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Russia's RS-28 Sarmat Heavy ICBM: A Superheavy Deterrent Advancing Through a Troubled Development

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5 Key Points

- **The RS-28 Sarmat is a Russian superheavy, silo-based, liquid-fueled ICBM** built by the Makeyev Rocket Design Bureau to replace the Soviet-era R-36M2 Voevoda (SS-18 "Satan") ICBM. At roughly 208 tons and 35.3 m, with an 18,000 km range and an estimated 10-tonne throw-weight, it is the heaviest and longest-range ICBM in service.[1]
- **The RS-28's decisive attribute is payload and penetration, not economy.** The Sarmat can carry up to 10 heavy or 15–16 lighter MIRV warheads, or a mix of warheads, decoys, and up to three Avangard hypersonic glide vehicles — a load designed to saturate and defeat U.S. midcourse missile defenses.[2]
- **It is engineered to bypass defenses geographically.** A short boost phase, a fractional-orbital bombardment system (FOBS) option, and the ability to fly a South Pole trajectory would enable a Sarmat ICBM to approach the United States from directions that U.S. early-warning radars and interceptor fields do not cover.[3]
- **Employment and testing have been troubled.** Only one full-range flight test (April 2022) is publicly confirmed as clearly successful. A September 2024 test destroyed a Plesetsk silo, leaving a 62 m crater, and a November 2025 launch near Yasny failed shortly after liftoff. Putin announced a successful test on 12 May 2026.[4]
- **Initial deployment is imminent but limited.** The first operational regiment — the 302nd Missile Regiment of the 62nd Missile Division at Uzhur, Krasnoyarsk Krai, in southern Siberia near Russia's border with Mongolia — is slated to stand up by the end of 2026, reusing existing silo infrastructure. The thin, mixed test record makes the pace of fielding a live question.[5]

A Superheavy Answer to Missile Defense

Few weapons carry the symbolic and strategic weight of Russia's RS-28 Sarmat. Designed by the Makeyev Rocket Design Bureau and built principally by KrasMash in Krasnoyarsk, it is a silo-based, liquid-fueled intercontinental ballistic missile (ICBM) conceived to replace the aging R-36M2 Voevoda — the missile NATO nicknamed the SS-18 "Satan," which lent the Sarmat its colloquial label, "Satan II." Its significance lies less in any single figure than in a combination of raw mass, enormous payload, and trajectory flexibility

[1] Missile Defense Project, "RS-28 Sarmat," missilethreat.csis.org (Apr. 23, 2024); Wikipedia, "RS-28 Sarmat."
[2]National Interest, "Russia's RS-28 Sarmat Nuclear Missile Could Destroy the World" (Mar. 22, 2025); Missilestrikes.com, "RS-28 Sarmat" (Mar. 20, 2026).
[3]Wikipedia, "RS-28 Sarmat" (boost phase, FOBS, South Pole trajectory); National Interest (Mar. 22, 2025).
[4]RUSI, "Russia's Sarmat Test Failure" (Oct. 22, 2024); Ars Technica (Dec. 1, 2025); HCoC/CESIM (May 13, 2026).
[5]IISS, "Russia's Sarmat Missile 'Success'" (May 19, 2026); MigFlug/Army Recognition (May 2026).

intended to defeat the missile-defense architectures the United States has fielded and is now expanding under the "Golden Dome for America" initiative. The RS-28's status is double-edged: the Sarmat is a genuine leap in Russian counter-defense payload capability, yet a decade and a half of delays and repeated test failures leave its operational reliability an open question.

Anatomy of the RS-28 Sarmat

The Sarmat is a three-stage, liquid-fueled missile roughly 35.3 m long and 3 m in diameter, with a launch weight of nearly 208 tons — dimensions that make it the heaviest ICBM in service anywhere in the world. Its first stage is powered by the PDU-99 engine, derived from the RD-274 family, retaining the liquid-propellant lineage of its Soviet predecessor. Liquid fueling imposes readiness and handling constraints relative to solid-fuel systems such as the U.S. LGM-35A Sentinel ICBM, but this type of propellant provides the RS-28 it's the throw-weight and range capabilities. Credited with a range of about 18,000 km — extendable to roughly 35,000 km on a suborbital, fractional-orbital profile Russia says is limited under the Outer Space Treaty — it is housed in a modified 15P718M silo complex and cold-launched by gas ejection before ignition, improving silo survivability against a preemptive strike. Guidance combines inertial navigation, GLONASS, and astro-inertial correction.[6]

What Makes the Sarmat Dangerous

The Sarmat's threat is structural, resting on several reinforcing attributes:

- **Payload and throw-weight.** An estimated 10-tonne throw-weight lets a single missile carry up to 10 heavy or 15–16 lighter MIRV warheads — reportedly including 750 kt-class weapons — or a mix of warheads and penetration aids. These MIRV options would enable one Sarmat to target multiple widely separated targets.
- **Missile-defense penetration.** The large payload margin is spent deliberately on decoys and electronic countermeasures meant to saturate midcourse discrimination, and the missile can carry Avangard hypersonic glide vehicles which maneuver at speeds reported above Mach 20, complicating any intercept.
- **Trajectory flexibility.** A FOBS-capable, suborbital option and a South Pole approach would enable a Sarmat's flight profile to include an azimuth that U.S. Ballistic Missile Early Warning System (BMEWS) radars and the northern-facing Ground-Based Midcourse Defense interceptor units are unable to cover based on existing fielded capabilities.
- **Short boost phase and silo survivability.** A compressed boost phase shortens the window in which infrared sensors such as the U.S. Space-Based Infrared System (SBIRS) can track the missile at its brightest, while cold-launch ejection from hardened silos is meant to preserve a retaliatory capability even under attack — reinforcing the Sarmat's second-strike capability.

[6] Missile Defense Project; Missilestrikes.com (Mar. 20, 2026); MigFlug/Army Recognition (May 22, 2026); Wikipedia, "RS-28 Sarmat."

A Sarmat-associated transporter-erector raises a canister at a Russian test-and-deployment site. The Sarmat is emplaced in modified 15P718M silos and cold-launched by gas ejection before first-stage ignition.

Employment and Testing History

The Sarmat's employment history is, to date, a testing history rather than an operational one — and a long, uneven one. Development traces to roughly 2009–2015; a first stage (PDU-99) test came in August 2016, and ejection ("throw") tests followed at Plesetsk in December 2017 and March 2018, when Putin unveiled the Sarmat among six new strategic weapons. The single clearly successful full-range flight test occurred on 20 April 2022, from Plesetsk to the Kura range in Kamchatka. On its strength, Roscosmos head Yuri Borisov announced on 1 September 2023 that the system was on combat duty — notably, not an announcement also made by Putin. A February 2023 test was assessed by the United States as a failure, which Russia neither confirmed nor denied.[7]

Two subsequent failures were dramatic and public. On or about 21 September 2024, a test at Plesetsk destroyed a silo; Maxar and Planet Labs' imagery showed a crater roughly 62 m wide and surrounding fires, and analysts judged the missile had likely exploded during ignition or fallen back. On 28 November 2025, video from near Yasny in Orenburg Oblast — widely assessed as an RS-28 test at Dombarovsky — showed a missile deviating after launch, losing thrust, and striking the ground near the pad. On 12 May 2026, Putin announced a successful test, framed as part of final validation ahead of deployment. Independent analysts are cautious: a record of essentially two successes and several failures is, as one put it, thin ground for "experimental combat service."[8]

Development, Production, and the Road to Deployment

The Sarmat is built by a Russian consortium — KrasMash as prime, with Zlatoust MZ, NPO Energomash, NPO Mashinostroyeniya, and KBKhA — and it was partly a response to the loss of the Ukrainian industrial base that built and serviced the R-36M2. That dependency is central to the story: as the Voevoda fleet aged past its service life around 2023, Russia needed a domestically producible replacement to sustain the silo-based leg of its nuclear force triad. Early plans were expansive — in 2019, sources spoke of rearming some twenty regiments over 2020–2027 — but reality has been slower. As of mid-2026, upgrades to the six silos of the 302nd Missile Regiment at Uzhur (new command posts, double fencing, hard standing) in southern

[7]Wikipedia, "RS-28 Sarmat" (timeline, ejection tests, 2018 unveiling); Space.com (Apr. 22, 2022); RIA Novosti / WION (Sept. 1, 2023); CBS News (Feb. 22, 2023).
[8]RUSI (Oct. 22, 2024); Ars Technica (Sept. 23, 2024 and Dec. 1, 2025); The Telegraph (Dec. 1, 2025); Daily Pioneer (May 13, 2026); HCoC/CESIM (May 13, 2026); IISS (May 19, 2026).

Siberia were reported nearing completion, with the first regiment expected to stand up by year's end and eventual deployment across two divisions, at Uzhur and in eastern Russia at Dombarovsky.[9]

Announced capabilities have advanced even as system reliability has lagged. Russian statements since 2024 emphasize the suborbital/FOBS profile and, in 2026, an extended range beyond 35,000 km — language some read as pointing toward an operational FOBS configuration. Avangard integration, first fielded on the older UR-100N UTTKh, is repeatedly cited as an option for the Sarmat, though details remain classified. The persistent gap between claimed capability and demonstrated reliability is the defining feature of the program.[10]

Indicative Capacity Snapshot (Open-Source Estimates)

Attribute	RS-28 Sarmat	Note / comparison
Class	Super heavy, silo-based ICBM	Replaces R-36M2 Voevoda (SS-18)
Size / weight	35.3 m × 3.0 m; ~208 tons	Largest ICBM in service
Range	~18,000 km (35,000+ km FOBS)	Global reach; polar approach
Throw-weight	~10 tons	Enables large mixed payload
MIRV load	Up to 10 heavy / 15–16 lighter	Plus, decoys & countermeasures
Advanced payload	Up to 3 Avangard HGVs	>Mach 20, maneuvering
First deployment	Uzhur, 302nd Regt (end 2026) in southern Siberia	Reuses existing silos

Figures are open-source rounded estimates and vary by source, variant, and reporting. [11]

The Challenge to U.S. and Allied Defenses

For missile defense, the Sarmat is deliberately designed to defeat missile defenses. U.S. homeland defense against ICBMs rests on the Ground-Based Midcourse Defense system — a limited number of interceptors in Alaska and California oriented against a small or accidental launch vice a large salvo — and the Sarmat attacks this architecture on three axes at once.

- **Saturation**: one missile fields many warheads plus decoys, would strain midcourse discrimination.
- **Maneuver**: Avangard glide vehicles lack a predictable ballistic arc, which undermines the physics of midcourse intercept operations.
- **Geometry**: FOBS flight profiles and South-Pole trajectories approach from directions early-warning radars and interceptor fields do not face, while a short boost phase narrows the detection window.

Together these target the assumptions behind current and planned U.S. defenses, including the layered "Golden Dome" concept.[12] Two caveats temper the threat picture. The Sarmat is a small-inventory, silo-based system — fixed, geolocated, and lacking demonstrated reliability — in contrast to a survivable,

[9]Wikipedia, "RS-28 Sarmat" (manufacturers, 20-regiment plan, Uzhur/Dombarovsky); Army Recognition (May 14, 2021 and Jan. 28, 2026); IISS (May 19, 2026).
[10]HCoC/CESIM (May 13, 2026); Wikipedia, "Avangard (hypersonic glide vehicle)"; Milivox (Oct. 30, 2025).
[11] Missile Defense Project; Missilestrikes.com (Mar. 20, 2026); MigFlug/Army Recognition (May 22, 2026); Wikipedia, "RS-28 Sarmat."
[12]National Interest (Mar. 22, 2025); Wikipedia, "RS-28 Sarmat" (FOBS, boost phase); Milivox (Oct. 30, 2025); IS Missile Defense Project.

mobile Russian ICBM systems such as road-mobile Yars. As a strategic nuclear delivery system, its relevance to homeland and base defense is, in part, a function of U.S. strategic deterrence capabilities in addition to U.S. ability to actively interception a live salvo. Russia's investment in and development of this system clearly signifies its intent in countering the evolution of U.S. missile defense capabilities. Russia's ability to overcome clearly demonstrated testing and fielding problems is the key to Moscow actualizing this intent by deployed effective RS-28 ICBM nuclear capabilities.[13]

Implications and Recommendations

The RS-28 Sarmat should be read as a signal of Russia's intent to rely on penetration and payload attributes to counter U.S. missile defenses, even though the program has struggled to prove itself. Three implications follow for U.S. and allied posture.

- First, the U.S. should plan against the payload, not just the platform: the Sarmat's challenge is its MIRV-plus-decoy-plus-HGV load and trajectory options, so investment in discrimination, space-based sensing, and defenses oriented to non-northern approaches matters more than counting silos. Moreover, the U.S. Intelligence community should invest in collection and analysis necessary to determine the scale of reentry vehicles most likely to arm deployed RS-28 Sarmat ICBMs. Narrowing this down would improve our ability to understand the scale of an individual RS-28 launch's threat to the U.S. homeland.
- Second, weigh reliability soberly: a thin, mixed test record means neither dismissing the Sarmat as a hollow threat nor accepting Russian claims at face value. Continued assessments should track the validation program at Uzhur and Dombarovsky rather than headline announcements.
- Third, the U.S. response to this system should be based on a mix of strategic deterrence nuclear capabilities and active missile defenses. As a strategic nuclear system, the Sarmat sharpens the case for sustaining U.S. modernization (Sentinel) and for clear-eyed engagement on any successor to the New START treaty.[14]

Above all, the Sarmat is a reminder that Russia continues to invest in defeating missile defense via mass, maneuver, and geometry — even as its ability to deliver on this investment reliably remains, for now, unproven. Defending against what it represents is less about intercepting one missile than about sustaining a credible deterrent and an early-warning and defensive architecture that accounts for the approaches the Sarmat was built to exploit.

[13]Geopolitical Monitor (Dec. 4, 2025); technology.org (Dec. 2, 2025), on cancellation debate and mobile-launcher comparison.
[14]MDAA analysis; IISS (May 19, 2026); Geopolitical Monitor (Dec. 4, 2025); IS Missile Defense Project.