

# Russia unveils new strategic delivery systems

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Russian President Vladimir Putin revealed details about a range of new strategic weapon systems in an address in March. *Malcolm Claus* assesses the information presented on Russia's hypersonic glide vehicle and analyses the technical challenges involved in its design

## Key Points

- Based on the description provided by Putin and open-source information on its development, *Jane's* assesses that Avangard is a credible in-development hypersonic glide vehicle, although technical challenges will remain around heat management and vehicle control.
- Any extant Avangard gliders are likely to be used for development work through 2018 and into 2019, which – if successful, and subject to financial constraints – could enable initial operational vehicles to enter service with the Russian armed forces in the early 2020s.
- The development of Avangard, alongside the Kinzhal air-launched ballistic missile and the Burevestnik nuclear-powered cruise missile, indicates that Russia is pursuing technologies intended to defeat or circumvent US ballistic missile defences.

On 1 March, Russian President Vladimir Putin delivered the annual State of the Nation Address to the Federal Assembly. Putin used the address to present information on six weapon systems that he said were currently under development or were entering service.

The weapon systems were: Sarmat, a heavy intercontinental ballistic missile (ICBM); Avangard, a hypersonic glide vehicle (HGV); a then-unnamed nuclear-powered cruise missile, which was subsequently named Burevestnik in a competition organised by the Russian Ministry of Defence; a nuclear-equipped torpedo, previously identified as the Status-6 and apparently renamed Poseidon in the same competition; an air-launched ballistic missile named Kinzhal (literally 'Dagger'), that was carried and launched from a modified MiG-31BM 'Foxhound'; and a laser system, subsequently named Peresvet in the competition.

Putin presented these weapon systems in the context of the US ballistic missile defence (BMD) system. Claiming that "the US was working at full speed on their BMD system", Putin stated that Russia's response was to improve the strike capability of its strategic forces to enable them to defeat defensive systems. He also claimed that the new systems had been developed at "a modest price" – a significant point, given the health of the Russian economy – and that the new weapons were compatible with all of Russia's current strategic systems.

The HGV and the nuclear-powered cruise missile are the systems least understood by open-source analysts. Putin stated during the presentation that the model of Avangard shown in the video did not represent the system's true configuration, saying that "for obvious reasons we cannot show you today what the actual system looks like". This underlines the challenges faced by open-source analysts in assessing these systems.



*In this still taken from a video released by the Russian Ministry of Defence, the Kinzhal air-launched ballistic missile can be seen mounted on a modified MiG-31 'Foxhound'. Parts of the image appear to have been deliberately blurred. (Russian Ministry of Defence)*

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Avangard appears to be the new name for Russia's previously identified Project 4202 or Yu-71 HGV programme. Pavel Podvig, an expert on Russian strategic forces, drew this connection in a post on his blog on 21 March and the relationship has been assumed within much coverage of Putin's address. Podvig noted that the programme for a Russian HGV to counter missile defence dated to at least 1985, and in the document he cited the name 'Albatross' for the vehicle. The name 'Avangard' was also previously attached to a Russian ICBM.

As previously reported in the March 2017 edition of *Jane's Intelligence Review*, in addition to Russia, the US and China are actively developing and flight-testing HGV systems: the US Hypersonic Technology Vehicle 2 (HTV-2) and Advanced Hypersonic Weapon (AHW), and China's DF-ZF (WU-14). The underlying technology has been understood since at least the 1950s. However, significant technical challenges are involved in the development of an HGV with the performance described by Putin, underlining the importance of analysing those claims.

### **Avangard description**

Putin made numerous claims about the Avangard HGV during the address. He described it as capable of maintaining a speed of Mach 20 during the cruise or glide phase of its trajectory, and able to manoeuvre laterally (cross-range) and vertically (altitude). Putin said that lateral manoeuvrability of the systems was of the order of "several thousand kilometres", and that – combined with its vertical manoeuvrability – this would allow the HGV to "neutralise missile defence".

Putin said that Avangard's flight would take place in the dense atmosphere and that this, combined with its high Mach number, would sheath the vehicle in plasma (ionised gas created by the high temperature generated by the vehicle's flight). The surface temperature of the vehicle was described as being "2,000°C [2,273 Kelvin, 3,632°F]".

A computer-generated video included in Putin's address that illustrated the Avangard concept depicted a simplistic, representative computer-generated HGV with the ability to manoeuvre around air- or missile-defence systems.

As noted above, the vehicle shown in the video cannot be straightforwardly assumed to represent the 'true' Avangard. Nevertheless, in the absence of further information, the video represents a source that can be analysed for information about the design choices depicted and the intended capabilities of the system.

The configuration of the vehicle shown in the video appears to be a wedge-like blended-wing body (BWB) design, generically referred to as a 'waverider'. It was shown detaching from a boost vehicle, before manoeuvring to a target. Four possible control surfaces were visible in the video, two of which were located on the top of the fuselage and two body flaps, all located at the rear of the vehicle. It is also possible that a reaction (rocket thruster) control system is also fitted, but given the nature of the video this could not be ascertained.

A report by the Russian TASS news agency on 12 March provided further details about the system. The report described the "Avangard hypersonic missile complex" as a "strategic intercontinental ballistic missile system equipped with a gliding hypersonic manoeuvring warhead". The TASS report noted that the characteristics of the system "have not been officially disclosed", but that "[p]resumably" it was approximately 5.4 m long, and capable of carrying conventional and nuclear warheads.

The report stated that the Avangard vehicle was "codenamed" 15Yu71 – this would be the Main Missile and Artillery Directorate of the Ministry of Defense of the Russian Federation (GRAU) index code system Division 15 designation, and appears to confirm that Avangard is the new name for Yu-71.

The report notes that Avangard was developed "as part of the R&D [research and development] work '4202' by specialists of the Military and Industrial Corporation 'Research and Production Association of Machine-Building' (the town of Reutov) under the guidance of Chief Designer Pavel Sudyukov". The report noted that Russia's Federal Space Agency had acted as the customer for the research and development work for Object 4202, which explains why the launches were carried out at Baikonur.

On 20 March, TASS reported that Avangard could enter service "no later than 2019". The agency cited a "defence industry" source, and this has not been confirmed officially.

### **Avangard assessment**

Unlike the earlier Russian IGLA (see box below), the vehicle shown in the video did not appear to have an air-breathing engine. This would further support the assessment that the Avangard, and the earlier Yu-71, are purely glide vehicles without independent propulsion systems.

**[Continued in full version...]**

(1010 of 5894 words)

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