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EVOLUTION OF THE STRATEGIC ROCKET FORCES OF THE RUSSIAN FEDERATION IN THE POST-COLD WAR ERA

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Abstract: *Since the collapse of the Soviet Union in 1991, the Russian Federation has placed great effort and resources in maintaining the quantitative and qualitative characteristics of its strategic nuclear forces. The land-based component in particular, the RVSN, encompasses the larger part of Russia's strategic nuclear arsenal and as such warrants examination and assessment against the backdrop of dynamic and adversarial relations in the international system of security relations, particularly between the major nuclear powers. The following paper will examine the transformative processes within Russia's Strategic Rocket Forces over the past three decades, with the principal objective to deconstruct the main policy directions, vectors of technical development and present state and structure of formations. Principal political decisions in the examined time-frame are tied with set goals encompassing Russian modernisation efforts of the land-based strategic nuclear arm, with the historical processes in turn tied to an evaluation of present-day capabilities in both technical terms and observations on the organisational structure of the RVSN as the main strategic nuclear deterrent within Russia's broader nuclear capabilities.*

Keywords: *Russia; RVSN; nuclear deterrence; intercontinental missiles.*

"After us - silence" ("После нас - тишина")
Motto of the Strategic Rocket Forces of the Russian Federation

Introduction

Strategic nuclear stability and credible deterrence have long served as pillars of global security, underpinned by the delicate interplay of capability, doctrine, and arms control — particularly between the United States and the Russian Federation, the Soviet Union's principal successor state. Within this framework, the Strategic Rocket Forces (Ракетные войска стратегического назначения, RVSN) of the Russian Federation constitute the backbone of Russia's strategic nuclear deterrent and assured second-strike capability. As a distinct branch of the Russian Armed Forces, the RVSN operates alongside the air- and sea-based legs of Russia's nuclear triad, controlled by the Russian Air and Space Forces (VKS) and the Russian Navy (ВМФ), respectively. Tasked with the supervision of the country's land-based strategic nuclear arsenal, the RVSN oversees both silo-based and mobile intercontinental ballistic missile (ICBM) systems, as well as newer land-based strategic and sub-strategic nuclear platforms designed to bolster Russia's deterrence posture (Bukharin, Kadyshev, et al. 2001, 36-37).

Since the end of the Cold War, the evolution of Russia's nuclear posture has been shaped by a confluence of geopolitical upheavals: the Soviet collapse, economic instability, the erosion of the nuclear arms control regime, and the progressive deterioration of relations with the United States and NATO. These pressures have driven shifts in strategic priorities, structural reconfigurations, doctrinal adjustments, and ambitious modernisation efforts aimed at enhancing the RVSN's capabilities. Over the past three decades, this transformation has encompassed a transition from aging Soviet-era systems to a force structure incorporating modern mobile launch systems, modernised silo-based missile complexes, the widespread incorporation of multiple independently targetable re-entry vehicles (MIRVs), and initial introduction of hypersonic glide vehicles (HGVs) - all designed to improve survivability - increase strike flexibility, and penetrate advanced missile defence umbrellas. Far from a perceived Cold War relic, the RVSN has evolved into a dynamic instrument of Russian 21st-century statecraft, playing a central role in shaping contemporary assessments of strategic stability amid a renewed arms race and the breakdown of global security architectures (Congressional Research Service 2025, 1).

As of available data in 2024, the RVSN ICBM component of Russia's strategic nuclear deterrent encompasses 1,244 total operational strategic warheads spread across 329 road-mobile and silo-based launchers, making it the most significant in Russia's nuclear triad of 1,822 total operational strategic offensive nuclear warheads (992 within the VMF and 586 within the VKS) (Hans M. Kristensen 2024). As such, the RVSN is of objective interest in understanding the overall military capabilities of Russia.

The following paper will examine the *Strategic Rocket Forces of the Russian Federation, as the main object of analysis*. More specifically, *the principal vectors in the evolution of the RVSN in the period from 1991 until present (2025) will be explored, expressed in the political priorities, doctrinal changes, technical direction of development, and current state of RVSN capabilities*. Consequently the paper is divided into three main sections – the first dealing with the dynamics of the post-Soviet centralisation of nuclear deterrence capabilities in Russia, dealing with economic and financial constraints, treaty stipulations and the maintaining of nuclear parity with the United States; the second dealing with the vectors of technical development, expressed in a greater focus on road-mobile ICBMs and the introduction of newer generation systems with superior capabilities; and the third serving as a general case study and demonstration of the qualitative and quantitative characteristics of the traditional components of the RVSN through the examination of the organisational structure and capabilities. The following paper has *as its principal objective to provide an updated and objective assessment of the Russian Strategic Rocket* Forces through an overall understanding of the overarching processes of the evolution of the RVSN.

In fulfillment of the principal objective, the paper first undertakes a deconstructive analysis of political decisions undertaken by the Russian Federation in relation to its strategic nuclear assets within the framework of bilateral and multilateral diplomatic decisions. Thus, the conduct of Russia as an actor within the international system is taken as the first point of reference in understanding the defined scope of the paper. Based on this analysis and through the process of extrapolation, certain technical vectors in the development of the RVSN are derived and the specific qualitative aspects listed in the chronological order of their inclusion as part of the broader strategic deterrence capabilities of Russia. Concurrently and based upon a data-set of biannual changes in both the qualitative and quantitative ratios of the RVSN arsenal within the set time-frame of examination, conclusions are drawn as to the achievement of set technical and policy objectives, as well as the overall fluctuations in deterrence capability. Finally, and based upon a process of image intelligence analysis of several known Russian RVSN sites, conclusions are drawn as to the manifestations of changes within the organisational and technical levels of the two main types of RVSN formations.

The objective assessment of the RVSN requires a multi-dimensional framework integrating quantitative, qualitative, and policy-oriented criteria. In quantitative terms, the evaluation centres on measurable factors such as the size of the arsenal (deployed warheads, delivery systems), readiness rates, and geographic distribution of assets. Qualitatively, the focus shifts to the technological characteristics (e.g., types of systems, warhead capacity, system survivability). Policy criteria examine Russia's declaratory nuclear posture, compliance within bilateral treaties, and strategic signalling. These layers collectively determine the RVSN's operational credibility, deterrent value, and adaptability to evolving geopolitical or technological constraints. Crucially, the interplay between these criteria informs debates on strategic stability, arms race dynamics, and Russia's capacity to effectively project power.

A structured evaluation procedure encompasses open-source intelligence aggregation (e.g., SIPRI, FAS, Russian MOD releases) to establish baseline quantitative metrics in a data-set of RVSN capabilities from 1991 until present. Consequentially, a qualitative analysis employs technical assessments of missile systems (e.g., range, payload, countermeasure efficacy) juxtaposed against define vectors in systems development. Policy alignment is scrutinized through treaty compliance records and patterns in force modernization vis-à-vis stated strategic goals and retrospective analysis of the RVSN's quantitative and qualitative characteristics. Cross-referencing these datasets with third-party analyses mitigates biases inherent in Russian disclosures. This procedure ensures a holistic understanding of the RVSN's role in shaping Russia's strategic calculus and its implications for global security architectures.

A notice of importance and consideration in the further discussions on the topic of the following paper is the measure of accuracy of the information provided and discussed, which pertains to the what can be considered as the most vital information for the security of any nuclear-armed state, especially in consideration of the dynamic and evolving international environment of extreme adversarial relations and narratives. Thus, the following paper makes no effort to ascertain or inform upon the reader exact technical or other qualitative characteristics of past or contemporary systems, outside of what has been officially communicated by state parties publicly and through the (now mostly defunct) framework of bilateral treaties between the United States and Russia, which as the basis of effective deterrence requires the communication of accurate and mutually verifiable data on nuclear arsenals, at least in quantitative terms and launch platforms. Regardless, and in reflection upon the set topic, which encompasses specific systems fielded recently, or not as of yet adopted into service, the provided information and the deliberations upon it will be based on publicly available information and logical extrapolations, as well as the chief understanding that for effective deterrence to exist between nuclear armed states, each must be made aware of the other's capabilities and thus information communicated by state parties and declared capabilities should bear a degree of truthfulness, even as an instrument of intimidation.

1. The Strategic Rocket Forces in Transition. Political Direction and the Treaty Regime

In understanding the evolution of contemporary Russian strategic nuclear capabilities, and specifically those of the RVSN, the first consideration of note is the period of transition in the immediate aftermath of the fall of the Soviet Union. In this period, the Russian Federation first sought to consolidate the Soviet nuclear arsenal under its sole authority, whilst eliminating the possibility of other former Soviet states retaining their own nuclear capabilities. At the same time, Russia examined its future relationship with the United States of America and envisioned its future security considerations revolving around a state of continued deterrence through maintaining and expanding upon treaty obligations, ensuring quantitative and qualitative parity, particularly in strategic nuclear arms. In the period from 1991 to 2019, both of these aspects in Russian policy, formed the basis for the future evolution and present state of Russian land-based strategic nuclear capabilities, and will be the focus of the following chapter.

The most nascent priority for the Russian Soviet Federative Socialist Republic, at the late stages of the dissolution of the Soviet Union in the period 1990-1991, was ensuring the future security of the state through the predominance of Russia in the power vacuum of the post-Soviet space. A consideration of extreme importance was the vast Soviet nuclear arsenal of both strategic and non-strategic nuclear weapons, spread across the former territory of the Union, as well as the associated infrastructure for the production, storage, maintenance, research and delivery of such weapons. The subdivision of Soviet strategic nuclear assets, 10,271 installed strategic warheads, presented a general challenge for Russian political and security considerations – 1,408 in Ukraine, 1,360 in Kazakhstan and 54 in Belarus (Walker 1992, 258, Norris 1992, 49). Additionally, non-strategic nuclear weapons across former Soviet states outside Russia, encompassed 2,605 in Ukraine, 1,120 in Belarus, 650 in

Kazakhstan, and 1,280 across the territories of Moldova, the Baltic states, Georgia, Armenia and Azerbaijan (Walker 1992). Opposed to these numbers, Russia, retained on its territory 7,450 strategic and 8,550 non-strategic warheads, along with the major production and most research and development facilities, nestled deep into the territory of the former Soviet Union (Bukharin 2002). Moreover, the administration of the Soviet nuclear arsenal was vital in consideration of the future status of Russia, particularly in its future relations with the United States of America. Thus, two major goals can be outlined, and observed upon in retrospect as having manifested in Russia's policy and goals in the immediate period after the fall of the Soviet Union:

- The retention of sole control over the vast Soviet nuclear arsenal and the "de-nuclearisation" of all other constituent Soviet republics, chiefly the Belarusian, Ukrainian and Kazakh SSRs.
- The maintaining of a quantitative and qualitative nuclear balance with the United States in the post-Soviet era, as a measure of effective future deterrence (Podvig, Russia's Nuclear Forces: Between Disarmament and Modernization 2011, 2).

In the first instance, the Russian Federation achieved its goals through a multi-vectored approach directed towards both the immediate post-Soviet space and the larger international arena. Within the framework of agreements on the dissolution of the Soviet Union and with the establishment of the organisation of the Commonwealth of Independent States (CIS), as a basis of future cooperation between post-Soviet states, the Russian Federation secured major recognitions, which facilitated the key goal of retention of all soviet nuclear arms. Within the Alma-Ata protocol of December 21st, 1991, "[Russia's] continued permanent membership on the U.N. Security Council" (text of decision by the council of heads of states of the Commonwealth of Independent States - I.L.M. pg. 151) was recognised, thus facilitating the position as sole successor state of the Soviet Union within the international system of relations, when concerned with the UN's most powerful body and all underlying binding international agreements. Within the establishing framework of the CIS and the Agreement on Joint Measures with Respect to Nuclear Weapons, "Belarus and Ukraine [acceded] to the 1968 Non- Proliferation Treaty as non-nuclear states and conclude an IAEA safeguards agreement; non-transfer of nuclear weapons, except to Russia" (Art. 5), establishing prior that all nuclear weapons on the territory of the two states will be up to "the President of Russia [to] decide their use" (Art. 4) (Commonwealth of Independent States 1991, 152). Thus, Russia ensured that other post-Soviet states will undergo nuclear disarmament, managed by Russian leadership, and would also forego aspirations to nuclear arms through both binding international agreements such as the Treaty on the Non-Proliferation of Nuclear Weapons, but also through political agreements within the closed framework of the Organization for Security and Co-operation in Europe (OSCE), with the Budapest Memorandum of 1994, which further underlined the non-nuclear status of Ukraine, Belarus and Kazakhstan (Memorandum on security assurances in connection with Ukraine's accession to the Treaty on the Non-Proliferation of Nuclear Weapons 1994, Memorandum of Security Assurances in connection with the Republic of Belarus Accession to the Treaty on Non-Proliferation of Nuclear Weapons 1994, Instruments deposited with the Government of the Russian Federation on: 20 May 1994 Kazakhstan 1994, 354).

In the second instance, the Russian Federation pursued the continued establishment and maintenance of qualitative and quantitative control mechanisms for nuclear armaments between itself and the United States, with the due consideration that the Russian resource potential could no longer sustainably maintain an arsenal of competitive parity. Within the established status of the direct successor state of the Soviet Union, the Russian Federation was also the responsible party in all preceding multilateral or bilateral nuclear arms control treaties – the Outer Space Treaty, Nuclear Non-Proliferation Treaty, Anti-Ballistic Missile Treaty (ABM Treaty), Intermediate-Range Nuclear Forces Treaty (INF Treaty), amongst others, which together made the "nuclear treaty regime" between the United States and Soviet Union (Marinov, The Strategic Nuclear Treaty Regime at a Crossroads. The (Im)Possible Search for a New Point of Balance? 2022, 100). Russia particularly pursued the further implementation of the Strategic Arms Reduction Treaty (START I Treaty), signed between the

United Stated and the Soviet Union on July 31st, 1991, months before the collapse of the latter, as the first effective treaty to lead to concrete steps in general reductions to the strategic and non-strategic nuclear arsenals of the two “nuclear superpowers” (START I 1991). The START I Treaty facilitated for Russia the position of equal nuclear power with the United States in the post-Cold War era, binding both states to continue massive reductions of their corresponding nuclear arsenals and allowing for Russia to begin an internal process where only the most capable and modern systems would be left in operation (START I 1991). The subsequent 1993 START II Treaty would be ratified by Russia, but by the treaty’s entry into force in 2000, the chief goal of eliminating multiple warheads on armaments would face hostility from Russia and lead to the abandonment of the START II in 2002 (Treaty Between the United States of America and the Russian Federation on Further Reduction and Limitation of Strategic Offensive Arms (START II) 1993), with the official reason being the US withdrawal from the ABM Treaty. However, the concurrent 2002 Strategic Offensive Reductions Treaty (SORT) (Treaty Between the United States of America and the Russian Federation On Strategic Offensive Reductions 2002) and subsequent 2010 New START Treaty (New START) would be adopted by Russia and thus facilitate further overall reductions in both warhead and launcher numbers (U.S. Department of State 2022). Through the maintenance of *treaty regime*, Russia pursued continued parity with the United States, whilst simultaneously limiting the economic and financial burden that the strategic nuclear forces would place on the country. Yet, qualitative treaty stipulations, such as the attempts at elimination of MIRVs and the INF Treaty’s constraints on intermediate missile development would be viewed with hostility in the face of Russia’s objective to maintain an offensive strategic nuclear arm, which is a threat to the United States and specifically against sophisticated US ABM capabilities. As the treaty regime progressively collapsed after the termination of the INF Treaty in 2019 (Lopez 2019), Russia froze its participation in mechanisms concerned under New START in 2023 (Diaz-Maurin 2023), whilst at least superficially maintaining the set quantitative limitations. Overall, a chief objective of Russia in the treaty regime over the preceding decades can be found in successful attempts to lower nuclear arsenals for the sake of the effective, more efficient and more economic completion of Russia’s nuclear rearmament efforts, whilst maintain that the US would not begin an arms race in the field.

Through the political processes of the 1990s, the Russian Federation successfully maintained its sole status as a nuclear power in the post-Soviet space. Moreover, through engagement in bilateral agreements with the United States, Russia maintained a status of qualitative and quantitative parity. The set treaty conditions would allow the Russian Federation to vastly optimise its arsenal and set the stage for future modernisation efforts and replacement of systems going into the 2000s.

2. Vectors of Strategic Weapons Development

With the establishment of Russia as the sole nuclear power of the post-Soviet space and the reinforcing of the nuclear treaty regime between itself and the United States, the next observable phase in the evolution of the Russian strategic nuclear forces, and specifically within the RVSN, was the vector of future strategic weapons development.

At the initial stage of the 1990s, Russia and the RVSN found themselves as the inheritors of a vast and diversified strategic nuclear arsenal, which encapsulated the doctrinal approaches and vision of the Soviet Union in the 1980s. A lesser portion of the total arsenal were modernised legacy ICBM systems introduced in the mid-1970s, such as the UR-100 (SS-11), RT-2P (SS-13) and MR-UR-100 (SS-17). The majority of ICBM capabilities were made up of then current generation missile complexes, such as the R-36M (SS-18), RS-18A (SS-19), RT-23 (SS-24) and RT-2PM (SS-25) (Stockholm International Pece Research Institute 1991, 18-20). Soviet silo-based ICBM development at this stage had focused on the mass deployment of multiple independently targetable re-entry vehicles (MIRV) in the ICBM fleet, as well as the development of super-heavy ICBMs, such as the R-36 with up to 10 MIRVs, as a departure from the 1960s-era focus on massive monobloc warheads.

Concurrently, and as a continuation of successful efforts in the development of operational and operational-tactical missile launch systems, a separate focus was placed on the development of the road-mobile RT-2PM “Topol” ICBM, with a singular warhead, as a potential “countervalue” system in the Soviet arsenal. The specific technical direction of development in the Russian Federation would follow the later-stages Soviet doctrine into the 2000s, albeit with the nuances of the implementation of the nuclear treaties and a turnover in system generations.

In the conditions of the START I Treaty and the quantitative limitations set therein, as well as the factor of severe financial constraints, Russian land-based strategic nuclear power was formalised around retaining only the R-36M, RS-18A, RT-23 and RT-2PM, where the MIRV-capable R-36M and RS-18A would be the main strategic nuclear deterrent, supplemented to a much lesser extend by the rail-mobile or silo-based RT-23 (Table 2). The road- and silo-based monobloc RT-2PM “Topol” would continue to be introduced into the strategic missile forces as an additional pillar of enhanced survivability and assured-second strike capability in the period from 1991 to 1997. Throughout the 1990s and even as the Topol was still entering service, development would continue on its successor, the RT-2PM2 “Topol-M” (SS-27), which would fulfil much the same role, albeit with improved technical characteristics (Podvig, Russia’s Nuclear Forces: Between Disarmament and Modernization 2011, 10). The RT-2PM2 Topol-M would enter service in 1999, but would not replace the older RT-2PM, with only 78 combat-ready launchers (excluding tests and replacements) and itself would in the 2000s be superseded by a more advanced design, the RS-24 “Yars” (Podvig, Russia’s Nuclear Forces: Between Disarmament and Modernization 2011, 10).

By 2000 the future vector of technical development would begin to be shaped by evolving geopolitical factors and changing pace of modernisation and replacement programs. On one hand, the preconditions of the START II Treaty elimination of multiple warheads from launch platforms, was seen as overtly critical in undermining Russian deterrence capabilities due to the over-reliance of MIRV-capable platforms, such as the R-36M. On the other hand, and in consideration of the US withdrawal from the ABM Treaty in 2002, MIRV-capable systems were declared by Russia as vital to their own offensive strategic nuclear arsenal and against potential US ABM development (Fedorov 2005, 15). As such, technical development was directed towards all elements of the RVSN in order to increase future capabilities through replacement programs. The first such program was the development of a MIRV-capable replacement for both the Topol and Topol-M in both their mobile- and silo-based configurations – the RS-24 “Yars” (SS-27 mod 2). The Yars would finish development and testing by 2010, and would see initial deployment by 2010 (Kristensen 2014). Essentially a further evolution of the Topol-M (given the NATO designation SS-27 mod 2 to reflect this), the Yars possesses a missile bus with 4, or potentially more, re-entry vehicles in addition to superior accuracy and missile velocity. Full deployment of the RS-24 would take from 2010 to 2025, when it would replace all Topol and Topol-M systems (Интерфакс 2024), thus precipitating a significant change in the overall balance of nuclear strike power within the RVSN – the mobile element would reduce the number of launchers; however, the number of total deployed warheads on mobile launchers would be significantly increased and would thus constitute a larger share of the RVSN’s total assets, allowing for the retirement of more R-36 and particularly RS-18 systems (Hans M. Kristensen 2024).

During the same period, development began on the replacement of the R-36M and RS-18-series missile complexes, which would require the development of a new superheavy ICBM – the RS-28 “Sarmat” (SS-29). As a successor to the R-36, the Sarmat strives to achieve and surpass the characteristics of its predecessor. The missile bus payload is projected at 10 or more re-entry vehicles in addition to numerous defensive mechanisms, such as penetration aids, due to the missile’s projected large throw weight (Persico 2017). A stated goal by Russian political and military speakers, for the RS-28, is to further enhance ABM penetration capabilities through a return to the fractional-orbital bombardment system (FOBS), wherein an ICBM would achieve a fractional polar orbit to approach intended targets from unplanned for non-ballistic trajectories. In principle, increased delta-v for a fractional orbit at the expense of missile bus payload reduction can allow for an already proven

Cold War-era concept with newer generation missile technology. The scale to which this is a practicable concept against a sophisticated missile defence umbrella, is beyond the scope of the present paper (Listner 2022). Regardless, the RS-28 would have a problematic development, which would make the missile ready for deployment only by 2024, after a series of failed tests, delays and the general accumulating costs of the programme (Kaushal 2024).

As an addition to the development of new generation offensive missile systems, Russia had set forth to further refine missile defence penetration capabilities through a drastic increase in the singular capabilities of warheads after missile release (Congressional Research Service 2024, 2, Каракаев 2019, 36). Such development within the RVSN were focused on the incorporation of hypersonic glide vehicles (HGVs), which would go beyond the technical capabilities of previous generation manoeuvrable re-entry vehicles (MaRVs). The "Avangard" HGV missile system (Object 4202) continued as a further development of preceding Soviet HGV programmes (Podvig, Russian hypersonic vehicle - more dots added to Project 4202 2014) and was flight tested in 2018 (Минобороны России 2018). Demonstrated compatibility has been shown with both the R-36 and RS-18 ICBMs, with the RS-18 becoming the main operational carrier in 2019 (CSIS 2024) and by 2025, with at least 10 operational systems and an unknown number fitted to R-36s (Hans M. Kristensen 2024).

The 2024 approximation of RVSN capabilities, as defined by the Federation of American Scientists (FAS) and their corresponding methodology of force projection, can be examined below:

Table no. 1: RVSN number of launchers and warheads. Of note is that the FAS methodology assumes maximum possible warhead deployment, whereas this is not certain to be the case (Hans M. Kristensen 2024).

Type	No. of launchers deployed	Warheads per missile and assumed yield	Deployed Warheads
R-36M	34	10 x 500/800 kt	340
RS-18 "Avangard"	10	1 x Avangard HGV (unknown yield)	10
RT-2PM2 (mobile)	18	1 x 800 kt	18
RT-2PM2 (silo)	60	1 x 800 kt	60
RS-24 (mobile)	180	4 x 100 kt	720
RS-24 (silo)	24	4 x 100 kt	96
	Total: 329		**Total:** 1,244

The overall vector of missile development, deployment and replacement within the RVSN throughout the examined period can be visualised and surmised in the below set of tables, which contain a biannual assessment of the types, number and warheads within the RVSN based on data from the START agreements, FAS and SIPRI:

Table no. 2: Biannual review of Russian land-based strategic nuclear assets since 1991. NATO identification used for system type. SS-27* denotes SS-27 mod 2 (RS-24 Yars). Data compiled based on SIPRI, FAS and START numbers.

Year	Type	No. deployed	Deployed Warheads	Year	Type	No. deployed	Deployed Warheads
1991	SS-11	310	310	**1993**			
	SS-13	30	30				
	SS-17	50	200		SS-17	40	160

Year	**Type**	**No. deployed**	**Deployed Warheads**	**Year**	**Type**	**No. deployed**	**Deployed Warheads**
	SS-18	308	3,080		SS-18	308	3,080
	SS-19	250	1,500		SS-19	300	1,800
	SS-24	86	860		SS-24	92	920
	SS-25	300	300		SS-25	378	378
		Total: 1,334	**Total:** 6,280			**Total:** 1,118	**Total:** 6,338
1995	SS-18	248	2,480	**1997**	SS-18	180	1,800
	SS-19	260	1,560		SS-19	160	960
	SS-24	46	460		SS-24	46	460
	SS-25	333	333		SS-25	369	369
		Total: 887	**Total:** 4,833			**Total:** 755	**Total:** 3,589
1999	SS-18	180	1,800	**2001**	SS-18	180	1,800
	SS-19	160	960		SS-19	150	900
	SS-24	46	460		SS-24	46	460
	SS-25	360	360		SS-25	360	360
	SS-27	10	10		SS-27	24	24
		Total: 756	**Total:** 3,590			**Total:** 755	**Total:** 3,589
2003	SS-18	138	1,380	**2005**	SS-18	110	1,000
	SS-19	134	804		SS-19	130	780
	SS-24	36	360		SS-24	15	150
	SS-25	342	342		SS-25	300	300
	SS-27	30	30		SS-27	40	40
		Total: 680	**Total:** 2,916			**Total:** 585	**Total:** 2,270
2007	SS-18	80	800	**2009**	SS-18	68	680
	SS-19	126	756		SS-19	72	432
	SS-25	242	242		SS-25	180	180
	SS-27	45	45		SS-27	63	63
		Total: 493	**Total:** 1,843			**Total:** 383	**Total:** 1,355
2011	SS-18	50	500	**2013**	SS-18	55	550
	SS-19	50	300		SS-19	35	210
	SS-25	120	120		SS-25	140	140
	SS-27	69	69		SS-27	78	78
	SS-27*	6	18		SS-27*	18	18
		Total: 295	**Total:** 1,007			**Total:** 326	**Total:** 1,050
2015	SS-18	46	460	**2017**	SS-18	46	460
	SS-19	30	180		SS-19	20	120
	SS-25	99	99		SS-25	90	90
	SS-27	78	78		SS-27	78	78
	SS-27*	58	236		SS-27*	82	328
		Total: 311	**Total:** 1,049			**Total:** 316	**Total:** 1,076
2019	SS-18	46	460	**2021**	SS-18	46	460
	SS-19	20	120		SS-19	Unknown	Unknown
					SS-19 M4	4	4?
	SS-25	63	63		SS-25	27	27
	SS-27	78	78		SS-27	78	78
	SS-27*	111	444		SS-27*	155	620
		Total: 318	**Total:** 1,165			**Total:** 310	**Total:** 1,189

Russian nuclear systems development within those systems subordinated to the RVSN has gone beyond the treaty recognised elements of the strategic nuclear triad. Since 2010, the development of an intermediate-range ballistic missile (IRBM) complex, the RS-26 “Rubezh” (SS-31), perhaps based on the RS-24, has been known to have been ongoing, but with uncertainty as to its eventual deployment leading into the first half of the 2020s. The technical characteristics of such a missile complex place it in the same doctrinal role of employment as the Cold War-era RSD-10 “Pioneer” in relation to striking targets on the European continent with the potential capability to be MIRV-equipped. Whilst the RS-26 project remains of unknown operational status, in November 2024, Russia operationally employed an intermediate-range ballistic missile system "Oreshnik" in Ukraine, which showcased unique and unprecedented characteristics, namely a cluster-type MIRV warhead – 6 MIRV warheads dispensing up to six further conventional submunitions (The Telegraph 2024) (logical extrapolation dictates that such submunitions can also be nuclear). Furthermore, and based on Cold War-era projects, the development of the nuclear-powered 9M730 "Burevestnik" (SSC-X-9 Skyfall) intercontinental cruise missile (ICCM) has been ongoing since at least 2016 (Marinov, Redefining the Strategic Nuclear Balance. Novel Strategic Offensive Weapons Systems 2022, Wright 2023). Little discernible and accurate technical characteristics can be derived about the specific weapons system, but if successfully introduced in the future, can be considered as an additional element of offensive strategic nuclear capabilities within the Russian arsenal and the prerogatives of the RVSN.

Overall, the RVSN can be witnessed to have transformed significantly in terms of technical capabilities over the preceding three decades by the incorporation of new generation missile systems focused on expanded MIRV capabilities and more recently the incorporation of HGVs. This is reflected in the 2025 US Congressional report on "Russia's Nuclear Weapons", which states that "Russia remains the U.S. rival with the most capable and diverse nuclear forces. Today it is unique in the combination of strategic and non-strategic nuclear forces it fields that enables nuclear employment ranging from large-scale attacks on the [U.S.] homeland to limited strikes in support of a regional military campaign [in the Euro-Atlantic region]" (Congressional Research Service 2025, 1).

3. Current RVSN Force Structure, Composition, and Characteristics

With the examination of both the political and technical direction of development of the RVSN, having been provided, the final segment will deal with the present state, structure, composition and force capabilities of the RVSN on both the macro- and micro-organisational levels.

As of 2024, the Russian Strategic Rocket Forces are organised into three principal operational missile groupings (ракетное оперативное объединение), or "rocket armies": the 27th Guards (Vladimir), the 31st (Orenburg), and the 33rd Guards (Omsk), which together encompass 12 missile divisions (4 silo-based and 8 TEL-based divisions) (Каракаев 2019, 34), each subdivided into 3 to 4 missile regiments, with mobile-based regiments traditionally operating 9 launchers and silo-based regiments operating 6 to 10 launchers (Podvig 2021, Kristensen, et al. 2024). The divisions themselves are widely dispersed in both the European and Asian parts of Russia. Mobile formations are distributed across Russia from its European regions to Trans-Baikal, primarily in densely forested areas that enable potential dispersal of units to locations difficult to detect and track. Silo-based systems are concentrated in the Asian part of Russia near its southern borders, with silo fields grouped into regiments of up to ten silos (Settle 2025).

Based on available data as of 2024, the process of incorporating the RS-24 Yars into the mobile forces has neared completion with 180 launchers, with 18 (two regiments) remaining with the older RS-12M1. By 2025, it is expected that this process will have been completed (Интерфакс 2024). Silo-based launchers currently stand at a mix of 34 RS-20V, 60 RS-12M2, 24 RS-24, and an approximation of 10 modified RS-18 with the Avangard missile complex. In total, the RVSN maintains 326 launchers, plus additional reserve, test, and as part of the Sirena-M command missile system (3 launchers). Overall, if the consideration is made that Russia maintains near New START treaty limitations of deployed warheads, 872 warheads are maintained combat-ready within the RVSN of Russia's total 1,822. The possible number in the upper threshold can range up to 1,244 warheads (Hans M. Kristensen 2024).

Strategic missile formations of the RVSN follow specific structural and organisational characteristics, which define further their operation and effectiveness, with mobile and stationary formations, differing from one another due to the specific technical and doctrinal role of the missile platforms in operation.

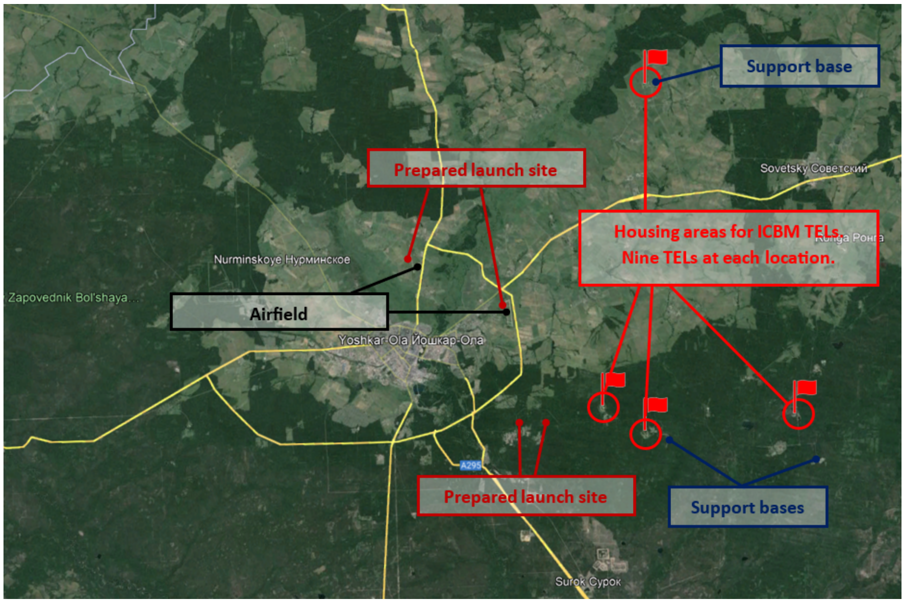

Figure no. 1: Layout of the 14th Kiev-Zhitomir Rocket Division, representing the typical structure of Russian mobile ICBM formations. Area: 80 km x 50 km (Hans M. Kristensen 2024, Settle 2025). Satellite imagery from USGS at https://earthexplorer.usgs.gov/

Mobile strategic missile formations, such as the one showcased in Figure no. 1, the 14th Rocket Division at Yoshkar-Ola, encompass several missile regiments, usually three to four regiments. Each regiment contains a closed complex of supporting installations and the regimental Launch Control Center (LCC), with the TELs and warhead storage situated in an adjacent perimeter complex (Figure no. 2). The TELs, 9 in number per regiment, are housed separately in groups of three in soft covered storage facilities. Each of the storage areas is constructed and situated vis-à-vis the others to allow for the rapid movement of each TEL outside of storage and further onward movement outside the regimental base. The general layout of these complexes has undergone iterations, and the latest ones has switched from a circular dispersion of launchers to a parallel one (Figure no. 2) (H. Kristensen 2014).

Additionally, to the TEL bases and adjoining infrastructure, several separate support and logistics bases are contained in each missile division, usually in close proximity to the main regimental bases. Such support bases contain auxiliary vehicle storage facilities for the purposes of security, maintenance, refuelling and communications. At least one of the support bases contains Transporter-Loader Vehicles (TLV) and training TELs for the corresponding mobile launcher type, based upon satellite imagery. Almost universally, this is now the MZKT-79221 and its subvariants for the RS-24.

At a specific distance, to ensure both adequate reaction and effective dispersion, from the regimental bases, there are usually at least several prepared launch sites. However, TELs can hypothetically use other points for missile launch and for this reason, regiments are located along multiple dispersing road arteries, to ensure that TELs can disperse in multiple directions.

Figure no. 2: 697th Regiment of the 14th Rocket Division. Area: 1,7 km x 1 km (Hans M. Kristensen 2024, Settle 2025). Satellite imagery from USGS at https://earthexplorer.usgs.gov/

Of note, is that the 14th Division has had an additional missile regiment formed and corresponding structures constructed since 2019.

Stationary formations, such as the 62nd Division at Uzhur (Figure no. 3), have a central divisional complex, which houses the divisional LCC, administration, communication, command and control, as well as other support infrastructure and storage facilities. The missile regiments are dispersed around the main complex in silo clusters, with each cluster containing 6 to 10 singular silos. Each regiment has one larger silo installation, which includes a regimental LCC.

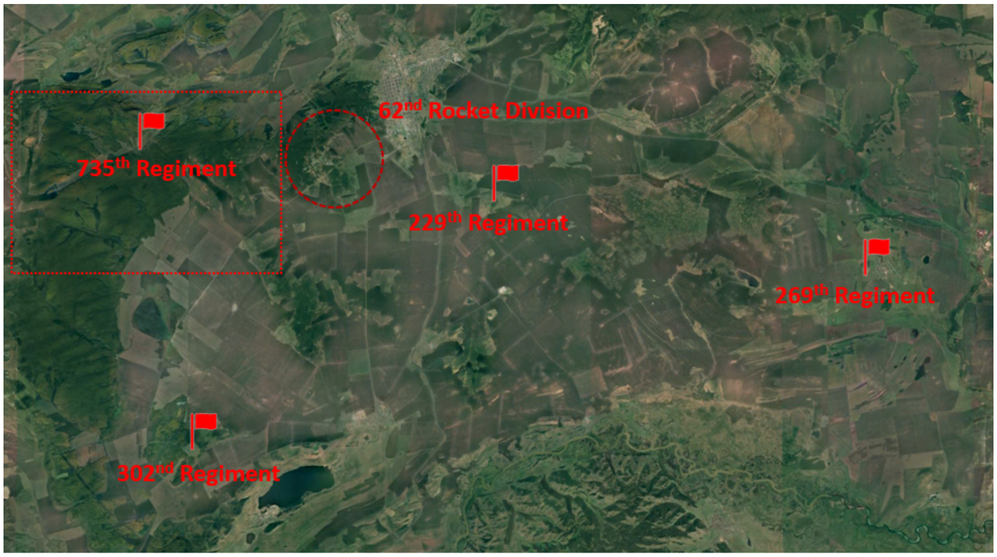

Figure no. 3: 62nd Red Banner Rocket Division structure. Area marked with dotted square expanded in next figure. Area 60 km x 30 km (Kristensen, et al. 2024, Settle 2025). Satellite imagery from USGS at https://earthexplorer.usgs.gov/

Figure no. 4: 735th Regiment of the 62nd Rocket Division. Additional four silos are located further north making the 735th one of the few with this many subordinated launchers. Area: 20 km x 12 km (Hans M. Kristensen 2024, Settle 2025). Satellite imagery from USGS at https://earthexplorer.usgs.gov/

Over the past several years, extensive excavation work can be witnessed at most silo installations. At least in part, this can be considered connected with the future adoption of the RS-28 Sarmat missile complex, but also with the general objective of improving site survivability against both symmetric and asymmetric threats.

Conclusions

The Russian strategic rocket forces have undergone a dynamic process of transformation since the end of the Cold War based on the principal priorities of maintaining quantitative parity with the United States, whilst also simultaneously seeking to achieve a qualitative edge through the adoption of successive generations of new land-based strategic offensive nuclear systems. The Russian ICBM fleet since has become centred on a combination of silo-based and mobile launchers, with one side of the spectrum focused on modernised super-heavy MIRVed missiles of legacy design, whilst the mobile branch has transitioned from older monobloc designs to a steady process of MIRV incorporation in systems of the latest generation. Additionally, great effort has been placed in producing advanced solutions to missile defence penetration with the adoption of HGVs and the process of introducing a new generation superheavy ICBM, albeit with limited progress, which does not yet translate in substantial changes in overall nuclear force capabilities. Going into the future the transformative processes are set to continue and will depend on the extent of future adoption of new technologies, as well as the potential for either the preservation of treaty arsenals or renewed expansion. The RVSN thus remains a force of current and future consideration as the main nuclear deterrent of Russia.

BIBLIOGRAPHY:

—. 2014. *Russian hypersonic vehicle - more dots added to Project 4202*. August 26. Accessed February 22, 2025. https://russianforces.org/blog/2014/08/russian_hypersonic_vehicle_-_m.shtml

—. 2021. *Ракетные войска стратегического назначения (*Raketnye vojska strategicheskogo naznachenija). August 7. Accessed February 22, 2025. https://russianforces.org/rus/missiles/.

—. 1991. "Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitations of Strategic Offensive Arms." Moscow: U.S. Department of State.1972. "Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems." Moscow, May 26.

1987. "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." Washington D.C., December 8.

1991. "Agreements establishing the Commonwealth of Independent States." Minsk and Alma Ata: Venice Commission, December 21.

1991. "Treaty Between the United States of America and the Union of Socialist Soviet Republics on Further Reduction and Limitation of Strategic Offensive Arms." *Treaty*. Moscow, July 31.

1994. "Memorandum of Security Assurances in connection with the Republic of Belarus Accession to the Treaty on Non-Proliferation of Nuclear Weapons." Budapest: Secretariat of the United Nations, December 5.

1993. "Treaty Between the United States of America and the Russian Federation on Further Reduction and Limitation of Strategic Offensive Arms (START II)." Moscow: Bureau of Arms Control, Verification, and Compliance, January 3. https://2009-2017.state.gov/t/avc/trty/102887.htm

1994. "Instruments deposited with the Government of the Russian Federation on: 20 May 1994 Kazakhstan." *United Nations - Treaty Series*. United Nations, May 20. 354.

1994. "Memorandum on security assurances in connection with Ukraine's accession to the Treaty on the Non-Proliferation of Nuclear Weapons." Budapest: Secretariat of the United Nations, December 5.

2002. "Treaty Between the United States of America and the Russian Federation On Strategic Offensive Reductions." Moscow: Bureau of International Security and Nonproliferation, May 24. https://2009-2017.state.gov/t/isn/10527.htm

Bukharin, Oleg. 2002. *A Breakdown of Breakout: U.S. and Russian Warhead Production Capabilities*. October. Accessed February 2, 2024. https://www.armscontrol.org/act/2002-10/features/breakdown-breakout-us-russian-warhead-production-capabilities

Bukharin, Oleg, Timur Kadyshev, Eugene Miasnikov, Pavel Podvig, Igor Sutyagin, Maxim Tarasenko, and Boris Zhelezov. 2001. *Russian Strategic Nuclear Forces*. Edited by Pavel Podvig. Cambridge: The MIT Press.

Bureau of Arms Control, Verification and Compliance. 1972. "Treaty Between The United States of America and The Union of Soviet Socialist Republics on The Limitation of Anti-Ballistic Missile Systems (ABM Treaty)." Moscow: U.S. Department of State.

Congressional Research Service. 2024. *Defense Primer: Hypersonic Boost-Glide Weapons*. Washington: US Congress.

Congressional Research Service. 2025. *Russia's Nuclear Weapons*. Washington: US Congress.

CSIS. 2024. *Avangard*. April 23. Accessed January 22, 2025. https://missilethreat. csis.org/missile/avangard/

Diaz-Maurin, François. 2023. *Russia suspends New START and is ready to resume nuclear testing*. Bulletin of Atomic Scientists. February 21. Accessed February 20, 2025. https://thebulletin.org/2023/02/russia-suspends-new-start-and-is-ready-to-resume-nuclear-testing/#:~:text=On%20Tuesday%2C% 20in%20his%20long-delayed%20state-of-the-nation%20address%2C%20Russian,nuclear%20arms%20treaty%2C%20but%20not%20withdraw%20from%20it

Fedorov, Y.E. 2005. *Russia's strategic forces: policy, evolution and prospects*. Paris: Institut Francais des Relations Internationales.

Hans M. Kristensen, Matt Korda, Eliana Johns, Mackenzie Knight. 2024. *Russian nuclear weapons, 2024*. Washington: Bulletin of the Atomic Scientists. Accessed January 20, 2025. doi:https://doi.org/10.1080/00963402.2024.2314437.

Интерфакс (Interfax). 2024. *Мобильная группировка РВСН полностью оснащена новыми ракетными комплексами (Mobil'naja gruppirovka RVSN polnost'ju osnashhena novymi raketnymi kompleksami).* December 30. Accessed February 22, 2025. https://www.interfax.ru/russia/1001257

Каракаев, С.В. (Karakaev, S.V.) 2019. "Ракетные войска стратегического назначения современной России." ("Raketnye vojska strategicheskogo naznachenija sovremennoj *Военная мысль* (*Voennaja mysl'*) 12: 33-38.

Kaushal, Sidharth. 2024. *Russia's Sarmat Test Failure: Implications for the Strategic Balance.* Royal United Services Institute. October 22. Accessed Jan 23, 2025. https://www.rusi.org/explore-our-research/publications/commentary/russias-sarmat-test-failure-implications-strategic-balance

Kristensen, Hans M., Matt Korda, Eliana Johns, and Mackenzie Knight. 2024. *Russian nuclear weapons, 2024.* Bulletin of the Atomic Scientists. March 7. Accessed January 20, 2025. doi:https://doi.org/10.1080/00963402.2024.2314437.

Kristensen, Hans. 2014. *Russian ICBM Force Modernization: Arms Control Please!* Federation of American Scientists. August 5. Accessed January 22, 2025. https://fas.org/publication/russianmodernization/

Listner, Michael. 2022. *FOBS, MOBS, and the reality of the Article IV nuclear weapons prohibition.* October 17. Accessed February 20, 2025. https://www.thespacereview.com/article/4466/1.

Lopez, Todd. 2019. *U.S. Withdraws From Intermediate-Range Nuclear Forces Treaty.* August 2. Accessed September 8, 2022. https://www.defense.gov/News/News-Stories/Article/Article/1924779/us-withdraws-from-intermediate-range-nuclear-forces-treaty/

Marinov, Mario. 2022. "Redefining the Strategic Nuclear Balance. Novel Strategic Offensive Weapons Systems." Знание, наука, иновации, технологии (Институт за знание, наука и технологии).

Marinov, Mario. 2022. "The Strategic Nuclear Treaty Regime at a Crossroads. The (Im)Possible Search for a New Point of Balance?" Romanian Military Thinking (Centrul tehnic-editorial al armatei) 94-111.

Norris, Robert S. 1992. "C.I.S. (Soviet) Strategic Nuclear Forces, End of 1991." Bulletin of the Atomic Scientists, March: 49.

Persico, Anthony. 2017. *RS-28 Sarmat (Satan 2).* Missile Defence Advocacy Alliance. January. Accessed February 20, 2025. https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/russia/rs-28-sarmat-satan-2/#_ednref4

Podvig, Pavel. 2011. *Russia's Nuclear Forces: Between Disarmament and Modernization.* Paris: Security Studies Cente.

Russian Ministry of Defence. 2018. *Avangard missile launched from Dombarovsky area.* December 26. Accessed February 20, 2025. https://www.youtube.com/watch?v=SgzeS7-jgSY&t=5s

Settle, Frank. 2025. *Russian Nuclear Complex.* Washington and Lee University. February 10. Accessed February 20, 2025. https://www.google.com/maps/d/viewer?mid=1VrJmDuHVIskxtX_0eVjTWw2swNhL9tIo&ll=61.45918312096067%2C92.69004266818932&z=4

Stockholm International Pece Research Institute. 1991. *SIPRI Yearbook 1991: World Araments and Disarmament.* Solna: Oxford University Press.

The Telegraph. 2024. *Putin: Russia tested new hypersonic missile in Ukraine strike.* November 21. Accessed February 18, 2025. https://www.youtube.com/watch?v=NFNa-7e5Z7o

U.S. Department of State. 2022. *New START Treaty.* September 12. Accessed September 13, 2022. https://www.state.gov/new-start/

Walker, William. 1992. "Nuclear Weapons and the Former Soviet Republics." *International Affairs* (Royal Institute of International Affairs) 68 (2): 255-277.

Wright, Timothy. 2023. *Russia claims to have tested nuclear-powered cruise missile.* IISS. October 13. Accessed February 20, 2025. https://www.iiss.org/online-analysis/missile-dialogue-initiative/2023/10/russia-claims-to-have-tested-nuclear-powered-cruise-missile/