.S. Army War College External Research Associates Program. Information on this program is available on our website, *www.StrategicStudies Institute.army.mil*, at the Opportunities tab.

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The author wishes to thank Václav Trejbal of the University of Economics in Prague, Czech Republic, for research assistance with this monograph.

ISBN 1-58487-689-1

FOREWORD

The focus on Russian intervention in Ukraine in 2014-15 has obscured other areas of contention which previously were prominent and problematic in relations between the United States and Russia. One such area is the strenuous Russian objection to U.S. plans for ballistic missile defense, most recently in the form of the European Phased Adaptive Approach (EPAA).

At some point in the near future, the issue of missile defense will once more be on the table with Russia; whether as a result of a relaxation of tensions allowing renewed bilateral discussion of security issues, or indeed because of an immediate threat of Russian escalatory action in response to the United States rolling out missile defense capabilities. In either case, U.S. policymakers and negotiators need to be prepared and fully acquainted with the wide range of issues at stake.

In this respect, both the current monograph and its predecessor, *European Missile Defense and Russia*, provide an essential grounding in the Russian approach to missile defense, and crucially, to specific inconsistencies in Russian objections to U.S. plans. The Strategic Studies Institute therefore recommends both monographs to those both engaged with studying and managing Russia, and mitigating the adverse consequences of Russia's distinctive world view.

DOUGLAS C. LOVELACE, JR.
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KEIR GILES is the director of the Conflict Studies Research Centre (CSRC), a group of deep subject matter experts on Eurasian security formerly attached to the United Kingdom (UK) Ministry of Defence. Now operating in the private sector, CSRC provides in-depth analysis on a wide range of security issues affecting Russia and its relations with overseas partners. After beginning his career working with paramilitary aviation in Russia and Ukraine immediately following the fall of the Soviet Union, Mr. Giles joined the BBC Monitoring Service (BBCM) to report on political and military affairs in the former Soviet space. While still working for the BBCM, Mr. Giles also worked for CSRC at the UK Defence Academy where he wrote and briefed for UK and North Atlantic Treaty Organization (NATO) government agencies on a wide range of Russian defense and security issues.

He is the only double Associate Fellow of the Royal Institute of International Affairs (Chatham House) in London, UK, as well as a regular contributor to research projects on Russian security issues in both the UK and Europe. Mr. Giles's work has appeared in a wide range of academic and military publications across Europe and in the United States.

SUMMARY

Russia has made air and space defense, including ballistic missile defense (BMD), a top priority, while at the same time protesting vehemently against the deployment of U.S. missile defense technology in Europe, which Moscow claims upsets strategic stability and increases the danger of war. Russian declaratory policy provides U.S. policymakers with significant material to develop an approach intended to mitigate Russian obstructionism over European Phased Adaptive Approach (EPAA) and U.S. plans for BMD more broadly. Put simply, Russian complaints at the dangerous irresponsibility of the United States introducing new anti-missile capabilities ring hollow, when Russia is forging ahead with its own program to do precisely the same.

U.S. officials have repeatedly attempted to allay Russian concerns over the potential for EPAA and its predecessor systems to compromise Russian strategic deterrence. These attempts have foundered on Russian concerns, some of which appear disingenuous, but others of which are genuinely rooted in an entirely different Russian approach to the purpose and status of nuclear weapons. Despite the current hiatus in relations, opportunities for meaningful dialog with Russia on missile defense will arise again in the future. At that point, U.S. representatives should be fully informed on the scope and ambition of Russia's own missile defense programs. This will allow them not only to rebut some of the more facile Russian accusations, but also to counter some persistent Russian arguments relating to strategic balance.

In brief, discussion of Russian capabilities should be an integral part of future conversations with Rus-

sia on the deployment of U.S. and allied BMD assets. This monograph provides the necessary overview of Russian plans for missile defenses, and the rhetoric surrounding them.

RUSSIAN BALLISTIC MISSILE DEFENSE: RHETORIC AND REALITY

INTRODUCTION

While this monograph was being researched and written, Russian actions in Crimea and eastern Ukraine had brought U.S.-Russian relations to a new low in the post-Cold War era. Normal relations and conversations between the United States and Russia were apparently on hold during an unprecedented, and apparently intractable, crisis of European security.

But the longer view of relations between the two former superpowers shows precedents that suggest relations stand a strong chance of early recovery, despite Russia's hard line and unpalatable actions.[1] With or without this recovery, some persistent challenges to the relationship will remain; the state of relations will affect how these challenges are presented, rather than the underlying contradictions themselves. One of these challenges is ballistic missile defense (BMD), and its implications for nuclear deterrence.

For the past 7 years, plans for BMD capability in Europe have been a consistent sticking point in relations between the United States and Russia. In brief, Russia's strenuous opposition to these plans is based on claims, not all of them disingenuous, that this capability is intended to compromise Russia's nuclear deterrent capability.[2]

Yet, all discussion of the subject highlights the current and proposed U.S. deployments and entirely ignores Russia's own missile interception systems, which are claimed to have comparable capability. While Moscow continues to strengthen its armed forc-

es and seeks to reduce its capability gap with the United States, the perception of vulnerability leads Russia to invest heavily in strategic weapons and aerospace defense, including defense against both nuclear missiles and precision guided munitions.

Russia protests that U.S. SM-3 missiles pose a potential threat to strategic stability, and has made belligerent threats of direct military action to prevent their deployment. But no mention at all is made of the strategic implications of Russia's own S-400 and S-500 systems, despite the fact that if the performance and capabilities claimed for them by Russian sources are accurate, they pose at least as great a threat to deterrence as do SM-3s.

This monograph therefore aims to describe Russia's claims for its missile defense systems and, where possible, to assess the likelihood that these claims are true. This will form a basis for considering whether discussion of Russian capabilities should be an integral part of future conversations with Russia on the deployment of U.S. and allied BMD assets.

An assessment of this kind requires an essential caveat. Research for this monograph has been conducted from open sources in Russian and English, and unclassified discussion with knowledgeable individuals on both sides of the debate. As such, it has obvious limitations, especially in a field where the fine detail of capabilities and deployments is highly classified. In addition, the proliferation of designations used by Russia for systems still in development, and the confused and contradictory reporting of them in open source media, adds a further layer of obfuscation. In the words of one assessment—entitled, tellingly, "Experts Baffled by Profusion of Russian Missile Projects"—the resulting "linguistic labyrinth has been

further confused, perhaps deliberately, by a proliferation of new names in Russian reports."[3]

The descriptions of specific Russian projects in this monograph are therefore a synthesis of public declarations by Russia as carried in open sources, rather than an authoritative and verified systems handbook. Nonetheless their value is important, since responses to Russian claims for their missile defense systems must necessarily rely on public pronouncements.

RUSSIAN PRIORITIES

> Missile defense is an illusion—no matter how much money you invest in it.
>
> Dmitri Rogozin, Russian Deputy Prime Minister responsible for the military-industrial complex[4]

This first public pronouncement reflects a widespread view, both in Russia and elsewhere, that successful missile defense is both immensely expensive and technically not feasible. This reflects a long legacy of costly and mostly fruitless efforts by American and Soviet arms designers in the field.[5] But the view is at odds with current Russian defense policy, which is devoting considerable resources to aerospace defense as part of the current Russian rearmament program.[6]

The program to develop and deploy means of air and space defense is one of the largest components of the widely-reported State Armaments Program for the period up to 2020, and will receive approximately 20 percent of the program's total budget, which in absolute terms means around 3.4 trillion rubles (more than $100 billion).[7] Under the approved plan, space- and land-based missile attack early warning systems will be modernized and provided with new components;

a whole series of entirely new anti-aircraft and anti-missile weapon systems will be introduced; Moscow's ballistic missile defenses will be thoroughly overhauled; several new antimissile production plants will be built to handle huge procurement contracts; and a new integrated air and space defense command-and-control information system will be established.[8]

The irony lies in the fact that Moscow has made air and space defense, including BMD, a top priority, while at the same time protesting vehemently against the deployment of U.S. missile defense technology in Europe, which allegedly upsets strategic stability and increases the danger of war. In his 2012 pre-election treatise on defense policy and national security, Russian President Vladimir Putin ranked aerospace defense second in importance to Russia after the nuclear deterrent.[9] A year later, Chief of the General Staff (CGS) of the Russian Armed Forces Valery Gerasimov confirmed that priority in the development of Russia's armed forces through 2020 would continue to be given to the strategic nuclear forces and the air and space defense system.[10]

Although brought to the fore by Russia's new financial capabilities and emphasis on military regeneration, emphasis on missile defense is, in fact, not a novelty in the evolving Russian military doctrine. As a former high-ranking official in the Ronald Reagan administration put it: "The Kremlin, going back to Soviet days, has always believed missile defenses were not simply legitimate but necessary." Furthermore, the Russian military pursued the development and deployment of such weaponry without interruption "including and notwithstanding its obligations under the 1972 Anti-Ballistic Missile Treaty."[11]

The following sections discuss the organization of aerospace defense in Russia, Russia's current and planned BMD systems, the state of their manufacturers, and finally the rhetoric surrounding the development of missile defenses.

Russian Aerospace Defense Forces—Current and Future Shape.

The Russian Aerospace Defense Forces (VKO) were created in 2011 by a decree of former President Dmitry Medvedev[12] and ever since have been the subject of controversy. The birth pangs of the new organization perfectly reflect the circumstances surrounding the radical military reform launched by former Defense Minister Anatoliy Serdyukov and the former CGS General Nikolay Makarov in 2008.

According to a number of informed observers, the most striking feature of the overall reform effort has been the absence of a coherent definition of the precise purpose of Russia's military and threats it is supposed to counter.[13] In the course of the changes, which strove to reduce the number and size of various command structures and abolish unnecessary tiers of command, the air force lost the bureaucratic tussle for control over the VKO, which thus gained space to develop on its own. The decree establishing the VKO was issued at the end of 2011. But even at that time next to nothing was known about its content, the remit of the new armed service, or even the date of signature. It appears that senior Russian officers, even those who had given media interviews with confident predictions about the future shape of the VKO and who were later put in charge of a very different organization from the one they had described, were in all probability kept in the

dark until the final political decision had been made.[14] In late-2012, senior officers were explaining that the process of integration of VKO into Russia's command and control system was still ongoing, and while the new command was scheduled to take on its full duties in 2015, integration would continue through 2020.[15]

The Russian Ministry of Defense has now declared the main outlines of the new armed service. The core of the VKO consists of Air Force's surface-to-air missile (SAM) brigades in the Moscow region and the space forces. The latter, overseen by the Space Command, have seen very few changes in their organization. They include the Main Missile Attack Early Warning Center (SPRN) in Solnechnogorsk, the Main Space Surveillance Center (SKKP) in Noginsk, and the Main Trial Centre for Testing and Control of Space Assets.[16]

However, the VKO's air and missile defense component, under the umbrella of the Air and Missile Defense Command, looks curiously weak. The VKO took over SAM systems but not air defense aircraft, which are still assigned to the Military Districts and to the air force. The three air defense brigades assigned to Air and Missile Defense Command are supposed to protect Moscow and 26 administrative regions around the capital (the so called Central Industrial Region) which is home to 30 percent of Russia's population and lists 140 separate high-priority facilities.[17] This was a daunting task even for the predecessor of Air and Missile Defense Command, the Special Purpose Command, which had Su-27, MiG-29, and MiG-31 air defense regiments at its disposal. It is therefore difficult to perceive how VKO can fulfill its stated role as a stand-alone command. In an ideal scenario air force, missile defense, the SRPN and SKPP systems should cooperate (they even share a common catalog of tar-

gets with single designations), but, as one Russian defense analyst put it, "in practice such integration will be difficult to pull off."[18]

Meanwhile, the complexity of the VKO structure has been openly criticized, with growing calls for reorganization. Liberal military analysts Alexei Arbatov and General Vladimir Dvorkin decried their lack of "logical command structure and a unified information system" and, most importantly, the fact that their existence is not compatible with Russian "economic or military-technical capabilities."[19] Aleksandr Tarnayev, a member of the Russian State Duma Defense Committee, complained that due to insufficient funds, the VKO command could not fulfill its tasks. The General Staff, Tarnayev asserted, lacks the means to constantly monitor Russian airspace, since re-equipping the VKO with modern high technology assets is progressing too slowly. Furthermore, the former unified system of air defense in the country had broken into five parts: four air defense Military Districts and the VKO.[20] As part of his review of reform decisions made by his predecessor, in 2012 incoming CGS Gerasimov asked for "clarification" of the development of the VKO, including the manner of its creation and the number of mistakes and corrections needed.[21]

Protecting the important military and government infrastructure in the industrial heart of the country is not the only mission the VKO forces have been officially assigned. The Ministry of Defense lists other tasks:

- Providing command authorities with highly accurate information on detection of ballistic missile launches and prevention of missile attacks;

- Destruction of the ballistic missile warheads of the potential enemy in case of crucial governmental facilities being attacked;
- Defense of the major command control stations and governmental facilities, armed formations, the most important industrial and economic centers, and other installations against the enemy's joint air- and space-based strike weapons (SVKN) in the zone of probable damage;
- Monitoring space objects and identification of potential threats to the Russian Federation in space and from space and prevention of attacks as needed;
- Carrying out spacecraft launches and placing into orbit and controlling satellite systems, including integrated ones (intended to be used for both military and civilian purposes), in flight, and using specific ones to provide the Russian Federation Armed Forces with necessary data; and,
- Maintaining both military and integrated satellite systems with launching installations and assets of control in working order; and "a number of other tasks."[22]

These are clearly far beyond the current VKO capabilities. But objections to the VKO's current structure and purpose do not take into account the fact the extended process of integration into Russia's command and control system, which itself has undergone a significant overhaul over recent years.[23]

A clearer picture of the future shape and mission of the VKO was provided by Deputy Defense Minister Yuri Borisov and Major General Sergei Yagolnikov, Director of the Second Scientific and Research Insti-

tute of the Defense Ministry (responsible for air and space defense), in the spring of 2014. The VKO will be "modernized" over the next 6 years, they said, and its structure overhauled in 2015. Under the approved plan, the VKO will comprise four subdivisions. These will include a space- and ground-based intelligence-gathering and ballistic missile early warning system, an air and space defense command, a command-and-control structure, as well as a logistics support branch. Thus, the ministry plans to integrate the activities of all units responsible for conducting Russia's air and space defense into one branch. According to Borisov, investments in new arms systems and other military hardware for the new command should reach 2 trillion rubles ($55 billion) by 2020.[24]

The overhauled structure would be intended to integrate Russia's response to potential attacks into a single system of air and space defense. Emphasis would be put on enhancing the role played by radar in detecting airborne threats. The Defense Ministry is working on about 100 research and development projects for new VKO weapon systems, to be financed out of the 2 trillion rubles.[25]

Yagolnikov presented the principal philosophy behind the planned reform in a speech at the annual session of the influential Non-departmental Expert Council on VKO Problems on February 28, 2014, which was later republished by the authoritative military publication *Voyenno-promyshlennyy Kuryer* (VPK). Yagolnikov identified two possible approaches to the reorganization of Russian air and space defense. The first scenario assumed continuation of the build-up of the VKO with a unified command-and-control structure and an exclusive area of responsibility. The second scenario assumed merging the VKO and the

Air Force into a single armed service, and dividing operational and administrative functions between a new Air and Space Command and individual Military Districts. In order to assess the two options, Yagolnikov outlined three basic tasks of the VKO:

1. Contribution to strategic nuclear deterrence through early warning against decapitating and disarming nuclear attacks and through defending strategic command-and-control systems and strategic forces against such attacks;

2. Protection of Russian state boundaries in airspace, control over airspace, and cessation of attempts at its misuse; control over outer space; and,

3. Air and space defense of forces and installations in regional military conflicts.[26]

Reviewing the tasks individually by use of mathematical modeling, the Ministry of Defense came to the conclusion that the first option, a gradual build-up of the VKO, is best suited for their fulfillment.

The problems and challenges facing the VKO are complex and not limited to modernizing its structures and re-equipping its units with state-of-the-art systems such as the much vaunted S-500 air defense system. The challenges are also organizational and systemic, and extend to a lack of qualified personnel.[27] The timeframe and the outline of reorganization have been set. The eventual effectiveness of the new structure can be assessed after its results emerge.

Almaz-Antey.

The chaos and unpredictability surrounding the establishment of the VKO is mirrored in developments around the main airspace defense technology manu-

facturers. The company now known as Almaz-Antey originated in the merger of two prestigious defense manufacturers: Almaz, which produced long range air defense systems, and Antey, which dealt with short range and troop air defense. After a complex and controversial combining of the two entities, "Joint-Stock Company Almaz-Antey Aerospace Defense Concern" (*OAO Kontsern PVO Almaz-Antey*) was established by President Vladimir Putin in 2002 uniting no fewer than 46 enterprises, including factories, research and production organizations, design bureau, and research and development institutes involved in the development and manufacture of short-, medium-, and long-range air defense missile systems, radar surveillance systems, and automated control systems. This was part of a broader push to unite splintered pieces of the sprawling military-industrial complex, and other industries ravaged by underinvestment and lack of direction during the chaotic 1990s. In 2007, the company was enlarged and now includes around 50 enterprises in 17 Russian regions, employing over 94,000 people. The Russian state is the sole shareholder.[28]

Along with other "national champions" created by the Kremlin with the purpose of monopolizing the domestic market and attaining a competitive edge over global rivals, Almaz-Antey has performed extremely well. The group produces the whole range of Russian top-line anti-aircraft and anti-missile systems, including S-300PMU2 Favorit, S-300VM Antey 2500, S-400 Triumf, S-300 Rif-M (ship-based), 9K37 Buk, and 9K330 Tor. Approximately 90 percent of its revenues come from the defense sector, with half of the total made up by exports. In 2012, the company managed to increase its defense revenues by an impressive 62 percent to $5.7 billion, which placed it among the top 15 arms manufacturers worldwide.[29]

Yet not even a company the size of Almaz-Antey is able to produce advanced anti-aircraft systems on its own, and has to purchase hardware from various state-owned and private enterprises. This is especially the case for radar, communications, electronic warfare and electronic countermeasures technology. As part of his primary concern with airspace defense, President Putin has long sought to establish a horizontally integrated holding company, which would serve the interests of the VKO. One of the proposed solutions involved integrating Almaz-Antey into Rostec, a bloated conglomerate of more than 600 entities overseen by Sergey Chemezov, which includes radar manufacturer Vega and JSC Sozvezdiye, responsible for developing and producing electronic warfare and radio communications technology. The second proposal envisaged selling Almaz-Antey to the RTI group, which specializes in producing early warning radars (Voronezh for instance), space communications technology and control systems for anti-aircraft weaponry. In the end, Putin was content with neither solution. First, Rostec was considered cumbersome and ungovernable even by Russian standards; and, second, Almaz-Antey was regarded as too strategically important to pass to private hands, as RTI is majority-owned by AFK Sistema, a holding controlled by magnate Vladimir Yevtushenkov. A compromise was therefore found under which Almaz-Antey is to become the core of the VKO industry. It should absorb several independent subcontractors (mainly satellite manufacturer Kometa) and appoint Sergei Chemezov head of its supervisory board in order to ensure harmonized relations with Rostec.[30]

On July 16, 2014, the U.S. Department of Treasury placed Almaz-Antey on the Sectoral Sanctions Identification List, cutting it off from the American financial

system and potential American subcontractors or clients.[31] The EU imposed a similar set of sanctions on Almaz-Antey 2 weeks later, noting that the company makes missiles that have been used by pro-Russian groups to shoot down aircraft over eastern Ukraine.[32] According to the General Director of Almaz-Antey Yan Novikov, the sanctions will have no tangible impact on the company.[33]

New Hardware—Radars.

Commenting on the state of the Russian military-industrial complex, Igor Ashurbeyli, former chief designer of Almaz-Antey, used a medical metaphor, saying that the patient is "more alive than dead."[34] In each sector of the Russian defense industry, where export revenues were available, they allowed capacity and manpower to be retained during the long period of underfunding following the end of the Soviet Union. In the case of aerospace technology, which makes up by far the biggest share of Russia's arms exports, the patient is doing relatively well.

New hardware has recently been added in all important branches of aerospace defense. The early-warning systems for detecting incoming ballistic missiles or threats from space (SPRN and SKKP) consist of satellites and ground-based radar and observation sites. Since March 2012, four new satellites of the Oko system have provided Russia with practically permanent coverage of the continental United States, but they are unable to detect launches from other areas.[35] The ground-based early-warning radar chain is being modernized and relocated to Russia. The most important additions include three Voronezh-type radars, which became operational after long delays in

Lekhtusi (east of St. Petersburg) in 2012 and Armavir in 2013. As of June 2014, two additional radars of this class had begun initial operations: one in Mishelevka (near Irkutsk), one in Kaliningrad; and four others were under construction (Vorkuta, Barnaul, Orsk, and Yeniseysk).[36] Voronezh-class radars have an operational range of 6,000 kilometers (km) (3,728 miles). Compared to previous generation stations, they can be more quickly established and require a smaller crew to operate.[37] In keeping with the usual tenor of Russian claims for new systems, Deputy Defense Minister Yuriy Borisov said "no one else can match these stations."[38] It was the Voronezh radar in Armavir, which in 2013 detected a launch of two ballistic missiles in the Mediterranean Sea, which later turned out to be part of Israel's test of its missile defense shield.[39]

Russia has also begun testing a new radar designed to detect highly maneuverable aerial targets, including cruise missiles and unmanned aerial vehicles, at a range of up to 3,000-km (over 1,800 miles), allowing it to cover most of Europe. The new-generation over-the-horizon radar, dubbed Container, was put on trial duty near the town of Kovylkino southeast of Moscow in December 2013. According to Defense Minister Sergei Shoigu, Container will allow Russia to expand its monitoring range and control over the situation "to the west" and should be fully operational by the end of 2015.[40] According to Russian CGS Valery Gerasimov, the completed airspace defense system will ensure guaranteed detection of enemy ballistic and long-range cruise missiles at launch.[41]

Russian Designation	NATO Designation
S-300P/PT	SA-10A Grumble A
S-300PS	SA-10B Grumble B
S-300PM/PMU	SA-10C Grumble C
S-300V	SA-12A/B Gladiator / Giant
S-300PMU1	SA-20 Gargoyle A
S-300PMU2 Favorit	SA-20 Gargoyle B
S-300VM/Antey-2500	SA-23A/B Gladiator / Giant
S-400 Triumf	SA-21 Growler A
S-500 Triumfator	

Table 1. New Hardware - Missile Systems.

S-400 Triumf.

The most significant upgrade of the VKO air and space defense component currently under way is the introduction into service of S-400 systems produced by Almaz-Antey. The S-400 Triumf (North Atlantic Treaty Organization [NATO] designation SA-21 Growler) is in fact the most recent operational upgrade of the extensive S-300 SAM family. The antiballistic missile capabilities of the older versions were comparable to those of the American PAC-1 and PAC-2 Patriot series.[42] In the case of the S-400, however, analysts largely agree that the system "in many respects is more capable than the U.S. Patriot series and offers mobility and performance and thus survivability much better than that of Patriot."[43] The main distinctions between the S-400 and its predecessors lie in the refinements to the radar, software (thanks to Russia's post-Cold War large-scale access to Western technology markets, and Western computational technology) and several new

missile types. As a result, the S-400 can be armed with flexible mixes of missiles designed to counter a range of different targets, providing a truly multilayered defense capability.

The S-400 is equipped with sophisticated electronic warfare systems. Hence, jamming of the S-400s acquisition and engagement radars will prove challenging, because they employ countermeasures such as rapid frequency-hopping and agile beam-steering. The S-400 also employs new methods that reportedly have shown some ability to detect stealth aircraft. Among the most potent is the use of new radar systems such as the Nebo-M, which employ a combination of sophisticated radar systems designed to track and engage stealth aircraft at tactically meaningful distances.[44]

Like the Patriot SAM system, the S-400 has been designed to counter a wide range of airborne and airspace targets, not only ballistic missiles, and until now the main concerns over its potency have been focused on manned aircraft.[45] For the interception of ballistic targets, it uses the 48N6 and 9M96 families of long- and medium-range missiles with a maximum range of up to 250-km.[46] That is comparable to the U.S. Terminal High Altitude Area Defense (THAAD) system, designed solely for missile defense. THAAD is intended to shoot down short-, medium- and intermediate-range ballistic missiles, although owing to a different design philosophy, the maximum THAAD operating altitude (around 150-km) is significantly higher than that of its Russian rival.[47] The 48N6 missile is reportedly suited for destroying medium-range ballistic missiles with a maximum range of 3,500-km flying at 4,800 meters per second, at a distance of 5 to 60 km and an altitude of 2 to 27 km. The warhead is able not only

to deflect the incoming ballistic missile but also effectively destroy it.[48] In the case of the better-known and extremely maneuverable 9M96 missile, the producer claims an 80 percent hit probability against a ballistic missile and a 70 percent kill probability against a particular part of a ballistic missile (i.e., warhead).[49]

Very few details, except for vague declarations by military officials, are known about the ultra-long-range 40N6 missile, which is supposed to have a range of up to 400-km.[50] It is not known whether a one-stage or a two-stage rocket will carry its warhead, and there are some doubts about its maneuverability due to its size.[51] Some estimates[52] allege a maximum speed of 4,800 meters per second, which would slightly overmatch the performance of the U.S. SM-3 Block IIA missile, to be rolled out in 2018 at earliest in Phase 3 of the European Phased Adaptive Approach (EPAA).[53] The 40N6 missile supposedly passed all trials in July 2012, and according to Major General Andrei Dyomin, the Chief of Staff of the Air and Missile Defense Command, was supposed to enter service "soon" afterwards.[54] Military analysts are less optimistic and estimate the 40N6 will not be deployed before 2015.[55] The sole supplier of missiles for the S-400 system is Moscow-based manufacturer MMZ Avangard, which is part of Almaz-Antey. In its latest available annual report for 2012, the company stated that it was finishing work on starting serial production of the 40N6 missile.[56] No information on its performance or commissioning has been released since. The situation was pointedly summarized in June 2014 by Russian defense expert Aleksandr Stepanov:

> Although official sources have repeatedly stated that the testing of new long-range missiles is completed

and that it will be adopted in the near future, on the sidelines they are saying the opposite.[57]

The VKO forces around Moscow have command of three S-400 regiments (in Elektrostal, Dimitrov, and Zvenigorod), which means six battalions in total, with eight launchers per battalion.[58] Furthermore, one additional regiment should be put under the VKO command by the end of 2014, concluding the first phase of the VKO rearmament.[59] Not all S-400 deployments, however, have ended up in VKO hands. During the 2009–12 time frame, most new deliveries went far away from the capital, apparently under the influence of the air force.[60] Priority was given to potential areas of vulnerability in the vicinity of Russian borders. As early as 2009, one battalion was reportedly deployed in the Far East near Nakhodka to counter the potential threat posed by North Korea's missile tests.[61] A whole regiment was permanently stationed there in August 2012.[62] More surprisingly, the Pacific Fleet should receive an unspecified number of additional S-400 units "for the protection of Kamchatka" by the end of 2014.[63] The second border destination of Russia's most advanced anti-aircraft and anti-missile system was Kaliningrad where the first battalion under the aegis of the Baltic Fleet was commissioned in April 2012.[64] Finally, one S-400 regiment was stationed in the Southern Military District near Novorossiysk at the end of 2012, this time with the Air Force.[65] All in all, out of seven regiments received by the armed forces by the end of 2013, only three have been given to the VKO, with one additional regiment promised by the end of 2014.

According to the 2020 State Armament Program, plans are to produce and deploy a total of 56 S-400 battalions, which translates into approximately 450

launchers.[66] This will be a demanding task for the defense industry. In order to accomplish it, 21 additional regiments will have to be produced in the course of the next 7 years, meaning three regiments per year. Representatives of the S-400 manufacturer, Almaz-Antey, assessed the current production capacities at two to three regiments a year.[67]

In the past, Almaz has experienced difficulty completing the state defense order for supply of S-400 systems. This, at least according to the official version, was what led to the surprise firing of Almaz chief designer Igor Ashurbeyli in February 2011.[68] Lately, the company has been investing in new facilities. In May 2014, production started at a new building for S-300/S-400 assembly at Almaz-Antey's North-Western Regional Centre in St. Petersburg, with first batches planned to roll out by the end of 2014.[69] But at the moment, it is safe to assume, as Almaz-Antey's then-General Director Vladislav Menshchikov confirmed in 2012, that the State Arms Program 2011–20 exceeds the company's existing capacity.[70]

Export to China.

In March 2014, the usually well-informed daily *Kommersant* reported that President Vladimir Putin had agreed "in principle" to the sale of S-400 systems to China. Talks are now being held on the number of systems and their cost, but even if specific agreements are reached, the Chinese armed forces will not be able to receive the complexes "earlier than 2016."[71] Given the apparently stretched production capacities of Almaz-Antey, this still seems to be an optimistic estimate.

China's desire to acquire an unnamed number of S-400 battalions was reported unofficially for the first

time in 2011. However, the Russian military predictably asserted that first they have to receive a sufficient number of the S-400 systems in their own inventory before the complex would be exported. Another objection was raised by Russia's security services, which feared (quite justifiably) that the Chinese intended to copy the necessary technical elements of the system to create their own air defense weaponry on this basis.

Supposedly, these problems have been resolved. An agreement between Russia and China on intellectual property rights in the arms trade has entered in force. According to *Kommersant* information, the delivery to China of two to four Triumf battalions is now being discussed, and the client's main desire is to obtain complete information on the specifications and performance characteristics of the new complex.[72]

Defense experts are skeptical about the deal coming through until the requirements of the VKO and the air force are met. Even if the sale eventually takes place, it will certainly not include the newest long-range interceptors.[73] The last Chinese-Russian contract involving advanced air defense systems was sealed in 2007. Under the terms of that contract, the Chinese armed forces received 15 S-300PMU2 battalions, which were supplied to protect the largest cities such as Beijing and Shanghai. The development of the S-300PMU2 Favorit (NATO designation SA-20B Gargoyle), which was the last of the S-300P variants to carry the S-300P designation, was completed in 1997.[74]

The uncertain timeframe of the S-400 sale was confirmed by Sergey Ivanov, the Chief of Staff of the Russian Presidential Administration, and until 2007 Russia's first civilian defense minister. In July 2014, he remarked that if a contract were to be signed for China to buy the system, it would still take a number

of years for the deal to be completed. Several other countries including Egypt, Kazakhstan, Belarus, Vietnam, Armenia, Saudi Arabia, Turkey, and Serbia have also expressed interest in purchasing the system.[75]

S-500 Triumfator M.

When the first reliable news about the development of the fifth-generation air defense system surfaced in 2009, the S-500 Triumfator M (sometimes also designated as Prometheus) was supposed to be introduced in 2012.[76] The latest projections by the Russian military and Almaz-Antey experts presume that system development will be completed in 2015, with the first battalion to be deployed a year later.[77] This still seems to be a very optimistic estimate, given the fact that the S-400 experienced a 7-year delay in development.[78]

In contrast to the S-400, whose primary purpose was air defense, the S-500 is intended to be a full-fledged anti-ballistic missile (ABM) system.[79] Rather than succeeding the S-400, it is intended to work in conjunction with it. While the S-400 is designed to defend against short- and medium-range missiles, the S-500 is designed to combat intercontinental ballistic missiles (ICBMs).[80] In 2012, the system had completed the technical design phase and the estimated timeframe for its deployment was reported to be 2015–18.[81]

The exact specifications of the new airspace defense system remain classified, and the most detailed comment to date on the design philosophy and implementation have been observations made by Russian defense and industry officials in interviews. According to them, the S-500 is derived from the existing S-400 Triumf, but reduced in dimensions and more power-efficient. The choice of vehicles intended to

carry the S-500 launchers, radars, command posts, and other electronic equipment suggests a highly mobile and survivable system, built for "hide, shoot and scoot" operations.[82]

Designed to intercept ballistic missiles at a height of up to 200 kilometers and a maximum range of 600 kilometers, the system is expected to be able to shoot down up to ten incoming ballistic missiles simultaneously. It also has an extended radar range compared to the S-400.[83] Russia's Air Force Commander-in-Chief Lieutenant General Viktor Bondarev claimed that the S-500 will also have a response time of about three to four seconds, which is considerably shorter than the S-400, which is rated at nine to ten seconds.[84]

New S-500 Missiles.

What remains a source of speculation, however, is the kind of interception the S-500 missiles will use. One option is a nuclear blast because it can destroy "the entire cloud of incoming warheads with no need to determine true threats from dummies."[85] Most of the missiles in the S-300 and S-400 systems use high-explosive fragmentation warheads. Russia, however, is working on two new missiles that have been designed for the S-500 (and the S-400): the 77N6-N and the 77N6-N1. They will be the first Russian missiles with inert warheads, which can destroy nuclear warheads by hitting them with precision at hypersonic speed (7-km per second).[86] This would far outmatch even the American SM-3 block IIA missile, which is also currently under development and is to be deployed from 2018 onwards. The Block II has a projected maximum speed of roughly 4.5-km per second and enhanced capability to address interme-

diate-range ballistic missiles (IRBMs) and a limited capability to address ICBMs.[87] However, it is not clear when the 77N6-N and the 77N6-N1 may enter service, given that facilities for their production are still in construction.[88]

Initially, two large factories in Kirov and Nizhniy Novgorod, the cost of which was estimated at 81 billion rubles, were supposed to start production of 77N6N and 77N6-N1 missiles "at the beginning of 2014."[89] Latest reports suggest that the Kirov facility should begin production at the end of 2015, with full capacity utilization available in 2017.[90] The Nizhniy Novgorod facility should be finished in 2016 and employ 3,500 people.[91] Given these time frames, it is doubtful that the new generation hypersonic missiles will enter service any time soon.

The absence of more advanced missiles in general is one of the major obstacles to fully equipping the VKO with modern systems. The missile shortage worsened after the production of the old S-300 was stopped completely, even for exports.[92] This has also reflected workforce aging and the low replacement rates of production equipment. In 2008, Almaz-Antey agreed with the Defense Ministry on a plan for the company's modernization, but, due to the financial crisis, those intentions never materialized. It took an intensive campaign calling for overhaul and refurbishment to induce the presidential administration to act. In February 2012, President Putin signed a Federal Targeted Program for the development of the defense industry to 2020, under which three trillion rubles were promised to the military-industrial complex for the modernization of its production facilities.[93]

Bottlenecks in missile production could cause further delay in the introduction of the S-500. The S-400 is already in operation and, therefore, any further delays

in 40N6 missile production will set upgrades back still further. Unlike the S-400, the S-500 cannot employ missiles used in the S-300 family, which means that the range of the missiles suitable for the system is severely limited.[94] There are already signs that additional delays are to be expected. At first, the State Armament Program 2011-20 projected purchases of 10 battalions of the S-500.[95] At the end of 2013, the Commander of the VKO expected five batteries to be delivered by 2020, with first batches arriving in "several years."[96]

The results of throwing more money at the defense industry remain to be seen. As defense analyst Aleksandr Konovalov put it:

> The country's leadership looks at the defense sector like a Coke machine. Put money in and get a bottle. Nothing is that simple with the domestic military-industrial complex, and investing a lot of money doesn't guarantee getting production precisely on time. And the discussion about the S-500 is questionable; it's possible it doesn't even exist in drawings.[97]

Whether or not the system really exists and regardless of what its real capabilities are if it does, Russian senior officers are publicly confident about its performance, especially vis-à-vis American competitors. Thus, the former Commander of the VKO, Colonel General Oleg Ostapenko, claimed in 2012 that "the S-500 will be better than any similar U.S. system. The Americans have so far only hyped them up in the electronic media, but we already in effect have a real missile." Declining to give the specifications and performance characteristics of the missile for the S-500, he said "until it flies, we do not talk about these things."[98]

Missile (Russian)	System (Russian)	System (NATO)	Missile Max Speed (m/s)	Altitude (min) (m)	Altitude (max) (m)	Range (min) (km)	Range (max) (km)	Missile weight (kg)	Warhead weight (kg)	IOC
5V55K	S-300PT	SA-10A	2000				47	1480-1500	133	
5V55R	S-300PS/PMU	SA-10B	2000	25	25000		75	1665	196	1985
9M82	S-300V	SA-12B	1800		30000		100	5800	150	1988
9M83	S-300V	SA-12A	1800				75	5800	150	1988
48N6	S-300PM/PMU1	SA-20A					150	1800-1900	143	
48N6E	S-300PM/PMU1	SA-20A	2100				150			1990
48N6E2	S-300PMU2	SA-20B	2100				200	1835	180	1999
48N6E3/DM	S-400	SA-21	2100				250	1835	180	2009
9M82M	S-300VM	SA-23B	2600		30000		200	5800	150	2011
9M83M	S-300VM	SA-23A	1700				75			2011
9M96E	S-400	SA-21		5	20000	1	40			
9M96E2	S-400	SA-21	-	5	30000	1	120			2011-2012
40N6E	S-400	SA-21	TBD				450			2011-2012
55R6M	S-500									

Note: The data have been collated from a range of open sources and should therefore be treated as indicative of Russian claims rather than definitively accurate.

Table 2. Area Defense SAM Parameters.

At Sea.

Russia is also working on naval versions of the S-400 and S-500, but their deployment seems also to be unlikely in the near future. According to a source from the military-industrial complex, the S-400F, the naval version of the S-400, was "practically ready" in 2012, but no information about its commissioning has yet appeared in open sources.[99] The carriers of the systems were supposed to be the three mothballed nuclear-powered Kirov-class missile cruisers (the *Admiral Nakhimov*, *Admiral Lazarev*, and *Admiral Ushakov*), with 2020 given as the year of their reintroduction into service.[100]

After years of delays, the refit of the *Admiral Nakhimov* finally began at the beginning of 2014. The cruiser will be equipped with P-800 Oniks (SS-N-26) supersonic anti-ship cruise missiles, and the S-400 Triumf, along with other weapon systems designed to shoot down missiles and aircraft approaching the ship. The refit should be completed in 2018.[101] The other missile cruisers, including the *Pyotr Velikiy*, the only Kirov-class ship active in service, are expected to be modernized as well, but no timeframes have been announced.

In March 2013, the Navy reportedly decided to heavily modernize antisubmarine ships of the Project 1155 Fregat (NATO codename Udaloy) class and equip them with the Redut air defense system with interceptors from the S-400. A representative from the Northern Shipyards design bureau, which built the Project 1155 vessels and is among the front runners in the competition for modernization of Project 1155, said that:

> the first modernized big antisubmarine ship will appear not earlier than in 2016: development of the lead

project will take about 18 months. After that the technical project of modernization will be retrofitted for 2 to 4 years more.[102]

In February 2013, the Russian Navy approved a preliminary design for the largest naval ship to be built since 1989. According to the newspaper, *Izvestia*, the new ship will be armed with anti-ship missiles, cruise missiles, air defense and ballistic defense systems, including the S-500. However, no final decision about its construction has been made, and it will take 2 to 3 years just to prepare technical documentation.[103] Finally, the official designation for the naval version of the S-500 does not appear to have been made known publicly.

Moscow Defense System.

Meanwhile, the A-135 Moscow missile defense system, which is also part of the VKO and became operational in 1989, is being modernized under the Samolet-M program. Originally, the A-135 was deployed with two types of missiles capable of countering ballistic targets: the shorter-range 53T6 (NATO designation Gazelle) endo-atmospheric interceptor and the giant 51T6 (Gorgon) exo-atmospheric interceptor with a 350-km range.[104] Both were silo-launched and used 10 kiloton nuclear warheads to destroy their targets. Between 2005 and 2007, the 51T6 missiles were decommissioned. Among the probable reasons were the drawbacks of nuclear interception and the approaching end of the interceptors' service life. This has left the remaining 68 53T6 missiles as the sole operational interceptors of the A-135 system.[105] In 2007, financing for the project increased sharply. According to some sources, the missiles have had their nuclear warheads

replaced with conventional explosives.[106] Gazelles are regularly tested to prolong their permitted service lives, with the last known launch taking place in 2012.[107] In 2013, the command center and the powerful radar assigned to the A-135 system underwent software upgrades.[108]

Designation (Russian)	Designation (NATO)	Missile Max Speed (m/s)	Apogee (km)	Missile weight (kg)	Warhead
51T6	SH-11 Gorgon		350	33,000	Nuclear
53T6	SH-08 Gazelle	5500	80	9693	HE (previously nuclear)

Table 3. Silo-Based Missiles.

Gazelle has a maximum range of 60-km and is capable of intercepting targets at an altitude between 10 and 40-km. It can reach a speed of 5-km per second.[109] VKO officers have enthusiastically praised the supposed high effectiveness of the A-135. According to Major General Andrei Dyomin, the Chief of Staff of the Air and Missile Defense Command, ballistic and air defense systems around the capital "can destroy 90% of targets in the event of a potential massive aerospace attack. This figure stands at 60% for the Central Industrial Region."[110] However, Dyomin did not elaborate on what a "massive aerospace attack" means and which part of it the A-135 is supposed to counter. Former Chief of the Strategic Missile Troops Main Staff Colonel General Viktor Yesin, noted since retirement for his off-message commentary, offered a more reserved estimate. According to him, the Moscow system, "once it has been made fully ready, can at best destroy several dozen intercontinental warheads targeting its coverage area."[111] Critics point to a lack of combat readiness, as the 53T6 nuclear warheads are believed to be stored separately from their deliv-

ery vehicles. Reportedly, the warheads are mounted together only during the time of "serious military threat."[112] This "scandalous revelation, which according to some accounts bordered on treason," was first made by none other than former General Director of Almaz-Antey Igor Ashurbeyli.[113] As one Russian defense analyst put it, "even back in Soviet times, the system's capability was so limited as to be unsuitable for defending against any serious strikes. At best it could cope with a few single ballistic missiles."[114]

It remains to be seen what additional capabilities the A-235 Samolet-M modernization program will bring. According to latest available reports, the A-235, just like its predecessor, was designed and developed by the Novator company in Yekaterinburg. It is intended to be a fixed land-based ballistic missile defense system and its new interceptors, upgraded 53T6 missiles with conventional as well as nuclear warheads, will probably utilize the presently mothballed 51T6 (Gorgon) silos. It should have a range of up to 100-km and an altitude of up to 30-km and should be able to counter "the fastest ICBMs currently in service."[115] The system will feature Russia's first anti-missile to employ hit-to-kill technology, which will in all probability be its biggest limiting factor. Reservations about the high-precision, high-altitude kinetic intercept were expressed most prominently by Aleksandr Konovalov, the President of the Institute of Strategic Estimates, who stated that "it is doubtful that the designers of Novator have achieved such a remarkable result in the stratosphere."[116] That may well be true. Russia began work on the A-235 in 1997, and in 2011 the first test launches were conducted. The system should by now have become operational, but there appears to have been no mention of it in open sources since 2012.

Prioritizing Missile Defense.

Despite doubts over the delivery of actual capability, it is clear that Russia devotes significant attention and considerable resources to ballistic missile defense. Both the General Staff and the Kremlin consider capabilities in this branch indispensable for countering current and future threats. CGS Gerasimov stated in 2013 that the center of gravity of combat operations is shifting from the spheres of land and sea to the aerospace and information spheres, and that it is impossible to safeguard national security without a reliable defense shield.[117]

Regional threats are important. Despite public rhetoric, Russia is well aware of, and worried about, the growing number of deployed ballistic missiles and nations operating them, all of them dangerously close to Russian borders. The most important proliferators include China and North Korea, with Pakistan, India, and Iran also possessing significant arsenals of theater-range ballistic missiles. Iran and North Korea are actively developing ballistic missiles with strategic reach. Due to its massive size, much of Russia's territory is well within the reach of IRBMs and ICBMs launched from Iran, North Korea, and especially China.[118] While Russia is not antagonistic toward any of these countries, it could be painfully vulnerable in any contingency. Sergey Ivanov touched upon the issue in May 2013:

> We are surrounded by a raging sea of threats and problems. These are Muslim fundamentalism, North Korea's nuclear device, for sure, and also we have Iran that is developing its missile technology. I am not saying that they are our enemies, but we must take this all into consideration.[119]

He then pointed out a key difference in American and Russian threat perceptions regarding IRBMs: "They cannot reach America, but they can very well reach us."[120]

Another important factor contributing to Russia's emphasis on BMD derives from the militarized nature of the Russian economy and society as a whole. Over the course of history, the country has developed an image of great-power status and prestige, which rests largely on its defense capabilities. The military-industrial complex is supposed to be both a source of pride and, notionally, an engine of progress, as described by President Putin in his pre-election treatise on national security:

> Sometimes they say the revival of the defense industry is a yoke for the economy, an extremely heavy burden that ruined the Soviet Union. I am convinced that is a profound mistake. . . . The renewal of the military-industrial complex will become a locomotive that will pull the development of various industries: metallurgy, mechanical engineering, the chemical and radio-electronic industries, the entire [information technology] and telecommunications range. . . . The task is to multiply Russia's economic power, create an army and military-industrial complex that will secure Russia's sovereignty, the respect of our foreign partners and lasting peace.[121]

In addition, arms manufacturing is one of the few industries in which Russia continues to demonstrate a level of success far surpassing its civilian industrial and technological achievements, and is able to compete in foreign markets. Russia has managed to maintain its position as the number two exporter of arms to the world. According to Centre for Analysis of Strategies and Technologies (CAST), the most successful

businesses in the sector are aerospace and air defense companies.[122] As the story with the Russian contract to deliver five battalions of the S-300 to Iran among others shows, arms exports in Russia's case represent a powerful instrument of foreign policy.

In terms of national pride, it is remarkable how regularly Russian officials present new weapon systems as the most sophisticated and capable in the world, and how particular comparisons are drawn with American rivals. Thus, Igor Ashurbeyli, the designer of Russia's most advanced air defense weapons, describes their potential as if the arms race had never ended: "We are not overtaking someone, we are not lagging behind, and on the contrary, they [the United States] are attempting to overtake us."[123] The tone becomes patronizing when comparing the S-400 and S-300 family with the Patriot systems: "Yes, they have followed our path, but let's put it this way, they haven't got so far."[124]

In common with the almost mythic status of Russia's nuclear deterrent,[125] the importance of Russia's air defense arsenal has over time become psychological.[126] In order to retain its self-perceived great-power status, Russia needs capabilities, which can be portrayed as state-of-the-art, which in missile defense translates into the most sophisticated systems capable of destroying both IRBMs and ICBMs.

This explains why recent Russian efforts in improving missile defense capabilities have only partly depended on developments and progress in similar U.S. efforts. Thus, in 2011, the heyday of the Russo-American reset, Russia's Deputy Prime Minister Dmitry Rogozin stated that Russia will build its national missile defense system "irrespective of what its Western partners will be doing in this field." He conceded

that Russia was "somewhat behind the U.S. in missile defense," but added that serious efforts had been made in recent years to restore Russia's parity in this area.[127]

Parity with the United States brings us to the most serious threat Russian missile defense is supposed to counter, other than irrelevance in the international arena; this is vulnerability to U.S. offensive potential. Russia views specific actions by the United States and NATO as threats to its security, and the establishment of a missile defense shield in Europe is at the top of the list. The Russian position was expressed by Vladimir Kozin, a member of an interagency working group attached to the Russian presidential administration discussing missile defense issues with NATO, and a leading researcher with the Russian Institute of Strategic Studies: "The only purpose of the U.S. missile defense equipment deployed in Europe is to destroy Russian intercontinental ballistic missiles."[128]

Also, the Russian military has sometimes described the expansion of the VKO capabilities as a response to U.S. and NATO plans to establish missile defense infrastructure in Eastern Europe. Hence the oblique reference of Lieutenant General Oleg Ostapenko, former Commander-in-Chief of the VKO, who said the new Voronezh early warning radars represent "elements of the nuclear deterrence system. It is only natural that each new radar put into duty is an additional reason for the concerned parties [the U.S. and NATO] to think about their actions."[129]

In the context of the limited plans for deployment of U.S. anti-missile systems, there have been doubts as to whether Russia's senior leaders really view U.S. missile defense plans with such deep anxiety. But the official rhetoric has been consistent. President Putin

openly described the annexation of Crimea as a preemptive step to foil NATO plans for missile defense in the Black Sea.

> I'll use this opportunity to say a few words about our talks on missile defense. This issue is no less, and probably even more important, than NATO's eastward expansion. Incidentally, our decision on Crimea was partially prompted by this.
>
> Needless to say, first and foremost we wanted to support the residents of Crimea, but we also followed certain logic: If we don't do anything, Ukraine will be drawn into NATO sometime in the future. We'll be told: 'This doesn't concern you,' and NATO ships will dock in Sevastopol, the city of Russia's naval glory.
>
> But it isn't even the emotional side of the issue. The point is that Crimea protrudes into the Black Sea, being in its center, as it were. However, in military terms, it doesn't have the importance it used to have in the 18th and 19th centuries—I'm referring to modern strike forces, including coastal ones.
>
> But if NATO troops walk in, they will immediately deploy these forces there. Such a move would be geopolitically sensitive for us because, in this case, Russia would be practically ousted from the Black Sea area. We'd be left with just a small coastline of 450 or 600 kilometers, and that's it![130]

Needless to say, the NATO ships in Sevastopol would include those equipped with SM-3 missiles and the ground forces would be "immediately" deployed with other pieces of missile defense infrastructure, including powerful radars. Russia believes the U.S. missile defense shield is "not a defensive system, but part of the offensive potential deployed far away from

home."[131] The development of Russia's missile defense capabilities is aimed at countering this offensive potential, if nothing else, by dissuading the adversary from believing a massive surprise attack could be successful.

In assessing security threats, Russia has always placed greater emphasis on capabilities than on intentions. Thus, any country possessing capabilities that the Russian military cannot counter represents an alarming threat. In addition, Russian officials themselves ascribe this line of reasoning to their American counterparts. State Duma Deputy and Defense Committee Member Aleksandr Tarnayev, who also happens to be a former communications officer and KGB military counterintelligence operative, wrote for bimonthly defense-industrial journal *Vozdushno-Kosmicheskaya Oborona*:

> In politics agreements are observed as long as they are favorable to the strong side. There is no other such country in the world except Russia with the potential of ensuring guaranteed destruction of the United States. That is why the Americans are preparing to fight specifically against us. They have clearly written in corresponding documents that we are their Enemy No 1, and not partners, friends, or comrades.[132]

Devising weapon systems capable of countering the American threat, therefore, is only natural as the Russian side always expects the worst from other countries. The fact that the expansion of the VKO is to a large extent aimed at countering the U.S. offensive potential was confirmed by the Russian president himself. When visiting one of the facilities for manufacturing air defense missiles in June 2013, he observed: "Effective airspace defense is the guarantee

of strategic nuclear deterrent forces' survivability and our country's protection against attacks by the airspace systems."[133] The reference to the United States is clear: only the United States is capable of threatening the survivability of Russia's strategic nuclear forces and no other country possesses offensive airspace systems.

But a closer examination of Russian declarations on strategic deterrence reveals additional complexities. In his 2012 pre-election campaign article, President Putin wrote:

> We can guarantee against upsetting the global balance of power either by creating our own very expensive and as yet not very effective missile defense system, or, much more productively, by ensuring our capability to penetrate any missile defense system and protect Russia's retaliation potential.[134]

This statement is worth dissecting in greater detail. It appears to be a recognition that it is cheaper and more efficient to attempt to maintain what Russia sees as strategic balance by designing missiles capable of penetrating the U.S. missile defense shield, than by committing trillions of rubles to projects aimed at reliably protecting millions of square kilometers and hundreds of locations from massive missile attacks. But Russia appears to be following both logics simultaneously.

From its earliest days, critics of U.S. missile defense systems have noted that Russia—and other adversaries—would be prompted to invest in inexpensive (in relative terms) countermeasures to defeat missile interceptors.[135] This is precisely what Russia has proceeded to do. Russian Deputy Prime Minister Dmitry Rogozin recently described Russia's test

of an advanced road-mobile ICBM, called the RS-26 Rubezh, as a "missile defense killer."[136] According to Russian news reports, the missile flight test involved three dummy warheads designed to defeat defenses.

But if building Russian missile defenses is "expensive" and "not very effective" against U.S. nuclear ballistic missiles, which have always been considered the greatest threat to Russian strategic retaliation capability, why is Russia pushing ahead with investment in anti-missile systems? Leading defense analyst Alexei Arbatov thinks the main task for Russian airspace defense is to protect the country's strategic nuclear forces from U.S. offensive systems of a different kind, namely long-range conventional precision-guided weapons.[137] Russian defense commentators suggest that this threat consists currently of subsonic sea-launched and air-launched cruise missiles, which the S-400 can neutralize effectively. But the situation will change with the introduction of more advanced systems currently in development under the umbrella of the Prompt Global Strike (PGS) program.

The U.S. PGS program seeks to develop hypersonic and other conventional and nuclear weapons capable of attacking any location on earth within an hour. Elements of the U.S. system are supposed to be fielded in the next 10 to 15 years. They include boost-glide systems with hypersonic re-entry vehicles, which can follow an unpredictable trajectory and could be extremely hard to detect sufficiently in advance—that is, early enough to launch a retaliatory strike.[138]

According to Arbatov, "Russian authorities now consider these weapons, and not the U.S. missile defense systems, to be the main high-tech threat," since in this area "Russia has the biggest technology gap to close."[139] Indeed, senior Russian officers consistently

highlight the danger of a massive and paralyzing instantaneous air and missile strike,[140] and exercise scenarios are beginning to practice against this eventuality.[141] According to former chief of the Russian General Staff's Main Operations Directorate Lieutenant-General Andrey Tretyak:

> VKO is a response to the possibility of all campaigns being in air and space and not reaching the ground operations stage. . . . [they could assure] victory through supremacy in the air, space, and information domains—so VKO is a deterrent. If an opponent is more technologically advanced, he must risk suffering unacceptable damage to prevent aggression.[142]

This concern emphasizes still further the Russian preoccupation with preventing threats to deterrent potential: in this context, "the declining role of nuclear deterrence, to which Russian authorities give such a prominent part, must look like an alarming prospect."[143] It should not therefore be a surprise that Vladimir Kozin, in his role as member of an interagency working group attached to the Russian presidential administration discussing missile defense issues with NATO, complains that the:

> Americans completely exclude from the negotiations such important non-nuclear weapons as anti-missile systems, anti-satellite weapons and high-precision capabilities that could perform lightning strikes in any part of the world.[144]

At the February 28, 2014, annual session of the Non-departmental Expert Council on VKO Problems, Igor Ashurbeyli declared with his characteristic outspokenness, "We stand idle, bound by international

treaties about a 'peaceful space' which no one observes, except for us. The militarization of space is inevitable. What's more, it is vitally needed."[145] The start of tests of hypersonic missiles by China as well will only make the Russian headache worse.[146]

From this perspective, building up missile defense systems as well as enhancing the survivability of offensive missiles could appear to be a prudent insurance policy. This was confirmed by two senior officers from the Russian General Staff Academy in 2012. Speaking at NATO Defense College in Rome, they told the audience that Russian missile defense is a "military response to a new threat for the medium- and long-term forecasts over decades—all possibilities. The task is not to allow the worst case scenario to develop."[147]

CONCLUSION

Over the last 8 years, Russia has significantly modernized its air defense systems, expanding them geographically and making them more versatile, mobile, and effective. The interceptors introduced in this period, mainly on the S-400 platform, give Russia the capability to counter a wide range of missile threats up to and including IRBMs in some of the most important and/or vulnerable parts of its territory.

Further improvement and geographical expansion of air defense capabilities will depend on the ability of arms manufacturers to deal with increased demands of the State Armament Program. One of the main bottlenecks—the design, production, and troubleshooting of the newest long-range interceptors—significantly restricts the operational range of the S-400 by denying it the intended long-range interceptors, and will in all probability cause still further substantial delays

in introducing the S-500. The commissioning of this system before 2020 is unlikely.

If published figures are to be believed, the S-400 represents the apex of current air defense capabilities, and is in many respects more capable than the U.S. Patriot series. However, comparisons with THAAD and SM-3 missiles could be misleading, as these systems were developed solely for the purpose of missile defense and their design follows an entirely different philosophy. Russia's goal is to protect its territory from within its borders, using a multilayered shield of several complementary systems, including, but not limited to, the S-400 and the S-500. The United States is focusing heavily on countering ballistic missiles in various stages of their flight, which requires a missile defense shield of global reach and presence.

According to open sources and statements by Russian officials, Russian ultra-long-range interceptors, which are still in development, should offer better performance than their American rivals and should be able to counter ICBMs. However, many experts doubt their stated ability to neutralize nuclear warheads at high altitudes using high-precision hit-to-kill technology.

Nevertheless, entirely predictably, Russian officials and servicemen portray their air defense systems, whether commissioned or still in development, as being the best in the world. This derives from the fact that assertions of this kind significantly contribute to Russia's much vaunted great-power status, competitiveness on the global arms market, and, in Russian eyes, the flourishing of the Russian economy. This, together with the increasing threat of ballistic missile proliferation along the long perimeter of Russia's southern borders, is one of the reasons why the

enhancement of Russia's air defense capabilities is not a direct and symmetrical response to U.S. missile defense deployments in Europe.

The capabilities of the new VKO, built around the S-400 and other systems, can hardly protect Russian retaliatory capability, let alone the entire strategic forces, as nearly half of the S-400 regiments are currently stationed near Moscow where no strategic forces are based. The Russian missile defense shield is "expensive" and "not very effective" at best and a "myth" at worst. Its main *raison d'être* is to serve as a deterrent against a single more technologically advanced rival, who seeks the capability to destroy any target anywhere in the world within an hour.

Within the Russian understanding of strategic stability, future planned VKO assets could be considered a stabilizing factor, since they could eventually make a first disarming strike impractical. But the Russian narrative has not developed to include reasonable explanations such as this. Instead, superficial arguments (for example, that the VKO system is less immoral than U.S. BMD because it is built within Russia and does not approach toward U.S. borders) are being repeated as mantras.[148]

POLICY RECOMMENDATIONS

The military implications of Russia devoting huge investment specifically to countering U.S. plans for strike capabilities are obvious, and it is to be hoped that the intended results are already the subject of intensive study by the U.S. intelligence community. But in addition to the purely technical realm of capability, Russian missile defense developments provide a political opportunity for the United States to mitigate

some of the transactional costs of Russian opposition to the U.S. deployment of anti-missile systems.

Russian plans for the introduction of enhanced ABM capabilities have a much more nebulous timescale than the declared schedule for EPAA. Prior experience of development setbacks for the S-500 program—including the original flight test date passing by before construction of the production facilities had even started—together with known overloading of Almaz-Antey's production capacity suggest that it will be some time before the long-promised S-500 actually appears in the flesh.

But regardless of the actual state of real-life capabilities, Russian declaratory policy provides U.S. policymakers with significant material to develop an approach intended to mitigate Russian obstructionism over EPAA and U.S. plans for BMD more broadly. Put simply, Russian complaints at the dangerous U.S. irresponsibility of introducing new anti-missile capabilities ring hollow when Russia is forging ahead with its own program to do precisely the same. If the performance and capabilities claimed for new Russian systems are accurate, they pose at least as great a threat to deterrence as do SM-3s.

The paradox was pointed out by Roberto Zadra, Head of the BMD Section of NATO's Defense Investment Division, at the Royal United Services Institute (RUSI) Missile Defense Conference in June 2013. Zadra reversed the Russian argument of missile defense being a dangerous threat to strategic stability, and asked rhetorically why there was no NATO discussion of planned S-500 systems as a similar threat. By applying the same logic, he asked, how could the S-500 be anything other than destabilizing—all the more so since its proposed capabilities are so highly classified?[149]

U.S. officials have repeatedly attempted to allay Russian concerns over the potential for EPAA and its predecessor systems to compromise Russian strategic deterrence. These attempts have foundered on Russian concerns, some of which appear disingenuous, but others of which are genuinely rooted in an entirely different Russian approach to the purpose and status of nuclear weapons.[150] Despite the current hiatus in relations, opportunities for meaningful dialog with Russia on missile defense will arise again in the future. At that point, U.S. representatives should be fully informed on the scope and ambition of Russia's own missile defense programs. This will allow them not only to rebut some of the more facile Russian accusations, but also to counter some persistent Russian arguments relating to strategic balance.

In brief, discussion of Russian capabilities should be an integral part of future conversations with Russia on the deployment of U.S. and allied BMD assets.

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