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The Treaty between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START)[1] is, at the time of writing, nearing its 5 February, 2021 expiration date. Both the U.S. and Russia have suspended their obligations under the Intermediate-Range Nuclear Forces (INF) Treaty.[2] A renewal of New START would be the most logical future step that aids the cause of arms control. This is the option that requires the least political will and therefore might suit the current political climate. Nevertheless, the political relationship between the two countries could derail a renewal of New START. Without this renewal, one could ask whether this would truly be "the end of history for nuclear arms control."[3]

If another major bilateral U.S.-Russia or plurital arms control agreement were concluded, it would likely necessitate inclusion of new types of hypersonic weapons, such as the hypersonic glide vehicle (HGV).[4] Russian leaders have said that Russia remains open to extending New START, as well as to meeting the U.S. at the negotiation table should the U.S. initiate further talks regarding the INF Treaty.[5] In order to assess the position from which Russia would come to the table to negotiate limits to strategic nuclear-armed or shorter-range, non-nuclear precision-strike weapons systems, including hypersonic ones, under some sort of arms control mechanism, it would be helpful to uncover the main motivating driver(s) behind the development of Russia's hypersonic weapons systems. Applying models of strategic modernization decision-making can help organize and classify these motivations. This will lead to the conclusions that 1) these new weapons systems have uses that are vital to Russian military strategy, and their development is also likely part of a reaction to external stimuli; and 2) this, combined with the very fact of their development and deployment, gives Russia a position of strength from which to approach any new agreement.

During the second half of the 20th century, scholars applied a number of such models of decision-making to the processes by which the government of the Soviet Union determined on the one hand "weapons acquisition and force structuring" and on the other "military deployments and the use of Soviet military forces."[6] In his chapter "Soviet National Security Decisionmaking: What Do We Know and What Do We Understand?" the late Stephen Meyer organized the literature into summaries of the various general models of decision-making in existence.[7] Scholars have also tried to apply models to Russian defense decision-making. In a more recent book, *Russian Strategic Modernization: Past and Future*, Nikolai Sokov applies the models he believes were most relevant to the Soviet and Russian strategic

modernization process.[8]

Meyer provides an overview of the action-reaction model with its variant, the technological dynamic model, the military superiority model, interest-group models (the bureaucratic politics model and various applications of interest group models under this title), national leadership model, and the military mission model.[9] He argues that the literature existing at that time was often more descriptive than analytical, did not consider all data available, and often did not include tests of a given model against time in the form of follow-up research. Important to this conclusion and to most modeling works is the basic premise that under the conditions of incomplete information "[t]he most desirable model is one that can explain and predict the widest range of behavior with the fewest number of inputs."[10] Predictably, the chapter calls for further intense study.

In what seems to be an answer to Meyer's call, Sokov tests conclusions drawn in the 1970s and 1980s through analysis of the historical record of Soviet decision-making on strategic modernization, START I negotiations, the breakup of the Soviet Union, consolidation of the Russian nuclear arsenal, START II negotiations, and modernization activities after 1991. In his 2000 book, Sokov applies the models he believes best explain the Soviet and early Russian strategic modernization process and joins scholars who attempted to characterize Russian defense decision-making in that realm.

According to Sokov, a combination of external and domestic factors as influencers, and the *bureaucratic model* (like others, he minimizes distinction between this and interest group models for the Soviet and very early Russian cases), the *parity model*, the *action-reaction model*, and the *military mission model* are most applicable to Soviet strategic modernization from the 1960s through the 1980s, as well as early Russian strategic modernization.[11] He shows that these also help to explain Soviet and early Russian decision-making during arms control negotiations.

Differing theories on motivations behind Russian development of new hypersonic weapons and other "exotic" weapons systems have been floated in the public debate and news media in recent years. Pavel Podvig's arguments support the technological dynamic model and an action-reaction model asymmetric approach. He has argued that this development of newer strategic weapons systems is driven by parochial interests of actors in an unimpeded defense industry who lobby for their own projects that "'may not have a clear purpose or strategic mission,'" and that it is also the result of hysteria over the need to counter U.S. missile defenses.[12] Podvig and Alexander Stukalin offer the idea that Russia could use its hypersonic development program "to gain leverage in arms control discussions with the U.S. on the establishment of limits to missile defense and conventional strike capabilities."[13] Alexei Arbatov suggests that weapons like HGVs and other areas of military

expenditure are responses to perceived threats from the U.S. like "first global preemptive strike."[14] The idea that such weapons were developed to evade missile defenses has also been sounded by officials and in the Russian media.[15]

In many cases, more supporting research could be conducted. Testing models in analysis of the modern Russian military defense complex is rare. Re-establishing a record of models applicable to certain historical periods and certain research and development and development programs allows for the classification of these different decision-making cases. While not ensuring foresight, the application of models gives perspective and clarification to what can otherwise be murky procedure and helps provide for a more organized public debate. It also provides a common language with which to compare and contrast current circumstances and observations with those from the past. Understandings that result from such analysis could help both with one's own understanding of an adversary's military doctrine, as well as with thinking about a future for arms control.

This article applies models of decision-making given the facts observed for one historical period – the mid-2000s through the mid-2010s – and one series of development programs – those falling under the title "hypersonic weapons development program." It tests whether some of the models that Sokov argued accurately explain strategic modernization from the late 1960s through the mid-1980s fit Russia's development of its HGV and hypersonic cruise missiles. The action-reaction model, the military mission model, and the bureaucratic interests model are treated as most applicable and are tested against historical and current evidence to judge their utility as analytic lenses. The parity model, by which the Soviet Union sought to achieve numerical parity in warheads on strategic delivery vehicles with the U.S., possibly for negotiation purposes, is not treated as directly applicable to development of new hypersonic systems.[16] However, a revised model with an emphasis on quality could be useful.

The largest amount of high-quality evidence supports the military mission model and elements of the action-reaction model as those which best explain this weapons development. Therefore, it can be deduced that weapons developed under the "hypersonic" umbrella are very likely to be deployed and have missions that directly relate to Russian military doctrine. Assuming political will for arms control revives, the essential role these systems have taken on in deterrence, warfighting, and general power projection will make negotiating their numerical and qualitative limits more difficult than if their development resulted from a technological dynamic. Initially, an overview of the relevant models is necessary.

Models of Soviet and Russian Defense Decision-making

The *action-reaction model* postulates that the state adopts decisions that are in essence reactions to external stimuli "*in an effort to offset and neutralize increased*

threats to Soviet national security."[17] As Meyer summarizes, this means that decisions on weapons design and acquisition, force modernization, and structuring of forces are made in response to such decisions made by other states, especially the U.S. The response actions can include "imitative" (in the words of Russian military officials and experts "symmetric") or "offsetting" ("asymmetric") responses.[18] Underpinnings of what is commonly referred to as the "asymmetric approach" is a concept that, for Russia, has roots in tsarist military strategy and can be found in the writings of Russian military officials today.

According to the *technological dynamic model*, the state that has the technological and economic means to build a given weapons system will build it. This is the result of scientists viewing the given weapons system's development as timely combined with a perceived need to respond to the adversary's weapons acquisition since it "occurs in an action-reaction decision setting."[19] The discourse today reveals that this model remains on the minds of some who watch Russian weapons modernization most closely. However, other than the plethora of new strategic offensive weapons systems coming to fruition, concrete or official evidence supporting this model is scarce.

By the *bureaucratic politics model*, Soviet foreign policy actions were not the result of "black box" decision-making but rather that of the political push and pull of several actors in the Politburo and "heads of several bureaucratic elites at the Central Committee level."[20] The actors in this model are part of the decision-making apparatus. It is assumed that the political system is very bureaucratic, and that there is a collective leadership in which there is no preeminent decision-maker that has the power or wisdom to make decisions alone. Therefore, the actors were assumed to be the members of the Politburo and the agencies that they controlled as both actors and influencers.[21] Whereas the Politburo could be thought of as the top layer of the former, larger decision-making mechanism, today's presidency seems to possess a similar function.[22]

According to *interest-group models*, the actors were envisioned as "interest groups" that seek to influence government decision-making from outside the government.[23] These models have been defined as "the collection of models that posit that *Soviet weapons acquisitions and force structuring are derived from the pulls, pushes, bargaining and compromises that occur as various individual and institutional actors within the Soviet Union compete for resources and power*."[24] The distinction between the bureaucratic and interest-group models in terms of their actors was at times minimized in order to analyze the Soviet decision-making complex. The actors in the Soviet system were all within or so close to the government (the bureaucracy) that they could be considered part of it, rather than existing as influencers external to the bureaucracy, like those found in the U.S.[25] The same can be done in the case of Russia's new hypersonic weapons development decision-making process, where

the actors in and influencers of the process either lie within the federal government or cannot clearly be distinguished from it. Government-owned production companies serve as the best example of this. Therefore, this article focuses on the bureaucratic politics paradigm.[26]

Meyer coined the term *military mission model* when he explained the model of Soviet defense developments by which "*decisions regarding Soviet weapons acquisition and force structuring logically follow from the designation of specific military missions devised by the Soviet military*."[27] The missions are based on "Soviet military doctrine and strategy, institutional histories, organizational self-image and interpretations of the objective nature of the scientific-technical revolution in military affairs (that is, new threats)."[28] The model posits the opposite of the technological dynamic model in that a state that has the technological capability to build a weapon will not necessarily build that weapon.[29] In Sokov's words, according to this model, motivation (mission derived from the military planners), intention (planned strategic force structure), and outcome (final strategic posture) exist in a logical, successive chain.[30]

Relevant Technology

Technology

It is generally accepted around the world that the lower limit of "hypersonic speed" is five times the speed of sound (Mach 5 or 6,174 km/h) or higher. The main types of hypersonic weapons that countries are pursuing today are the HGV (which has also been called a "hypersonic gliding reentry vehicle," a "hypersonic glide delivery vehicle," and a "boost-glide vehicle," and together with its booster – a "boost-glide system"), the terminally guided ballistic missile, and the cruise missile with a scramjet engine. Increased accuracy (a much lower circular error probable) is envisaged to allow for conventional arming of an HGV or terminally guided ballistic missile, assuming the mission provided for this.[31] These weapons are difficult to detect, and especially difficult to intercept with existing missile defense systems. This means that an HGV or a terminally guided ballistic missile would have a mission similar to that of a currently existing ballistic missile but would generally have a larger chance of reaching its target.

As James Acton explains, HGVs are essentially large maneuvering reentry vehicles (MARVs/MaRVS) that are launched or "boosted" by re-purposed ballistic missiles. A given vehicle is then released and proceeds unpowered for perhaps thousands of kilometers, using aerodynamic lift.[32] The glide portion occurs for more than half of the vehicle's flight, which makes it difficult to classify the technology as either a ballistic missile or a cruise missile according to existing arms control treaty text.[33]

The hypersonic long-range cruise missile is another technologically challenging

option. Unlike HGVs, these are powered during flight. Similar to HGVs, they utilize aerodynamic lift. A new engine concept is required in order to make a cruise missile travel at hypersonic speeds. For that purpose, the U.S. has tested rocket-boosted scramjet (Supersonic Combustion RAMjet) engines, which utilize a rocket booster engine to propel the vehicle to an initial high speed.[34] Notably Russia is apparently conducting development work on scramjet engines, as well, and also reportedly tested a cruise missile with a miniature, nuclear-powered engine.

A terminally guided ballistic missile is another more technologically simple option for proceeding with a hypersonic system with increased accuracy and defense penetration capability. These have a steerable reentry vehicle, equipped with a guidance system and flaps that allow for steering toward a target.[35] Arming these with conventional warheads has been noted by some as especially problematic, since a nuclear-armed state could mistake the conventional warhead for a nuclear warhead and retaliate with nuclear means.[36]

HGVs in particular could grant a number of technological advantages to users. They could shorten the time period over which the adversary is aware of the incoming attack. They are also envisaged to more effectively evade existing missile defense systems than traditional ballistic missiles are. This is due to a combination of maintaining hypersonic speed for most of an HGV's trajectory with a flight path of lower atmospheric altitude and less predictability. Current missile defense systems are generally designed to detect, track, and intercept various kinds of traditional ballistic missiles. Terminally guided ballistic missiles might also share some of these advantages.[37]

Russia

Work on Russia's hypersonic systems within the defense industry is conducted under the auspices of the Joint Stock Company "Tactical Missiles Corporation" (KTRV), which is composed of over 30% of Russia's defense enterprises and cooperates with other state and non-state commercial entities.[38] Much as the enterprises that are developing Russia's hypersonic weapons systems are housed under one proverbial roof, the systems themselves were included in a single, two-stage "hypersonic weapons development program" that was pitched to the Russian government's Military-Industrial Commission (MIC) during or soon after 2013 and seems to have been approved by May 2014. The thinking and testing that preceded this began during the Soviet Union and restarted in the early 2000s. A number of enterprises that today specialize in work on different kinds of new hypersonic weapons (those with global reach, tactical sea- and air-based) were added to the KTRV structure at its inception in 2003 or subsequently.[39] The Russian Ministry of Defense is apparently also conducting its own hypersonics research and development work.

The program foresaw the creation of a sub-strategic air-launched cruise missile with

a range of 1,500 kilometers and speed of approximately Mach 6 by 2020. As mentioned above, according to the next stage of the program, a weapon that can travel at up to Mach 12 and has global range is planned. This second system seems to fit the profile of an HGV.[40]

Russia's weapons can be divided roughly into three categories. According to information collected by Podvig and others, the first includes those more relevant to strategic missile defense penetration (though each might support different missions). These include the "Avangard" HGV, and any type of hypersonic warhead that could be fit onto the Sarmat heavy intercontinental ballistic missile (ICBM). The second category encompasses systems that could eventually replace traditional cruise missiles: these are the Tsirkon (3M-22) anti-ship cruise missile (ASCM) with a scramjet engine; new air-launched cruise missiles (ALCMs) such as Kh-90 ALCM work continuation, and possibly the Kinzhal ALCM (though whether it will be hypersonic is questionable). The third category can be reserved for the nuclear-powered, possibly nuclear-armed ALCM, which has questionable speed and is boasted to have "practically limitless" range."[41]

Strategic Weapons

The Avangard HGV, formerly known as the Yu-71 HGV, was worked on within Project 4202. The predecessor program, "Albatross," was initiated in response to the U.S. Strategic Defense Initiative (SDI) in the 1980s.[42] Russia has conducted a number of tests of different vehicles under its predecessor and Project 4202 programs. The first test of an HGV prototype, the Yu-70/102E, is thought to have occurred 28 February, 1990 from the Soviet Union's main ballistic missile and space launch site at Baikonur, (now in Kazakhstan). A second test apparently occurred about a week later, and then, with almost no evidence of further testing throughout the 1990s, the next test occurred on 27 June, 2001, also from Baikonur. Russian President Vladimir Putin was apparently present at the 18 February, 2004 launch from Baikonur, which was reported to be unsuccessful. A new prototype, the Yu-71 of the Project 4202 program, is thought to have been tested for the first time from Baikonur on 27 December, 2011.[43] Later tests were conducted from the Dombarovskiy missile division site, still using the Kura ICBM test range impact area. Other tests occurred in September 2013, possibly in September 2014, and February 2015.[44] The latest tests occurred on 19 April and 25 October 2016, and 26 December, 2018.

The Yu-70/102E and Yu-71 were launched on top of a repurposed UR-100NUTTH (SS-19) ICBM; the Yu-71 was supposedly launched from the UR-100NUTTH Dombarovskiy basing area (in the Orenburg region) to the target at the Kura Missile Test Range (impact area) on the north-eastern side of the Kamchatka peninsula (about 6,000 kilometers). Russian media sources called the April and October 2016 tests successes.[45] The latest test was also apparently successful. According to

schedule, two UR-100NUTTH missiles armed with the Avangard were reportedly deployed with the Dombarovskiy missile division of its Strategic Nuclear Forces at the end of 2019.[46] Four more systems are planned for that regiment, to make a total of six, while another regiment of six is planned for deployment by 2027.[47] This deployment suggests that, at least for now, Russia plans to deploy nuclear-, rather than conventionally armed, HGVs.

Successful development and deployment of an HGV seems to be the product of what is nominally the second stage of the "target program for the creation of hypersonic weapons," which envisages a global-range system that travels at Mach 10 to 12 and was pitched to the government in 2013 or 2014.[48] Russian officials have generally stressed the increased ability of such systems to evade missile defenses.

In his 1 March, 2018 address to the Federal Assembly, Putin mentioned that the Sarmat (RS-28/SS-29) heavy ICBM could be armed with a "wide spectrum of high-yield nuclear warheads, including hypersonic" ones. It is unclear what type of hypersonic warhead he was referring to, but some believe it could be HGVs. It will likely carry about 10 MIRV warheads, or possibly a smaller number of HGVs, and will replace the Voevoda (SS-18/RS-20V).[49] With three ejection tests completed, the Sarmat is said (at the time of writing) to start flight testing in early 2019.[50] The Sarmat is set to start deployment in 2021 in Uzhur, with at first two missiles, then another four, and eventually having 46 missiles deployed across seven regiments at Dombarovskiy and Uzhur.[51]

Cruise Missiles

Russian officials are relatively transparent with regard to the development and deployment timeline of the 3M-22 Tsirkon missile with anti-ship and land attack variants. This is very likely to be a product of what is described as the type of product of the first stage of the hypersonic missile development program (see below). It might be dual-capable (i.e., capable of carrying either a nuclear warhead or a conventional high-explosive warhead). The missile will reportedly be powered by a solid-propellant boost motor and scramjet engine, have a range of up to 1,000 kilometers, and travel at up to Mach 6 (Putin has stated a range of "over 1,000 kilometers" and a speed of about Mach 9).[52] However, official information about the type of engine the missile will use is not available.

Russia has plans for both basing on submarines and surface vessels.[53] It was reported in IHS Jane's that two Kirov-class cruisers are due to be equipped with this missile. The 3M-22 can apparently be fired from the 3R-14UKSK-Kh Ship General-Purpose Firing System (SGPFS). The system is also capable of launching other sea-based anti-ship, land-attack and torpedo missiles, namely the Kalibr ASCM (3M-14TE) and LACM (3M-54TE and 3M-53TE1) variants, the supersonic BrahMos PJ-10 anti-ship and land-attack variants developed jointly with India, and

the 91RTE2 Kalibr torpedo missile.[54] As for the Russian HGV, NPO Mashinostroyenia, which developed and produced the "Onyx" missile system, leads the experimental design work on the Tsirkon.[55] Ground-based tests, which reportedly started around 2014, continue. Testing from ships and submarines was slated to begin during 2019.[56] A recent test launch conducted from the frigate Admiral Gorshkov in the White Sea was deemed successful.[57] After a failure to resolve Russia's INF Treaty violation and the U.S. suspension of its own treaty obligations, Russian officials announced plans to "launch […] research and development, followed by development and engineering to create land-based launchers for hypersonic intermediate-range and shorter-range missiles."[58]

In 2012 Russia and India agreed to jointly develop the BrahMos II Kalam LACM, also called the BrahMos II K and formerly the BrahMos II. The missile will apparently have a scramjet engine and a kinetic warhead. It is warranted based on a need for increased speed in current conflict situations.[59] Some believe this is the export variant of the developing Tsirkon Russian domestic hypersonic cruise missile.[60] The missile will have a range of over 300 kilometers, is expected to reach initial operational capability (IOC) after 2020, and is slated for air, ground, ship, and submarine deployment.[61] There is some overlap in missile designers and producers reportedly working on this project and other Russian hypersonic projects. NPO Mashinostroyeniya (part of KTRV), TMKB Soyuz, TsIAM, and TsAGI are all apparently working on the BrahMos-II, with NPO Mashinolstroyeniya leading much of the effort to engage Russian enterprises in hypersonic missile technology in 2013.[62]

Russia is also working on hypersonic ALCMs. As an example, work on the Kh-90 apparently continues. Research and development began during the late Soviet period. One product of this work was the GELA (Hypersonic Experimental Aircraft / Giperzvukoviye Experimentalniy Letatelniy Apparat) prototype.[63] Russia has since apparently developed another prototype in this same line, called the GZUR (Hyper-Sonic Guided Missile /*Giper-Zvukovaya Upravlaemaya Raketa*) (subject /*izdeliye*75). This is likely one of the main products of the hypersonic missile development program's first stage, as envisaged in April 2013. In 2012, a proof-of-concept test with a prototype from earlier work was reportedly conducted at Aktyubinsk in Kazakhstan; the general director of KTRV deemed the test a success.[64] It was also reported that the hypersonic vehicle was being fitted for launch from a Kh-22 (AS-4 "Kitchen") missile, and that in 2012 four Kh-22 missiles were made for testing with the vehicle, with the entire system to be launched from a Tu-22M3.[65] As of early March 2016, the GZUR was in the so-called "technical design stage" at KTRV, meaning that it still needs to undergo testing before deployment.[66] The GZUR is due to receive a ramjet engine (assumed to be a scramjet), and was rumored to enter serial production in 2020.[67]

Also mentioned in Putin's 1 March, 2018 speech is the dual-capable Kinzhal ALCM. It is envisaged to have a range of over 2,000 kilometers, and to be launched from the center pylon of specially modified MiG-31 K interceptors.[68] It has apparently been in "experimental combat duty" since December 2017, suggesting a nearby deployment date.[69] Officials have stressed a capability to overcome anti-air defenses and missile defenses.[70] While it is boasted to travel at Mach 10, this is unlikely given its experimental deployment date. Russia does not seem to have mastered the sustained use of the type of engine needed for a cruise missile to travel at such speeds.[71]

Nuclear-Powered Cruise Missile

Putin announced in his 1 March, 2018 address to Russia's parliament that the country is developing a nuclear-powered, possibly nuclear-armed ALCM. This is the Burevestnik (SSC-X-9 Skyfall).[72] The nuclear-powered engine will fit in the body of a missile like Russia's X-101/X-102 (Kh-101/Kh-102). The X-101/X-102 apparently originally had a range of up to 4,500-5,500 kilometers.[73] Putin noted that the nuclear engine will increase the missile range by a factor of 10.[74] The missile, which could be nuclear armed, was also noted for its envisaged ability to evade missile and air defenses.[75] There is speculation that this missile would actually fly just below hypersonic speed.[76]

Application of Models to Russian Defense Modernization

Military Mission Model

Given the physical capabilities that the hypersonic long-range precision strike weapons grant, the evolution of ideas in Russian military thought from the 20th to the 21st century, and evolution of Russia's foreign policy, it seems that development of these new weapons can be explained, at least partially, by the need to support military missions. The use of new hypersonic weapons fits into the Russian way of war and thinking about strategic stability.

Physical Capabilities

Global development of weapons that travel at hypersonic speeds is the most recent step in the development of long-range "precision-guided" or "high-precision" missile systems. The new types of hypersonic systems or weapons under development today (which generally include terminally guided, conventionally armed ballistic missiles (using a maneuvering reentry vehicle (MaRV) to deliver the warhead), hypersonic glide reentry vehicles (a newer, specific kind of MaRV), and hypersonic cruise missiles with a scramjet engine) are designed to have increased speed, range, maneuverability, accuracy, and precision, and for HGVs, less probability of timely detection.[77] Ballistic missiles with a conventionally armed reentry vehicle that

attacks its target based on kinetics (angle and speed) would need to be much more accurate to ensure that they hit their targets.[78]

Long-Range Precision-Strike Weapons and Modern Conflict

Roots of the significance for military strategy of the intercontinental and long-range hypersonic weapons under development in terms of speed and deepening of the battlefield can be found in Soviet military writings from the 20th century. More recent perceptions of technical necessities for offensive missiles resulted from observing the evolution of the nature of war, especially as waged by countries that Russia considers potential adversaries (especially the U.S.), and which tend to be the world's military leaders in terms of technology, operational art, and theory.[79] For intercontinental missiles and shorter-range cruise missiles, these physical features include higher accuracy, precision, and longer range.[80]

Development of new long-range precision-strike systems, especially conventionally armed cruise missiles, coincides with the expressed need of Russian military leadership to be capable of waging "high technology war." According to Chief of the General Staff and First Deputy Minister of Defense Valeriy Gerasimov in a 2016 article about Russia's experience in Syria, "science and technological developments have changed the character of armed struggle [(war using forceful means)]"; "distanced contactless pressure on the adversary will become the main method of achieving [military] goals with the use of massive employment of high-precision and long-range means of destruction from the air, sea, and space."[81] The 2014 military doctrine similarly notes that "[c]haracteristic features and specifics of current military conflicts" include, among other things, the "massive use of weapons and military equipment systems, high-precision and hypersonic weapons, means of electronic warfare, weapons based on new physical principles that are comparable to nuclear weapons in terms of effectiveness…," "exerting simultaneous pressure on the enemy throughout the enemy's territory on the global information space, airspace and outer space, on land and sea," and other characteristics.[82] The 2010 military doctrine notes similar features but with fewer specifics.[83]

In a 2013 speech on the changing character of war, regarding the "forms and methods" of modern war that the military must prepare and be armed for, Gerasimov noted:

The destruction of [the adversary's] installations is implemented at the entire depth of the territory. The differences between strategic, operational, and tactical levels, offensive and defensive actions are fading. The use of high-precision weapons takes on massive character.[84]

This is an advanced version of the original concept "deep battle." Deep battle was conceptualized in Soviet military thought during the 1920s and 1930s.[85] The

concept of the "deep operation" was developed in Russian military theoretical tradition as the result of the recognition that the industrial revolution (allowing for technological developments in offensive weapons and military transport mechanisms) had made it possible for the front to develop from a single point to an extended line and to have depth in the form of echelons of defense. This line of thought resulted from watching recent wars, including the First World War.[86] Throughout the rest of the 20th century, various technologies transformed the front even further in terms of deepening it physically and expanding its character across different domains of military activity.[87] For example, the vastly increased ranges (i.e. global range) that could theoretically be reached with an HGV embody a prospective historic geographical deepening of the battlefield.

The production rate of currently existing long-range precision-strike weapons—military means of long-range, distanced war in a non-global military theater—and the level of importance placed on their use indicates their perceived power projection value. For example, in terms of sea power, ships with Kalibr cruise missiles, the Bastion shore-based missile system, and the anti-air S-400 system are said to "provide control of the sea and air space," and are being deployed in strategically important regions (i.e. to the Baltic, the Barents, the Black, and Mediterranean seas).[88] In 2018 (at the time of writing), 116 Kalibr missiles are reported to have entered service.[89] A high-ranking Russian military official is noted as saying that the system "'provides…platforms…with significant offensive capability and, with the use of the land attack missile, all platforms have a significant ability to hold distant fixed ground targets at risk using conventional warheads'" and "'is profoundly changing…[the Russian Navy's] ability to deter, threaten, or destroy adversary targets.'"[90] In summary of the important power projection dynamic surrounding Russia's long-range systems, Sokov classified Russian use of its precision-guided, conventional-strike capability as the renewed capability to support the state's foreign policy with military power.[91] In the future, Tsirkon cruise missiles could replace or be used in addition to the Kalibr.

The long-range, precision-strike conventional capability turned out to be not a replacement for nuclear capability in terms of deterrence, but rather an addition to it, evidenced by the dual-capable nature of new weapon delivery systems.[92] The use of hypersonic cruise missiles would heighten the threat of use, and increase the effectiveness of Russian employment of such systems. Development of long-range high-precision systems, including hypersonic ones clearly supports the mission of defending the Russian state, protecting Russian interests past state borders, and projecting power in geographical regions of Russian interest.

Therefore, there is evidence that Russia decided to develop modern hypersonic weapons based on an objective understanding that the character of war has fundamentally changed once again and will continue to change along with

technological developments. Russian military theorists must at least remain on par with the theorists of other states. In logical succession and tasked with helping maintain Russia's great power role on the world stage, the Russian military-industrial complex must technologically supply the necessary means. Thus, there is significant evidence for military missions of strategic and non-strategic hypersonic systems.

Action-Reaction Model

In sync with the action-reaction model, Russian hypersonic weapons are also under development, at least nominally, as a reaction to external stimuli. In this case, the stimuli seem to be certain American offensive and defensive weapons developments. Evidence supporting this can be found mostly in statements by high-ranking state and defense industry officials, writings of former military theoreticians, and the general historical sequence of certain developments. This is stated while keeping in mind the difference between developing a system to keep up-to-date with the changing character of war and new military missions and the observation by Martin van Creveld that "[w]ar…is an imitative activity" on one hand, and responding in a symmetric or asymmetric manner to another country's weapons development based on perceived threats on the other.[93]

The main external military risks that seem most connected to Russia's development of hypersonic long-range high-precision weapons systems include the following, and pointedly relate to the U.S.:

[the] establishment and deployment of strategic missile defense systems undermining global stability and violating the established balance of forces related to nuclear missiles, implementation of the global strike concept, intention to place weapons in outer space, as well as deployment of strategic non-nuclear systems of high-precision weapons.[94]

While Russia's opposition to U.S. missile defenses was not new, this list of threats is part of a policy stance presented in full form for one of the first times in Foreign Minister Sergei Lavrov's January 2011 statement during ratification of New START. They are threats within areas of international security that Russian officials have said affect strategic stability and, therefore, affect Russia's ability to disarm (in the sense of nuclear reductions).[95] The list can be found in a number of other state sources (notably with some subtractions and additions), including in nascent form in the 2010 military doctrine, in the 2015 statement by Russian delegation head Mikhail Uliyanov during the general debate of the Non-Proliferation Treaty Review Conference, and more recently, in a late 2017 presentation by Russian Ambassador to the U.S. Anatoly Antonov.[96] As the Russian position was recently voiced, at least nominally, it may be impossible to have negotiations on further strategic reductions without also discussing such things as the presence of military bases near the

Russian border and the balance of conventional forces.[97]

Prompt Global Strike, Ballistic Missile Defense, and the Asymmetric Approach

As member of the Russian Academy of Sciences and former Secretary of Russia's Security Council Andrei Kokoshin explains, central strategic stability can be thought of as a combination of "vulnerability" and "invulnerability."[98] Put simply, the argument for penetration of missile defenses is largely based on the idea that the combined deployment of U.S. missile defenses and implementation of the prompt global strike concept (PGS) decreases Russia's confidence that the U.S. cannot "deliver a preemptive strike, and that [Russia…is] able to deliver a retaliatory strike under any conditions."[99]

This became official Russian policy in the 2000s, with leaders repeating this perception of the threat over the years.[100] In 2007, then Deputy Minister of Defense Anatoly Antonov noted the "direct link between U.S. plans for global missile defense and the prompt global strike concept which means the ability to strike any point on the globe within an hour of the relevant decision."[101] When the latter is combined with the former, it "becomes a means for world domination, politically and strategically," which "undermines the principles of mutual deterrence and mutual security and erodes the architecture of strategic stability…" In 2013, Gerasimov noted: "The concepts of 'Global strike' and 'Global BMD' are currently being developed. They provide for the infliction of a strike within a few hours on the installations and troops of the adversary located at practically any point on the globe. This is guaranteed to prevent unacceptable damage from the adversary's retaliatory strike."[101] According to the string of logic, this decreases the vulnerability of U.S. strategic assets and population to a second Russian strike, making the U.S. more likely to be able to "win" a nuclear war. The logic follows that confidence in the ability to conduct a strike without the chance of nuclear retaliation would increase the incentive for the U.S. to launch a first disarming strike.[102]

Thus, Russia's leadership seems to have come to a consensus, at least nominally, that the U.S. believes it can attain strategic predominance over Russia. Kokoshin notes an instance of historical precedence. During the 1980s, the Republican Party platform on which Ronald Reagan ran stated that the U.S. should aim to achieve military and technological superiority over the Soviet Union by means of its current (at the time) military build-up. He also recalls that certain Reagan administration officials stated that a nuclear war could be won or lost, (as opposed to it being catastrophic to all involved), and decades of internal U.S. discussion of ways to wage and win nuclear war.[103] Similar to how the Soviet Union viewed the Strategic Defense Initiative (SDI) in the 1980s, and based a plethora of development programs – necessarily or unnecessarily – on the proposed need to counter it, Russia's renewed HGV development and testing, as well as development of other strategic systems, seem to

fit into an asymmetric approach to countering U.S. missile defenses.[104]

The timeline of Russian restarting or starting long-range precision strike weapons programs vis a vis developments on the U.S. side suggests an action-reaction dynamic. Russia apparently resumed testing of its HGV in 2001 – shortly before the George W. Bush administration officialy withdrew the U.S. from the 1972 Anti-Ballistic Missile Treaty.[105] Russian officials viewed the withdrawal as an upset to the basic understandings underlying strategic stability. These include "the premise that nuclear war would have devastating consequences for all mankind," and that missile defense systems are inherently destabilizing.[106] These were established in written form by the 1972 treaty and reaffirmed in the 1990 Soviet-U.S. Joint Statement on Future Negotiations on Nuclear and Space Arms and Further Enhancing Strategic Stability.[107] Indeed, then-Prime Minister Putin wrote in a 2012 election campaign article about asymmetrically, and therefore cost-effectively, preventing an upset to "the global balance of power."[108] This is reminiscent of the cost-effectiveness Premier Mikhail Gorbachev himself apparently discussed during debates about how to respond to SDI.[109]

In terms of military strategy, acting with asymmetry is also characteristic of Russia. The concept of acting with indirectness, "avoiding strengths" and "addressing weaknesses" (both with the use of non-military and military means), have deep roots in the military tradition of Tsarist Russia, the Soviet Union, and modern Russia. Asymmetry and indirectness are ingrained in Russian military tradition, and similar thinking can be seen in other states. It requires ensuring the capability to act indirectly.[110]

Whether the threat posed by missile defenses is as Russian officials categorize it is a matter of debate. Furthermore, the number of deployed U.S. intermediate-range ballistic missile interceptors that Russian officials know could actually present a threat might be significantly fewer than the number that Russian officials have said is acceptable. This weakens the official argument for the need to counter them. In 2011 the Communist Party apparently submitted a proposal for inclusion in the Russian New START ratification resolution indicating that at an upper limit of "200 interceptors capable of intercepting intermediate-range ballistic missiles (effectively, SM-3 Block II interceptors whose deployment is currently scheduled for 2018)" was the point at which the "U.S. development of missile defense capability would be considered dangerous."[111] Sokov has noted that this number is much more lenient than the number over which Russia publicly criticized the U.S. for planning to deploy in Poland during the George W. Bush presidency: 10.[112]

Non-Nuclear "First Disarming Strike" and the Symmetric Approach

Developing conventional high-precision weapons systems, including hypersonic ones, supports the *non-nuclear (conventional) deterrence* strategy. Non-nuclear

deterrence was introduced in the 2014 Military Doctrine as a complex of foreign policy, military and military-technical measures aimed at preventing aggression against the Russian Federation through non-nuclear means.[113]

It is part of the system of *strategic deterrence*, and is said to serve as one means of preventing a first disarming strike with high-precision non-nuclear weapons.[114] The threat has been highlighted by both official and unofficial sources: Putin noted this threat in his 2015 Valdai Forum address, stating that "[a] strategy already exists for a so-called first disarming strike, including with the use of long-range, high-precision non-nuclear weapons, the effect of which may be compared to those of nuclear arms."[115] A Russian expert outlined the counterforce threat more specifically:

…conventional armaments can also present a threat to the survivability of Strategic Nuclear Forces if they possess such characteristics as stealth, high accuracy and destructive capability, as well as comparably short times to reach their target.[116]

Not all in Russia agree that the U.S. and NATO could amass enough conventional forces to launch a disarming strike on Russian strategic installations and their command, control, communication, and information (C3I) assets.[117] Furthermore, not all are convinced that non-nuclear weapons can deter large-scale war, which is what Russia officially suspects from the U.S. and NATO. In the journal *Military Thought*, one former and one serving colonel write, "It is impossible to prevent global (world) war with the threat of retaliatory use of general-purpose force conventional weapons."[118]

Despite internal disagreement, Russia seems prepared to use "strategic non-nuclear forces" in a deterrence, and if necessary, warfighting role to help implement strategic deterrence.[119] Non-nuclear deterrence forces currently include the operational and tactical Russian Iskander-M missile systems in Kaliningrad Region and North Ossetia, submarines and surface ships armed with Kalibr missile systems, and will include long-range aviation airplanes with new X-101 (Kh-101) cruise missiles. Given the Avangard deployment with the Strategic Nuclear Forces, it is likely that only conventionally armed hypersonic cruise missiles would potentially serve as a military means to support this mission.[120]

Possible targets may include U.S. ballistic missile defense installations in Europe (which conventionally or nuclear-armed Iskander missiles based in Kaliningrad are said to be able to reach). The idea of launching non-nuclear de-escalatory strikes corresponds to Kokoshin's writings, wherein he advocates a strategy of "pre-nuclear deterrence."[121] Such a strategy was meant to place more rungs in the ladder of escalation before the "nuclear use" rung, to "enhance…the cogency of deterrence and, consequently, its effectiveness."[122]

Nevertheless, one can characterize Russian development of offensive military and military-technical measures to support non-nuclear deterrence as a form of the symmetric approach, since it involves the development of offensive weapons in response to the development of other threatening offensive weapons.

Nuclear Reductions as External Stimuli

It is also possible that development of long-range high-precision weapons, especially hypersonic ones, might have also made sense given what at the time might have been a realistic possibility of further nuclear reductions. Putin noted the following at the Valdai Forum in 2014:

Today, many types of high-precision weaponry are already close to mass-destruction weapons in terms of their capabilities, and in the event of full renunciation of nuclear weapons or radical reduction of nuclear potential, nations that are leaders in creating and producing high-precision systems will have a clear military advantage.[123]

Gerasimov noted something similar, and more directly related to weapons traveling at hypersonic speeds in a November 2017 speech:

In the future, the pace of development of high-precision weapons and the ongoing development of hypersonic missiles will allow the transfer of a main component of strategic deterrence tasks from the nuclear to the non-nuclear sphere.[124]

Therefore, earlier in the 2000s, before the downturn in arms control, it might have been imaginable that in the future, and especially as nuclear weapons decrease in number, these non-nuclear weapons would be able to take over some roles of nuclear weapons. While numbers of strategic nuclear weapons and delivery vehicles are still controlled, with New START in effect and an existing potential for its extension, some prospects for further strategic nuclear reductions still remain.

Synthesizing the Perceived Threats

Offensive weapons are also developed to evade missile defense systems, forming an asymmetric response. Different kinds of offensive systems are perceived as necessary to deter the use of adversarial offensive systems, constituting a symmetric response. Their development likely also made sense at a time when further nuclear reductions seemed possible.

Therefore, it is possible that the action-reaction model (asymmetric and symmetric responses) partially explains Russia's development of its new strategic offensive hypersonic weapons. However, it cannot be relied upon as a complete explanation for these or for future programs.

Decision-Making Structure and Bureaucratic Interests

After a complete restructuring of the strategic modernization decision-making system in the 1990s, which included the abolition of the original Military-Industrial Commission (MIC), a new MIC was created and assigned many of the same roles as those fulfilled by the Soviet one.[125] Two main responsibilities of the MIC were and still seem to be: conducting the majority of the work in formulating common policy on the development and production of new weapons, as well as playing the role of customer (giving funds to the defense industry for the development and purchases of military equipment).[126] The new MIC is one of 15 Presidential Commissions.[127] Instead of answering to the Politburo, the Commission answers directly to the Russian President. In September 2014, the President was made commission chair, evidently in order to ensure smooth government-wide implementation of the import substitution launched after the West imposed sanctions and Ukraine severed all defense production ties.[128] Through the year 2000, projects for the creation of new strategic weapons systems were mostly continuations of work begun by the Soviet Union.[129] The MIC itself is treated as a continuation of the Soviet body.[130]

In line with the presidential system established by the 1993 Constitution, the President determines the "main tasks of the Russian Federation's military policy in accordance with the federal legislation, the National Security Strategy of the Russian Federation for the Period up to 2020 and the Military Doctrine."[131]

The Collegium of the MIC is the body which ensures that decisions taken by the MIC, as well as state policy on virtually all areas involving the military-industrial complex, including scientific and technological development for domestic defense, and export of military and dual-purpose products, are realized. Importantly, the Collegium also formulates the State Defense Order, and seems to serve as one of two "state customers" for the State Defense Order.[132] Membership of the Commission and of the Collegium overlap. The Collegium is chaired by Yuri Borisov, Russian Vice-Premier and deputy chair of the Commission itself.[133]

Today, as in the past, Ministry of Defense officials sit on the Commission and the Collegium and, thus, have influence over the actual initial decisions made.[134]

Other key MIC members include the minister of finance and the general directors of state corporations that represent a large portion of the Russian defense industry. While KTRV representatives do not sit on the MIC itself, today KTRV's first deputy general director sits on the Collegium "by agreement."[135]KTRV has always been directly connected to the government; the Russian government created it and owns one hundred percent of the corporation's shares.[136]

Defense industry representatives present their projects to the MIC, much like in the Soviet Union. As already noted, KTRV representatives did this with the hypersonic weapons development program during the summer of 2013, and approval was given either during 2013 or in early 2014.

Therefore, this leaves the Ministry of Defense, the Ministry of Finance, and the defense industry as the major bureaucratic players in the decision-making process on development and production of defense equipment. Given the large amount of constitutionally granted power the presidency holds over government processes, it seems to play a role similar to that played by the Politburo, which served as the top layer of the Soviet decision-making bureaucracy. Instead of being answerable to the Politburo, today's MIC is answerable to the President.[137]

There is some evidence of bureaucratic struggle amongst and within all of these groups, which inevitably affects final decisions taken by the MIC on defense production and state armament.[138] This could have affected details of, rather than the very fact of, the hypersonic weapons development program approval. Especially before the Russian President became the chair of the MIC, this final product may have been the result of greater bureaucratic struggles. Even after 2014, some bureaucratic push and pull is present, but this does not appear to change the direction set by earlier decisions.

Actor Interests

Interests of the Russian State (and the executive) in this realm include keeping the Russian military industry flourishing. This allows it to 1) effectively provide the Armed Forces with the means needed to carry out their mission of defending the Russian homeland and national interests, as well as the interests of its allies, 2) help improve the Russian economy (a large portion of its composition is made up of the defense industry) by helping Russia remain one of the largest arms exporters in the world.[139]

The defense industry is most interested in keeping itself afloat and flourishing economically. It does this by developing products relevant to the needs of both Russian and foreign military equipment customers. The Ministry of Defense is interested in maintaining and developing the capability to more effectively defend the Russian homeland, Russian national interests, and the interests of Russia's allies. After the 1990s – years of decline, dilapidation, and desertion largely due to underfunding for the Russian Armed Forces – the Ministry of Defense is also interested in maintaining its own relevance as a great military force to attract Russian citizens to join as a career.

It is in the general interest of the Ministry of Finance to balance the federal budget and ensure that enough funds are allocated to all of the necessary state programs (including healthcare, education, and pensions).

Pushes and Pulls Amongst Defense Industry Enterprises

Today the Russian government does not own all of the defense enterprises, but it

does own a significant amount of them, including those within KTRV. As mentioned, KTRV was created by the government, and, through the Federal Agency for State Property Management (Rosimuchestvo), the Russian government owns all of the company's shares.[140]

Without full transcripts of MIC meetings, it is impossible to know just how democratic the meetings are. Recent transcripts of Putin's opening remarks during meetings show that, as the chair, he brings issues to the table, after which a discussion is supposed to begin.[141] Therefore, at least nominally, there is discussion within the MIC. The voting mechanism of the MIC is unknown. The discussion does not seem to leave the boundaries of the MIC. For example, as far as Parliament members do not sit (or at least currently) on the MIC, the discussion does not officially include the legislative branch of the government.[142]

There could very well be disagreement and competition among defense industry enterprises, which is unimpeded by logic of actual military needs or other bureaucratic mechanisms. During the first meeting in which Putin served as the chair of the MIC, on 10 September, 2014, his opening remarks actually suggested that, like with many group-based processes that have a deadline, the decision-making process can become pretty hectic: "…I hope very much that we can avoid excessive hysteria when the final decisions are made and implementation begins."[143] However, in the case of the hypersonics program, as stated above, it seems that more enterprises were included in the drafting of the program and collaborated on the endeavor than might have been enterprises competing to win contracts for it. As KTRV General Director Obnosov noted, over 60 enterprises worked on the draft.[144] In KTRV alone, there are 36 enterprises, which reportedly comprise over 30% of the Russian defense industry.[145] Using these approximations and assuming percentage can be determined by number of enterprises out of the total, this means that there could be about 120 enterprises in the Russian defense industry. According to this logic, approximately one half of the Russian defense industry could have been involved in the initial collaboration.[146] Cooperation and collaboration on the endeavor also includes portions of the Russian Academy of Sciences and other corporations.[147]

The Ministry of Defense Versus the Defense Industry

Whereas in the late Soviet period the interests of the military and the enterprises that built strategic weapons systems were discordant and production was resultantly supply-driven, the interests of the Russian military and defense industry companies seem to be congruent vis a vis type of new hypersonic weapons development.[148] What the Ministry of Defense needs gives many defense industry actors something to do. As evidenced by the military mission section, the output of new high-precision weapons and the new hypersonic weapons that are under development seem to be in

line with military doctrine, as well as the writings and speeches of military leadership discussing the means viewed as necessary to conduct "high technology war" (see below) and effectively carry out Russia's strategic deterrence strategy.

The Russian President's oversight of the MIC, which increased after he became the chair of the body in 2014, has likely helped ensure this smoothness. One should note that, within this top-down dynamic, Putin favors rebuilding the Russian military. This is evidenced by past policies he approved, and his 2012 campaign article arguing for a strong Russian military.[149]

Among Ministry of Defense Personnel

While evidence of disagreement among Ministry of Defense personnel is scarce, there are signs that not all agree on the viability of a "first disarming strike" on Russian Strategic Nuclear Forces with the use of non-nuclear high-precision systems. Those who believe this to be viable likely base it on the idea that the U.S. would assume that in such a scenario Russia would not choose to respond with nuclear weapons after absorbing such a strike, since that would necessarily warrant U.S. nuclear retaliation.[150]

An officially adopted non-nuclear deterrence strategy seems to be the means by which Russia plans to deter such a strike. Despite official agreement on this, Ministry of Defense think tank officials have noted that "[s]ubstantive counterarguments of domestic specialists are ignored and silenced by those who side with such disarming, as if they do not exist."[151] These substantive counterarguments provide logic behind why such an attack is not only highly unlikely, but physically impossible in the foreseeable future.[152] Thus, it seems that arguments which rely on alternate calculations, an historic mistrust of the U.S., a necessity for all militaries to prepare for the worst case scenario, a desire to help feed long-term prosperity of portions of the defense industry and help ensure another mission for the Russian military, or other reasoning have won out.

The Defense Industry and the Ministry of Defense Versus the Ministry of Finance

Tensions between the Ministry of Defense and defense industry on the one hand and the Ministry of Finance on the other have drastically decreased since defense funding reached an historically low point in the 1990s. Nevertheless, some do still exist.[153] As Mathieu Boulègue explains, Putin himself noted this during a visit to the Kalashnikov factory in Izhevsk: "Of course questions of state capabilities, budget possibilities and demands of the Armed Forces always exist. Here we need to find the golden medium at which our expenses in the defense sphere will not suppress all of our other demands related to social issues, social security, pensions, healthcare, education…"[154] Underfunding of the Ministry of Defense helped fuel anti-presidency sentiments during the 1990s. Given historical memory, it is in the

interest of the political party in power to ensure that the needs of both the defense industry and, especially, the Ministry of Defense are satisfied.[155]

Summing Up the Bureaucratic Dynamics

There is evidence of bureaucratic struggle among all of these groups, and within some of these groups, which inevitably has and does affect final decisions taken by the MIC on defense production and state armament. But it seems this is not the main driver behind picking up where the Soviet Union left off with hypersonics. The major bureaucratic actors include the Ministry of Defense and the defense industry on one side representing the need for defense spending, and the Ministry of Finance on the other representing the voice of state budget concerns. Disagreements among defense industry enterprises are not so visible publicly, and it seems that, the largesse of the hypersonic weapons development program is in the interest of as many enterprises as can get contracts. The interests of the Ministry of Defense and the defense industry as a whole seem to align. Evidence suggests that within the Ministry of Defense, opinions favoring decreased or alternate threat perceptions did not move far in the decision-making process for historical, monetary, and political reasons. Thus, it seems that, rather than working-level disagreements and bureaucratic inertia overriding military interests, as characteristic during the 1970s, a more organized, top-down management style has allowed for a demand-driven process.

Implications

Of the three models applied above, Russia's decision to acquire intercontinental- and shorter-range hypersonic weapons is best explained by a mixture of the military mission model and the action-reaction model. Bureaucratic pushes and pulls among the various actors, while present, do not seem to have been a significant factor that led to the adoption of the hypersonic weapons development program. To use a physics analogy, the military missions that reflect the latest wave of military technical revolution in favor of (at least nominally) faster, high-precision weapons as means of deterrence and of deepening the battlefield, the threats from abroad that were perceived and determined to warrant symmetric and asymmetric responses, can be seen as coalescing into the "mass" variable of the "hypersonic weapons development program" momentum. While this piece does not measure the magnitude of the weapons development "velocity," the direction is surely forward.

There are a number of implications of this. One main and rather obvious one is that the weapons Russia develops and tests in this realm have a definite envisioned utility that precedes their deployment. Their production is driven by demand rather than supply. It is unlikely to lead to any "unintended posture," the type of which confused U.S. analysts who watched the Soviets fail to mitigate the potentially destabilizing consequences of having a strategic force composed largely of heavily

MIRVed silo-based ICBMs in the 1970s.[156] Unlike deciphering reasoning behind late Soviet strategic nuclear force posturing, pairing these new strategic and non-strategic means with their missions is more straightforward. When Russian leaders talk about developing and deploying similar systems, they should be taken seriously.

This leads to a second implication: Russia either is or is becoming an arms control negotiating partner with qualitatively-equivalent capabilities in the realm of precision-strike weapons. The issue of definition and whether or not to include conventionally armed boost-glide systems arose during New START negotiations. At this time, the U.S. was ahead of Russia in the development of hypersonics. The U.S. held to the position that "'future non-nuclear systems of strategic range that do not otherwise meet the definitions of the treaty should not be considered new kinds of strategic offensive arms for the purposes of this treaty.'"[157] Russia was of the position that conventionally armed boost-glide systems might serve as "'a new kind of strategic offensive arm.'"[158] According to New START Article 5(2), anything given that definition may trigger discussions in the Bilateral Consultative Commission (BCC) regarding whether and by what means to regulate the systems.[159] With Russia's HGVs deployed and more on the way, and U.S. HGVs under development, this discussion could arise in the near future.

In 2018 when presenting Russia's Avangard, Putin noted: "Why did we do all this? Why did we talk about it? […] we made no secret of our plans and spoke openly about them, primarily to encourage our partners to hold talks. […] nobody really wanted to talk to us about the core of the problem, and nobody wanted to listen to us. So listen now."[160] While other evidence suggests this was not the sole purpose, actually deploying an HGV gives Russia a stronger negotiating position from which to discuss boost glide systems (nuclear- or conventionally armed, at this point). More research on developing weapons in connection to desired negotiating position is warranted.

Shorter-range precision-strike systems, including those that fly at hypersonic speeds, have also shown their power projection and coercive utility in regional settings for Russia. Their use during the Syrian conflict proved this for Russian military leadership.[161] With the INF Treaty out of effect, there is even less of a starting place from which to begin discussing limits on such systems. Nevertheless, if the U.S. and Russia do come to the negotiating table on longer- or short-range precision-strike systems, including ones that fly at hypersonic speeds, the U.S. will find it must work with a partner that sees just as strong a utility for these weapons systems in its military and national security strategy as the U.S. does.

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Notes

1. As of publication date, New START has been extended to 2026.

2. The White House, *Statement from the President Regarding the Intermediate-Range Nuclear Forces* (INF) Treaty, Washington, DC February 1, 2019, https://www.whitehouse.gov/briefings-statements/statement-president-regarding-intermediate-range-nuclear-forces-inf-treaty/?utm_source=twitter&utm_medium=social&utm_campaign=wh as referenced in Amy F. Woolf, "Russian Compliance with the Intermediate Range Nuclear Forces (INF) Treaty: Background and Issues for Congress," Congressional Research Service, August 2, 2019, 1, https://crsreports.congress.gov/product/pdf/R/R43832/38; President of Russia, "Meeting with Sergei Lavrov and Sergei Shoigu," February 2, 2019, Moscow, http://en.kremlin.ru/events/president/news/59763.

3. Alexey Arbatov, "An Unnoticed Crisis: the End of History for Nuclear Arms Control?" Carnegie Moscow Center, March 16, 2015, http://carnegie.ru/2015/03/16/unnoticed-crisis-end-of-history-for-nuclear-arms-control-pub-59378.

4. This could fall into the New START Article 5(2) category of "a new kind of strategic offensive arm."

5. "Meeting with Sergei Lavrov and Sergei Shoigu."

6. Stephen Meyer, "Soviet National Security Decisionmaking: What Do We Know and What Do We Understand?" in ed. Jiri Valenta and William Potter, Soviet *Decisionmaking for National Security* (London: George Allen & Unwin, 1984), 256-279.

7. Ibid.

8. Nikolai Sokov, *Russian Strategic Modernization: Past and Future*, (Lanham: Rowman & Littlefield, 2000).

9. Ibid, 257-268, 275.

10. Meyer, "Soviet National Security Decisionmaking," 257.

11. See Alexander Dallin, "The Domestic Sources of Soviet Foreign Policy" in Seweryn Bialer ed.,*The Domestic Context of Soviet Foreign Policy* (Boulder: Westview Press, 1981), 346-347, and 364 note 78, and Celeste Wallander, "The Sources of Russian Conduct: Theories, Frameworks, and Approaches," in *The Sources of Russian Conduct After the Cold War*, ed. Celeste Wallander (Boulder: Westview Press, 1996) as referenced in Sokov, *Russian Strategic Modernization*, 261-265.

12. Pavel Podvig, "Russian Nuclear Strategy," Center for Strategic and International Studies, June 27, 2016, 9:55-13:00, https://www.csis.org/events/russian-nuclear-strategy.

13. Pavel Podvig and Alexander Stukalin, "Russia Tests Hypersonic Glide Vehicle,"*IHS Jane's*, June 4, 2015;Pavel Podvig, "Document Details Soviet Response to the Star Wars Missile Defense Program,"*Russian Strategic Nuclear Forces*(blog), March 21, 2018, http://russianforces.org/blog/2018/03/document_details_soviet_respon.shtml.

14. Meeting of the Valdai International Discussion Club, President of Russia, October 24, 2014, http://en.kremlin.ru/events/president/news/46860, as referenced in Arbatov, "An Unnoticed Crisis."

15. "Boris Satovsky: Hypersonic Aircraft Will Break Through Missile Defenses," (*Boris Satovsky: Gipersvukovie Letatelnie Apparati Prorvut PRO*), *Ria Novosti*, December 16, 2016, https://ria.ru/20161216/1483773921.html.

16. William Wolforth, *The Elusive Balance: Power and Perceptions During the Cold War* (Ithaca: Cornell University Press, 1993), 189 as referenced in Sokov,*Russian Strategic Modernization*, 4.

17. Meyer, "Soviet National Security Decisionmaking," 257.

18. Ibid, 257.

19. Ibid, 259-260

20. Jiri Valenta, "Soviet Decisionmaking in Czechoslovakia, 1968," in Jiri Valenta and William Potter ed., *Soviet Decisionmaking for National Security,*166.

21. Ibid, 166.

22. Nikolai Sokov, "Bureaucratic and Interest Group Explanation for Soviet Policy," (doctoral dissertation, The University of Michigan, 1996), 1-2.

23. Dallin, "The Domestic Sources of Soviet Foreign Policy," 346-347, and 364 note 78.

24. Meyer, "Soviet National Security Decisionmaking," 261.

25. See Dallin, "The Domestic Sources of Soviet Foreign Policy" 346-347, and 364 note 78, and Celeste Wallander, "The Sources of Russian Conduct" as referenced in Sokov, *Russian Strategic Modernization*, 5. See also Meyer, "Soviet National Security Decisionmaking," 261-265.

26. See discussions on government and defense decision-making structure in Sokov, "Bureaucratic and Interest Group Explanation for Soviet Policy," 6 and Elizabeth Teague, "Pluralism Versus Corporatism: Government, Labor, and Business in the Russian Federation," in Anthony Jones and Carol R. Saivetz ed.,*In Search of Pluralism: Soviet and Post-Soviet Politics*, (Boulder: Westview Press, 1994) 110.

27. Meyer, "Soviet National Security Decisionmaking," 266.

28. Ibid.

29. Ibid, 267.

30. Sokov, *Russian Strategic*Modernization, 2, 5.

31. Amy Woolf, "Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues," Congressional Research Service, February 3, 2017, 8, https://fas.org/sgp/crs/nuke/R41464.pdf; James Acton, *Silver Bullet? Asking the Right Questions About Conventional Prompt Global Strike*, Carnegie Endowment for International Peace, 5-6, http://carnegieendowment.org/2013/09/03/silver-bullet-asking-right-questions-about-conventional-prompt-global-strike- pub-52778.

32. Acton, *Silver Bullet?* 5-6.

33. Protocol to the Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms, paragraphs 6 and 10, https://www.state.gov/documents/organization/140047.pdf; Treaty Between the United States Of America And The Union Of Soviet Socialist Republics On The Elimination Of Their Intermediate-Range And Shorter-Range Missiles (INF Treaty), Article II (1, 2), https://www.state.gov/t/avc/trty/102360.htm#text.

34. This high speed forces air from the atmosphere through the ramjet engine at maintained supersonic speeds, allowing the vehicle to continue traveling forward at hypersonic speed. Vehicles without any initial booster engine that travel at supersonic speeds (below approximately Mach 4) use ramjet engines. These do not have the compressors (fans) used in jet engines; the supersonic speed forces oxygen through the engine at subsonic speeds.Acton,*Silver Bullet?*, 54.

36. The issue of using such conventional weapons systems in deterrence roles previously reserved for nuclear weapons became part of U.S. debate about arming its own systems in the early 2000s. See Woolf, "Conventional Prompt Global Strike and Long-Range Ballistic Missiles," 7.

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121. Kokoshin, "Ensuring Strategic Stability," 57-58.

122. Ibid, 57.

123. Meeting of the Valdai International Discussion Club, October 24, 2014, http://en.kremlin.ru/events/president/news/46860, as referenced inActon ed., Arbatov et al., "Entanglement," 26.

124. Speech of the Chief of the Russian Federation Armed Forces General Staff—First Russian Federation Deputy Defense Minister, Army General Valeriy Gerasimov at the Public Meeting of the Defense Ministry Collegium.

125. Pavel Podvig, Igor Sutyagin, and Boris Zhelezov, "The Structure and Operations of Strategic Nuclear Forces" in Pavel Podvig ed., *Russian Strategic Nuclear Forces*, (Cambridge: MIT Press, 2001), 49.

126. Ibid, 45-49; "Presidential Commissions," President of Russia, accessed January 7, 2018, http://en.kremlin.ru/structure/commissions#institution-41.

127. "Presidential Commissions."

128. "Gala Evening Marking 60 Years of the Military-Industrial Commission," President of Russia, December 14, 2017, http://en.kremlin.ru/events/councils/by-council/41/56380; "History of the MIC," (*Istoria VPK*), MIC Feed, last updated 2014, http://www.oborona.gov.ru/vpk/history; "Meeting on Drafting the 2016-2025 State Armament Programme," President of Russia, last updated September 10, 2014, http://en.kremlin.ru/events/councils/by-council/41/46589.

129. Podvig et al., "The Structure and Operations of Strategic Nuclear Forces," 49.

130. "Gala Evening Marking 60 Years of the Military-Industrial Commission."

131. Russia defines "military policy" as "the activities of the State aimed at organizing and conducting defence and maintaining the security of the Russian Federation as well as the interests of its allies." The Military Doctrine of the Russian Federation, Februay 5, 2010, paragraph 8(и); "The Military Doctrine of the Russian Federation," June 29, 2015, paragraphs 8(i) and 17.

132. According to the Russian law "On the State Defense Order," (*O Gosudarstvennom Oboronnom Zakaze*), the state consumer is a "federal organ of the executive branch or the Rosatom Atomic Energy State Corporation" and "ensures the supply of products in accordance with the State Defense Order." See Article 3(2), http://www.scrf.gov.ru/security/military/document125/.

133. "Composition of the Russian Federation Military Industrial Commission Collegium in revision of the Government order from 23 January 2019 No55-r," (*Sostavkollegii Voenno-promishlennoy komissii Rossiiskoy Federatsii v redaktsii rasporyazhenia Pravitelstva ot 23 yinvarya 2019 goda No55-r*), The Government of Russia, http://government.ru/info/35475/. Dmitry Rogozin served this post until recently. See "Collegium of the Russian Federation Military-Industrial Commission," Government of Russia, accessed February 3, 2018, http://government.ru/department/300/about/.

134. "Composition of the Russian Federation Military Industrial Commission Collegium in revision of the Government order from 23 January 2019 No55-r"; "Commission Composition," (*Sostav Comissii*), Military-Industrial Commission Collegium, last updated October 10, 2014, http://www.oborona.gov.ru/vpk/members1; Presidential Decrees 628, 49, 319, 25, 334, and 495, The Government of Russia, http://government.ru/department/300/members/.

135. "Composition of the Russian Federation Military Industrial Commission Collegium in revision of the Government order from 23 January 2019 No55-r."

136. "About the Corporation"; JSC Tactical Missiles Corporation, Yearly Report for 2011, 7, http://www.ktrv.ru/about/raskrytie-informatsii/finansovye-otchety/.

137. See Podvig et al., "The Structure and Operations of Strategic Nuclear Forces." Sokov explains how in general such decisions were heavily influenced by the Politburo, since it gave responsibility to certain actors to make a given defense decision. See Sokov,*Russian Strategic Modernization*, 22.

138. "Meeting on Drafting the 2016-2025 State Armament Programme."

139. "The Military Doctrine of the Russian Federation," June 29, 2015, paragraphs 5, 18,and 52.

140. "Tactical Missiles Corporation," (*Korporatsia Takticheskoe Raketnoe Vooruzhenie*), *RBK*, https://www.rbc.ru/companies/id/467; "'How to Not Lose the Missile War,' – Boris Obnosov, Tactical Missiles Corporation General Director," (*'Kak ne Proigrat Raketnuyu Voinu,' – Boris Obnosov, Gendirektor Korporatsii 'Takticheskoe Raketnoe Vooruzhenie'*), *Vedomosti*, September 25, 2007, https://www.vedomosti.ru/newspaper/articles/2007/09/25/kak-ne-proigrat-raketnuyu-vojnu---boris-obnosov-gendirektor- korporacii-takticheskoe-raketnoe-vooruzhenie.

141. See for example "Meeting on Drafting the 2016-2025 State Armament Programme."

142. "Composition of the Russian Federation Military Industrial Commission Collegium in revision of the Government order from 23 January 2019 No55-r."; "History of the MIC"; Presidential Decrees 628, 49, 319, 25, 334, and 495.

143. "Meeting on Drafting the 2016-2025 State Armament Programme."

144. "In Russia Work is Underway to Build Hypersonic Weapons," (*V Rossii vedutsya rabotiy po sozdaniyu giperzvukovovo oruzhiya*), *RIA Novosti*, April 23, 2013, https://ria.ru/20130423/934037911.html.

145. "About Corporation," (*O korporatsii*), JSC Tactical Missile Corporation, http://eng.ktrv.ru/about/;

"General Director of KTRV Boris Obnosov: 'The First Hypersonic Aircraft will Arise at the Beginning of the Next Decade" (*Gendirektor KTRV Boris Obnosov: 'Pervie Giperzvukovie Letatelnie Apparati Poyavyatsa v Nachale Sleduyushevo Desyatiletiya'*), *Interfax-AVN*, http://militarynews.ru/story.asp?rid=2&nid=439291.

146. Obnosov was noted as explaining at the 2013 Moscow Air Show that creating such vehicles takes the creation of new types of materials, technologies, and engines, and requires the uniting of "a large amount of production enterprises." "Russian Scientists Were Told to Creat a Hypersonic Aircraft," (*Rossiskim Uchyonim Poruchili Sozdat Giperzvukovoy Letatelniy Apparat*), *Interfax*, May 3, 2017, http://www.interfax.ru/russia/560994.

147. Zudin, "Russia to Draft Hypersonic Missile Programme in Mid-2013"; "Russian Scientists Were Told to Create a Hypersonic Aircraft."

148. Sokov, *Russian Strategic Modernization*, 4.

149.]Vladimir Putin, "Being Strong: National Security Guarantees for Russia,"*Rossiyskaya Gazeta,*February 20, 2012, http://archive.premier.gov.ru/eng/events/news/18185/.

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151. Akhmerov, Akhmerov, and Valeev, "It Won't Happen Fast."

152. Ibid.

153. Their decrease is likely due to the presence of more money for allocation to defense budgets.

154. "Meeting with Workers of the Kalashnikov Company," (*Vstrecha s Rabochimi Kontserna "Kalashnikov"*), President of Russia, September 20, 2016 ,http://www.kremlin.ru/events/president/news/52921 as referenced in Mathieu Boulègue, "Russia's New State Armament Programme Offers a Glimpse at Military Priorities," Chathem House, November 27, 2017, https://www.chathamhouse.org/expert/comment/russia-s-new-state-armament-programme-offers-glimpse-military- priorities.

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157. U.S. Senate, *Treaty With Russia on Measures for Further Reduction and Limitation of Strategic Offensive Arms (*The New START Treaty), Report, EXEC. REPT. 111-6, 111th Cong., 2nd sess. (October 1, 2010), 51-52, https://www.foreign.senate.gov/imo/media/doc/CRPT-111erpt6.pdf, as referenced in Woolf, "Conventional Prompt Global Strike and Long-Range Ballistic Missiles," 41, and Acton,*Silver Bullet*, 139. See also 55 specifically, and 51-57.

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