



Complexities and Challenges of Russia's Avangard Hypersonic Glide Reentry Vehicle

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OE Watch Commentary: Late last year, President Vladimir Putin referred to the Avangard hypersonic glide reentry vehicle (RV) as a “gift” to Russia for 2019. Clearly, the Avangard was designed, in part, to demonstrate the military-industrial power of Russia. But its development has faced serious problems, and its future remains questionable. The Avangard, developed by MIC NPO Mashinostroyenia, is based on the company’s 1980s-era Albatross project, which was supposed to counter the comprehensive ABM system being created by the US as part of the Strategic Defense Initiative (popularly known as “Star Wars”). The possibility of creating a hypersonic reentry vehicle was likely discussed during Putin’s visit to this plant in December 2002.

A Russian prototype hypersonic vehicle apparently performed a test flight as part of the Security 2004 military exercise, on February 18, 2004. This was stated by both the then–first deputy chief of the General Staff of the Armed Forces of the Russian Federation, Yuri Baluevsky, and President Putin. Speaking at a press conference, the Kremlin leader claimed these missiles systems are capable of striking ground targets across intercontinental distances with hypersonic speed and high accuracy. The gliders are also capable of sharp, high-speed horizontal and vertical evasive maneuvers in flight.

The first explicit mention of the Avangard (Project 4202) hypersonic RV dates back to 2007, and is referenced in “Publication No. 16” of the Special Bureau for Design and Technology, responsible for the development of missile silos. However, the first mention of “Project 4202” in NPO Mashinostroyenia corporate documentation does not appear until 2009. That year, then-president of Russia Dmitry Medvedev visited the plant, apparently jump-starting the development of the Avangard.

The Soviet-era project to develop a hypersonic glide vehicle (Albatross) was only given four years. Therefore, the 3–5 years of silence between Putin’s call for a hypersonic glide vehicle in 2002 and the initiation of the Avangard development program in 2007 or 2009 is quite striking, and likely related to several factors. First, since Washington’s withdrawal from the ABM Treaty, Moscow continued for several years to try to reach a new agreement to replace the Cold War–era arms control regime. The final decision on going forward with the Avangard, apparently, was made only after Russian-US negotiations on ABM hit a wall in October 2007. Second, the Russian Ministry of Defense repeatedly added new requirements for the hypersonic reentry vehicle.

The aforementioned documents produced by the Special Bureau for Design and Technology in 2007 suggest that a decision was made to utilize the R-36M Voevoda missile system for the new hypersonic reentry vehicle. In the development of the missile system, it was necessary to solve problems of stealth, guidance, maneuvering and radio waves passing through the plasma generated by the glide RV. The main problems were the high temperature (up to 2,000 degrees Celsius) during reentry and the associated problem of controllability. It was also important to achieve a speed of Mach 17–22. Russian arms manufacturers were unable to solve these problems between 2009 and 2015.

To date, at least ten tests of the hypersonic RV have been carried out. The first tests (in 2013–2015) either did not achieve the necessary performance data or were unsuccessful. As a result, in 2014 there was concern that the project would be canceled. The main issues were solved only in 2016, and newly successful tests were carried out. A year later, in 2017, before the completion of the official test program, the government decided to start serial production. As such, the Avangard’s development process echoed that of the Bulava ballistic missile, whose serial production began in 2008, before testing could be completed. The Bulava did not officially enter service until ten years later.

The Avangard reportedly has a length of 5.4 meters and is a multiple RV, with three independently targetable warheads, each equal to more than two megatons of TNT. The vehicle is equipped with a thermal control system developed by NPO Nauka. It travels along a low trajectory, at a height of 60 to 100 kilometers above the Earth, separating from the carrier and performing height and direction maneuvers up to 1,000 kilometers; it can fly several thousand kilometers to its target. According to Deputy Prime Minister Yuri Borisov, the latest test, carried out in December 2018, confirmed the controllability of the vehicle at speeds of Mach 27.

According to the State Armament Program, two regiments in the Orenburg Region will be equipped with the Avangard system by 2027—that equals 12 missile systems. According to the plans of the Ministry of Defense, the first regiment armed with Avangards will assume combat duty in 2019. However, due to persistent serial production backlogs in the Russian defense-industrial sector (over the past few years, no defense ministry plan for strategic missile systems deliveries has been entirely fulfilled, and NPO Mashinostroyenia failed to complete the State Defense Order in 2010–2011), probably only one or two battalions will be equipped with the Avangard (2–4 missile systems).

Additionally, the start of serial production and equipping of the first Strategic Missile Forces regiment with the Avangard, does not mean this hypersonic system is actually ready. It still must undergo a series of tests atop UR-100N and Sarmat ballistic missiles. The inventory of UR-100Ns is limited, production having stopped in 1985; some of these missiles have already been retired, while a part is relegated for testing. The long-term carrier of the Avangard will be the Sarmat, the development and production of which has also been delayed. Thus, the Russia’s much-advertised hypersonic weapon is unlikely to reach strategic missile units for some time to come. **End OE Watch Commentary (Starchak)**

Source: “«Отличный подарок к Новому году»: Путин оценил новое российское оружие (An “excellent New Year’s gift: Putin appreciated the new Russian weapons),” *NTV*, 26 December 2018. <https://www.ntv.ru/novosti/2128800/>

...The rocket launched from the Dombrovsky range near Orenburg and quickly gained altitude...In space, the unit separated from the carrier and rushed at the intended target, the Kura range on Kamchatka, at a speed of more than 20,000 km/hour...For Russia, “Avangard” is a deterrence weapon...