



*Changing Character of War Centre  
Pembroke College, University of Oxford  
With Axel and Margaret Ax:son Johnson Foundation*

## **Russia's Invincible Weapons: Today, Tomorrow, Sometime, Never?**

**Julian Cooper<sup>1</sup>  
May 2018**

On 1<sup>st</sup> March this year Vladimir Putin finally delivered his long-awaited annual *poslanie*, or State of the Nation speech, to the Federal Assembly. According to the constitution it should have been presented before the end of last year but was delayed, probably because of the forthcoming presidential election. Shortly before the event its venue was changed from the usual Georgievskii hall of the Kremlin to the nearby Manezh, a decision clearly motivated by the President's wish to accompany at least part of his speech by visual images, for which the new venue was better-suited. He spoke for almost two hours, the first 70 minutes on domestic matters, the remaining 45 minutes on international relations and above all defence. The first part was delivered in a rather monotonous fashion, gaining occasional polite applause, the second was far more animated, and evidently delighted the audience which responded with enthusiasm, with standing ovations.<sup>2</sup> Putin outlined a major concern of the country's security policy, namely the need to counter perceived US efforts to weaken Russia's strategic nuclear deterrence capability, first by unilaterally withdrawing from the Treaty on Anti-Missile Defence in June 2002 then by more recent initiatives, from about 2010, to develop a conventional prompt global strike capability. He explained that Russia had been obliged to adopt counter measures, above all to develop new weapons with the potential to greatly enhance nuclear deterrence and counter any US moves to create a truly effective missile defence network.

According to well-informed journalists of *Kommersant*, sources knowing about the preparation of the military part of the *poslanie* said that until the last moment representatives of the Presidential Administration, the Ministry of Defence (MOD) and the defence industry discussed the degree of openness to be adopted.<sup>3</sup> This is hardly surprising, the information revealed had hitherto been considered subject to state secrecy of the highest category.

With pictures and video clips Putin described six weapon systems that had been developed or were being developed in the following order, the 'Sarmat' heavy ICBM, a nuclear-powered cruise missile, a nuclear-powered and armed undersea drone, a hypersonic missile, 'Kinzhal', launched from a supersonic aircraft, the 'Avangard'

---

<sup>1</sup> Centre for Russian, European and Eurasian Studies, University of Birmingham/Associate Senior Fellow, Stockholm International Peace Research Institute.

<sup>2</sup> For a colourful account see Kolesnikov, Andrei (2018). The 'hyperboloid' of engineer Putin in the article's title alludes to the 1927 science fiction novel by Aleksei Tolstoy, *The Hyperboloid of Engineer Garin*, a laser-like death ray with which the engineer destroys his enemies in a struggle to become dictator of the world. It was turned into a popular Soviet film in 1965.

<sup>3</sup> Safronov, Ivan, Dzhordzhevich, Aleksandra, Chernenko, Elena (2018).

glide vehicle for an ICBM, and a laser weapon of unspecified purpose. After the event the MOD announced a public poll via its website to give names to three of the new systems. The final results were made known three weeks later. It was claimed that more than 7.6 million people had participated and the winning names were 'Peresvet' for the combat laser (named after a warrior monk famous for his role in the 1380 Battle of Kulikovo), 'Burevestnik' (Storm Petrel) for the nuclear-powered cruise missile and 'Poseidon' for the underwater drone.<sup>4</sup>

The logic of the order of Putin's presentation is not clear. Here each system will first be reviewed in detail in the approximate order of its likelihood to enter combat service. Given the secrecy that has hitherto shrouded most of the weapons, the information presented has had to be assembled from multiple sources. Then the reception of the *poslanie* will be considered, together with some issues arising from it, not least why it was delivered in the form it took.

#### *'Kinzhal' hypersonic missile*

Of all the systems presented by Putin the one that is most ready for deployment is clearly the 'Kinzhal' ('Dagger') aero-ballistic missile with a claimed range of up to 2,000 km, tested on a modernised, supersonic, Mig-31 fighter-interceptor. According to Dmitrii Rogozin, deputy prime minister and day-to-day leader of the Military-Industrial Commission, the modernisation of the aircraft was undertaken in parallel with the development of the new missile.<sup>5</sup> The 'Kinzhal' can be used against targets both on land and sea, nuclear or conventionally armed, and can reach hypersonic speeds. It is claimed to be highly manoeuvrable with stealth characteristics. The commander-in-chief of the Air-Space Forces, Sergei Surovkin, gives it the designation X-47M2 - X being the usual code for an air-launched missile.

The available evidence suggests that the 'Kinzhal' is based on a modified missile of the 'Iskander' complex with its 9M723 missile, a product of the Kolomna KB (design bureau) mashinostroeniya. But this strong design centre does not work on air-launched missiles, suggesting the involvement of the Korporatsiya Takticheskoe Raketnoe Vooruzhenie, KTRV, which does. In the corporation the two main centres engaged in the development of hypersonic missiles are the NPO 'Mashinostroenie' and the Dubna state machine building design bureau 'Raduga' (GosMKB 'Raduga' im. A.Ya. Berezhnyaka). The 'Iskander', which can reach a speed of 6 Mach (hereafter, M), is normally launched from a ground-based mobile launch vehicle.<sup>6</sup>

The version of the MiG-31 which carries the missile is a specially modified variant of the MiG-31BM. This has a maximum speed of 3,000 kph (2.83M) at a height of 17,500 m. Its range is about 2,300 km, suggesting that it could fly up to 1,000 km. before launching the missile and then return without refuelling.<sup>7</sup> The very high speeds claimed for the missile are clearly made possible by the fact that it is launched from an aircraft flying at supersonic speed at a considerable height, 12,000 m., with an initial speed of 2M according to one source.<sup>8</sup> Putin said that the system had been put on trial-combat duty in the Southern military district from the beginning of December 2017 and since then there have been reports that over 250 flights have been undertaken.<sup>9</sup> There is a consensus among Russian specialists that the system is above all seen as a means of striking naval targets, although there has also been claims that it could be used potentially against US anti-missiles systems located in Romania and soon also in Poland.<sup>10</sup>

The 'Kinzhal' is not really a hypersonic missile in the full sense, rather a missile that can reach hypersonic speeds, i.e. more than 5M, when released at high altitude from a very high speed launch vehicle. The 'Iskander' missile has a solid fuel rocket engine not a ramjet, let alone a hypersonic scramjet. This has led some observers to the conclusion that it is not really a hypersonic missile.<sup>11</sup> In the words of one US author, 'It's possible Kinzhal is a sort of shortcut hypersonic munition that while fast enough to evade enemy defenses, also lacks the

<sup>4</sup> Ministry of Defence RF (2018); Stepanov, Aleksandr (2018).

<sup>5</sup> TASS (2018a).

<sup>6</sup> Valagin, Anton (2018).

<sup>7</sup> Military Russia (2018b).

<sup>8</sup> BMPD (2018).

<sup>9</sup> Prezident Rossii (2018); TASS (2018b).

<sup>10</sup> See, e.g. Fel'gengauer, Pavel (2018).

<sup>11</sup> E.g. In the USA, Majumdar, Dave (2018) and in Russia, in firm terms, Viktor Kuzvkov, Viktor (2018).

manoeuvrability to accurately strike targets at long range'.<sup>12</sup> Furthermore, Russia does not yet have a developed scramjet, as Russian specialists acknowledge. The general director of KTRV, Nikolai Poroskov, has acknowledged that he stands by an earlier claim that the achievement of a hypersonic speed of 6-7M in the atmosphere will not be achieved until the beginning of the 2020s.<sup>13</sup>

Since the delivery of the *poslanie* it has emerged that China has developed a comparable aero-ballistic system with very similar functions, with a report that it has had five flight tests since December 2016, launched from a heavy bomber. It is a two-stage missile with a range of more than 3,000 km. According to a US assessment, the CH-AS-X-13 as it has been designated by American intelligence, should be ready for deployment after 2025. It is believed that China is developing two missiles of this type, one with a nuclear warhead and another conventionally armed for use against ships.<sup>14</sup> However, launched from a subsonic bomber, there has been no reference to this being a hypersonic weapon.

It is worth considering Russia's development programme for genuinely hypersonic systems. The lead organisation is KTRV, which has a general designer of hypersonic armaments, not yet publically named. The leading enterprises are 'NPO mashinostroeniya' and 'Raduga' which work closely with the Foundation for Advanced Research, Russia's equivalent to the US DARPA, established in 2012. 'Raduga' began the development of an experimental hypersonic vehicle in the final years of the USSR but work on the X-90 missile was ended in 1992.<sup>15</sup> According to Aleksandr Zelin, former commander of the air force, speaking in 2013, Russia had a two stage programme for the development of hypersonic missiles, the first stage to 2020 providing for the development of air-launched sub-strategic missiles with a range of up to 1,500 m. and a speed of c. 6 M; the second from 2020 for the development of a missile capable of a speed of 12 M, able to fly to any point in the world.<sup>16</sup> One project apparently under this programme was the development of the so-called 'article-75', a missile with a target speed of up to 6M to be launched from a TU-95MS or Tu-22M bomber. A ramjet engine was developed for it by the Turaevsk machine building design bureau 'Soyuz', Lytkarino, Moscow oblast, an enterprise of KTRV, with long experience of creating power units for cruise missiles and space systems. A number of directions of research appear to be being pursued, including ballistics, engines, materials, target acquisition and other on-board systems. According to Boris Obnosov, general director of KTRV, one of the aims of the programme is neutralisation of threats potentially posed by the US prompt global strike initiative.<sup>17</sup>

The basic demands of a hypersonic missile, as spelled out by Boris Obnosov, are the development of materials able to withstand extremely high temperatures and a suitable power unit, as no one engine can from zero rapidly reach hypersonic speed. First one has to get from zero to 0.8M or beyond; then to 4M to 6-6.5 M which requires the use of a ramjet; finally to 10 M, which requires supersonic combustion, i.e. a scramjet. At these speeds, there is aerodynamic heating to such high temperatures that new materials are essential. Finally, such high temperatures make severe demands on on-board radio-electronic equipment, with plasma making the transfer of signals very difficult.<sup>18</sup> But Obnosov has also stressed that what is needed is not hypersonic flight for a relatively brief period but stable, long term, flight in the atmosphere. The same point has been made by the 'father' figure of hypersonic systems in Russia, Gerbert Efremov, now advisor to the head of NPO 'Mashinostroeniya', but its director from 1989 to 2007, and this requires a suitable power unit which has not yet been fully developed.<sup>19</sup> According to Obnosov, interviewed in late 2016, a truly hypersonic weapon will not appear until the beginning of the next decade, i.e. 2020 or beyond.<sup>20</sup>

It is generally believed that the first deployable fully hypersonic system will be the 'Tsirkon' 3M-22 manoeuvring cruise missile for use against ships, under development since about 2011 at NPO 'Mashinostroeniya'.<sup>21</sup>

---

<sup>12</sup> Axe, David (2018).

<sup>13</sup> Poroskov, Nikolai (2018).

<sup>14</sup> Panda, Ankit (2018); Bogdanov, Konstantin (2018).

<sup>15</sup> Alexeev, Alex (2017).

<sup>16</sup> Ibid.

<sup>17</sup> Novosti VPK (2018a).

<sup>18</sup> Skorobogatyi, Petr, Khazbiev, Aleksei (2018).

<sup>19</sup> Lenta (2018).

<sup>20</sup> Safronov, Ivan (2016).

<sup>21</sup> Military Russia (2018a).

Development is expected to be completed by 2020 and production organised at the Orenburg 'Strela' association of KTRV, which has long experience of anti-ship missile systems, manufacturing the 'BrahMos', a product of a joint Russia-India programme, the 'Yakhont', 'Granit' and 'Bazalt'.<sup>22</sup> The 'Tsirkon' is believed to have a solid fuel booster taking it to supersonic speeds then a ramjet takes over bringing it to a hypersonic level. It is likely that a scramjet is being developed and a report that in 2017 the missile under test reached a claimed 8 M could provide support for this.<sup>23</sup> Another hypersonic missile is being developed by the Dubna 'Raduga' design bureau. This is a new operational-tactical missile, about which little is known except that it will have a range of about 1,500 km. and reach a speed of 6M and will probably be for use against ships. The aim is to start production by 2020 at a rate of up to 50 missiles a year.<sup>24</sup>

The development of the 'Tsirkon' and the new tactical missile, both apparently conceived as genuinely hypersonic systems, could turn out to be more important than the 'Kinzhal', which has the appearance of being a stop-gap initiative, at a stage of development sufficient to allow it to form part of Putin's presentation as a system near to deployment. The other hypersonic missile that Putin presented is clearly a weapon of the more distant future.

#### *Laser weapon - 'Peresvet'*

One new weapon system was dealt with only briefly by Putin and its military purpose was not explained. This was a mobile combat laser apparently already in service with the armed forces, at least on a trial basis. From the brief video shown, in this case of an actual system, not a graphic, it is clear that it is a road mobile laser installation accompanied by a number of support vehicles, probably including a mobile electric generator and systems aiding target acquisition. The laser beam can clearly be projected into the sky. But as Russian commentators have observed, particularly Kirill Ryabov, the laser is unlikely to be of adequate power to *destroy* a target, only sufficient to disable optical and electronic systems. This suggests that it has an air defence role, possibly aimed at both manned and unmanned flying apparatus, including reconnaissance UAVs. As Ryabov points out, while probably a very expensive military system it could potentially disable a number of aircraft and UAVs without expending many costly anti-aircraft missiles.

In this way the new combat laser is a logical successor to a number of similar systems developed in Soviet times. And like those systems it is probably a product of the Moscow-based 'Astrofizika' science and production association, a powerful centre for laser technologies, originating in 1969 as the 'Luch' central design bureau of the Soviet Ministry of the Defence Industry, headed for a number of years by Nikolai Ustinov, general designer of combat lasers and son of Dmitrii Ustinov, Defence Minister, 1976-1984.<sup>25</sup> The testing of combat laser systems was undertaken, and probably still is, at the state laser test site (*poligon*) 'Raduga' of the Raduzhnyi closed city (ZATO in Russian terminology) in Vladimir oblast', the sole defence industry closed city overseen by the Ministry of Industry and Trade.<sup>26</sup>

In Soviet times 'Astrofizika' developed a powerful laser locator, LE-1, at the Sary Shagan test site, the self-propelled tracked battlefield 'Stilet' complex of 1982 for disabling the optical-electronic systems of opposing armoured vehicles, the 'Sangvin' tracked system of 1983 to disable the optical-electronic systems of aircraft and helicopters, the ship-based 'Akvilon' of 1986 for use against coastal defences, and in the early 1990s the self-propelled 1K17 'Szhatie' with multiple lasers, again for disabling optical-electronic systems.<sup>27</sup> That the Russian Federation had renewed work on combat lasers was first revealed in August 2016 by deputy defence minister for armaments, Yurii Borisov. Speaking at an event marking the 70th anniversary of the foundation of the Sarov nuclear weapons research centre, he said that the armed forces had already adopted a number of combat laser systems.<sup>28</sup> Some confirmation of this came in early 2017, more than a year before Putin's speech, when *Izvestiya* revealed that the MOD would soon receive a mobile laser complex able to 'blind' at distance of tens of

<sup>22</sup> AO 'Proizvodstvennoe ob"edinenie "Strela"' (2018).

<sup>23</sup> Okorokov, Gennadii (2017).

<sup>24</sup> BMPD (2017).

<sup>25</sup> Military Russia (2018c).

<sup>26</sup> Gosudarstvennyi lazernyi poligon "Raduga" (2018)

<sup>27</sup> Il'ya Shchegolev, Il'ya (2014) and Aperesov, Sergei, Khlopotov, Aleksei (2017).

<sup>28</sup> RIA Novosti (2016). Research into lasers is one of the activities of the Sarov centre.

kilometres the optical systems of aircraft, helicopters, and the heads of self-guiding missiles and bombs. It would also be able to disable the optical-electronic systems of tanks, armoured vehicles and anti-tank missile systems. However, it was claimed that this laser system would be relatively small and mobile, which suggests that it was probably another one under development, not the one that figured in the video shown at Putin's *poslanie*. The system, developed by 'Astrofizika' and a direct successor to earlier Soviet systems, was undergoing tests and was apparently at a high level of readiness for combat service.<sup>29</sup>

These developments suggest that work has been underway for some time on a range of combat lasers and hints that the new one revealed by Putin, now known as the 'Peresvet', may be a more powerful, but less mobile, system than the ones developed earlier. This has led to speculation that it may be powered by a portable nuclear power station.<sup>30</sup> Indeed, this could be yet another use of the small nuclear power unit developed for other systems also currently under development, as discussed below. Nevertheless, Borisov has said that the new system is designed to 'blind' the self-guiding systems of incoming missiles suggesting that its power is such that this can now be done at a much greater distance.<sup>31</sup>

### *The 'Sarmat' ICBM*

Of all the systems presented at the *poslanie* the one that generated least surprise was the 'Sarmat' (RS-28; SS-X-30) heavy, liquid-fuelled, multiple-warhead, ICBM. This system has been under development at the Gosudarstvennyi raketnyi tsentr imeni Akadmika V. P. Makeeva at Miass, Chelyabinsk oblast' in the Urals, since 2009. This missile development centre is best known as Russia's principal organisation for submarine launched ballistic missiles. The new ICBM is to be built at the Krasnoyarskii mashinostoitel'nyi zavod, 'Krasnash', the main producer of submarine launched ICBMs.

The missile it is replacing is the Ukraine-built R-36M2 'Voevoda' (SS-18, Satan) the service life of which is set to end by 2027.<sup>32</sup> The new missile has been designed to be deployed in the existing silos for the 'Voevoda', with only minimum adaptation. For most observers, the two new points revealed by Putin would have been the fact that it will have a range making possible its use over not only the North Pole, but also the South, and that the 'Sarmat' underwent its first test in December last year. There is also the question of the weight of the missile, with divergent reports. It is possible that some confusion about the current status of the new missile was created by the fact that one of the videos shown was not in fact of the 'Sarmat' but of a 'Voevoda' in flight, first shown on Russian television in 2011.<sup>33</sup>

To reach the USA over the South Pole a range of at least 16,000 km would be needed, while the 'Sarmat' is usually considered to have a range of c.11,000 km. But the 'Voevoda' could be built in two variants, one with 10 warheads and a range of 11,000 km and a 'light' variant with a single warhead with a range of 16,000 km..<sup>34</sup> Thus it is no surprise that its successor will also have a longer-range option and this is what Putin was referring to. Indeed, in May 2014 Borisov stated that the 'Sarmat' would be able to fly over both poles and that the missile's development was seen as a means of neutralising attempts by the US to develop the potential for a rapid global strike.<sup>35</sup>

In 2011 it was expected that the 'Sarmat' would be ready for deployment by 2018, but over time this scheduled had to be revised.<sup>36</sup> It is clear that there have been many delays. That this has been a source of concern can be seen from the fact that 'Krasnash', undergoing extensive re-equipment, presumably in preparation for the manufacture of the new missile, has been visited frequently by defence minister Sergei Shoigu, no less than three

<sup>29</sup> Ramm, Aleksei, Litovkin, Dmitrii (2017).

<sup>30</sup> See Konstantin Bogdanov, Konstantin (2018a). The military specialist Viktor Murakhovskii asserts directly that the 'Peresvet' has a compact nuclear power source, Grishchenko, Nikolai (2018).

<sup>31</sup> Nezavisimaya gazeta (2018). Meanwhile, the United States has been making progress in developing its own equivalent systems. Lockheed Martin claims to have created an effective laser weapon for protecting military bases from UAVs and is working on systems for use against missiles. Nikitina, Ol'ga (2018).

<sup>32</sup> Mukhin, Vladimir (2018).

<sup>33</sup> Novye izvestiya (2018).

<sup>34</sup> Military Russia (2018e).

<sup>35</sup> TASS (2014).

<sup>36</sup> Military Russia (2018d).

times since the summer of 2016, most recently in February 2018.<sup>37</sup> At one time there were expectations that the first stage of testing, the so-called ejection test (in Russian, *broskovoe ispytanie*) would begin before the end of 2015, but it was then regularly postponed.<sup>38</sup> This is not a flight test of the missile but a check of the mechanism that ejects it from the launch container or silo, a necessary preparation for an actual test of whether the missile can be launched successfully and then fly. It was just such a test in December 2017 to which Putin referred. An actual flight test is still some time in the future, perhaps in 2019, as before then at least two more ejection tests are needed.<sup>39</sup> There will have to be a lengthy series of flight tests, perhaps involving modification to the missile, before an acceptable level of success is achieved making possible serial production and eventual deployment of the 'Sarmat' by the strategic missile forces.<sup>40</sup> This now seems unlikely before 2020: the 'Sarmat' is still some way from being an existing, useable, missile.<sup>41</sup>

Finally, there is the issue of the missile's weight and the types of warheads it will carry. Putin said that it was more than 200 tonnes, but confusion was created by some writers who stated that it was half the weight at 100 tonnes.<sup>42</sup> The consensus is that it is very much like the 'Voevoda', which is 211 t. with a payload of 8.5 t.<sup>43</sup> Confusion may have arisen because in 2012, an early stage of the project, the commander-in-chief of the strategic missile forces, Sergei Karakaev, indicated that it would be a 100 t. missile.<sup>44</sup> This raises the possibility that it was not at first conceived as a direct replacement of the 'Voevoda' to the point of being designed to use its vacated silos. Perhaps a decision was taken to redesign it in order to create that possibility, thereby speeding up its eventual deployment and reducing the associated investment costs. This would account for the delay in the missile's development. There is still some uncertainty as to the number and type of warheads the missile will carry and the choice of a heavier missile would have widened the options. According to Karakaev, it will have three types of re-entry vehicle, one of them 'advanced'.<sup>45</sup> It will likely have at least 10 warheads with penetration aids: according to Borisov they will be manoeuvrable.<sup>46</sup> This brings us to another of the systems presented by Putin.

#### *The 'Avangard' hypersonic boost-glide vehicle*

That Russia has been developing an advanced re-entry vehicle for strategic missiles has been known for some time but details have been sparse. The '4202' development project of the military-industrial corporation 'NPO Mashinostroeniya' based at Reutov, near Moscow, in the past the design bureau of Vladimir Chelomei, responsible for many of the USSR's ICBMs and cruise missiles, has been underway for some time. Since 2012-13 this major centre of missile and space technology has been part of the large KTRV, responsible for the design and manufacture of a wide range of systems, in particular air launched missiles, and as noted above is known for its research into hypersonic technology.

The available evidence suggests that 'NPO Mashinostroeniya' has been working on a hypersonic vehicle for an ICBM since the 1990s and project '4202' began before 2009.<sup>47</sup> One author plausibly claims that the decision to focus on the development of the new glide vehicle was prompted by the June 2002 US decision to withdraw from the Anti-Ballistic Missile Treaty of 1972.<sup>48</sup> The first flight test is believed to have taken place in February 2004 using a RS-18B (SS-19 'Stiletto') ICBM, with more tests in later years, all with the same missile. In 2015 there was a claim that the '4202' manoeuvrable hypersonic vehicle would be an option for the 'Sarmat' heavy

<sup>37</sup> News report on Krasnoyarskii mashinostroitel'nyi zavod (2018).

<sup>38</sup> Military Russia (2018d).

<sup>39</sup> Safronov, Iva, Dzhordzhevich, Aleksandra, Chernenko, Elena (2018).

<sup>40</sup> The 'Voevod' underwent a total of 36 test flights before a high level of reliability was achieved, Military Russia (2018e).

<sup>41</sup> The claim by Viktor Bondarev, chair of the Federation Council's defence committee, that the missile forces will soon receive several pre-serial 'Sarmat' missiles is not credible. Bondarev himself acknowledges that serial production in the next year or two is not possible. Tsentr analiza mirovoi torgovli oruzhiem (2018).

<sup>42</sup> E.g. Baranets, Viktor (2018).

<sup>43</sup> Vyatkin, Ya. (2018); Military Russia (2018e).

<sup>44</sup> Military Russia (2018d).

<sup>45</sup> Krasnaya zvezda (2018). Karakaev then goes on to discuss the 'Avangard' glide vehicle but does not link it directly with the 'Sarmat'.

<sup>46</sup> TASS (2014).

<sup>47</sup> Military Russia (2018f). Note, it has two other known identifiers, article (*izdelie*) 15Yu71 and complex 15P771.

<sup>48</sup> Vladykin, Oleg (2018).

missile, which could have the capacity to carry three of them.<sup>49</sup> According to one report, after 2014, action had to be taken to substitute Ukrainian components originally used in the flight control systems of the vehicle leading to some delay in its development.<sup>50</sup> According to one authoritative source, on 25 October 2017 there was a successful test of a fully Russian 'Avangard', with a launch from the Dombrovskii missile base in Orenburg oblast' to a target at the Kamchatka test range, Kura.<sup>51</sup>

There is little doubt that the '4202' is the 'Avangard' system presented by Putin. However, some confusion has arisen prompted by the fact that at one time a version of the RS-24 'Yars' ICBM was known as the 'Avangard', leading to speculation that the system presented by Putin is for the 'Yars' not the 'Sarmat'.<sup>52</sup> Given the likely scale and weight of the hypersonic vehicle this seems very unlikely but it cannot be ruled out that additional variants will be developed making possible the vehicle's use on other missiles.<sup>53</sup>

According to Putin, the 'Avangard' can travel at a speed in excess of 20M and is capable of manoeuvring both horizontally and vertically. As the glide vehicle approaches its target, the surface temperature rises sharply to 1,600 – 2,000 degrees and for this reason composite materials have been developed, apparently to protect it not only from aerodynamic heating but also potential laser radiation.<sup>54</sup> One account of the system claims that there are options for its use, either as a single warhead or as a vehicle that can scatter a number of independently targetable warheads.<sup>55</sup> Putin claimed that that serial production of the new glide vehicle has already started, which, if true, suggests that it will be used from the outset on some of the 'Sarmat' missiles when they are deployed. The 'Avangard' is a real system at an advanced stage of development and its deployment can be expected within the next three-five years, i.e. before the end of the first five years of the state armament programme to 2027.

Later in March it was confirmed by a source in the defence industry that the 'Avangard' has been included in the programme instead of the 'Rubezh' variant of the 'Yars' ICBM, whereas it had originally been the intention to include both. The reason was financial, the cost of acquiring both was too high, and given this situation it was concluded that the 'Avangard' would contribute more to enhancing the country's national security.<sup>56</sup> It was also revealed unofficially that at first the 'Avangard' will not be used with the 'Sarmat' but as an interim measure, prior to its serial production for volume deployment, it will be used with the same missile on which it has been tested, the Soviet-era 'UR-100N UT'TKh' (SS-19 Stiletto). Russia has about thirty of these ICBMs, transferred from Ukraine, in storage and some of them will become carriers of the 'Avangard'. The strategic missile forces have approximately 30 of the silo-based missiles still in service so it can be assumed that a few will be replaced by newer versions with the hypersonic vehicle.<sup>57</sup>

*Unmanned, nuclear-powered, underwater autonomous apparatus - 'Poseidon'*

One system presented by Putin was not entirely surprising as it had made a public appearance earlier, ostensibly by accident but probably as the outcome of a calculated leak of information. This is the nuclear 'torpedo', publicised first in 2015 as 'Status-6'.<sup>58</sup> It was concluded then that it was a weapon actually under development and this has now been confirmed with some new details not previously available.<sup>59</sup> According to Putin, the

---

<sup>49</sup> Military Russia (2018f).

<sup>50</sup> Surkov, Nikolai (2018).

<sup>51</sup> Fomichev, Oleg (2018).

<sup>52</sup> See, e.g. Fel'gengauer (2018). This issue is discussed by Michael Kofman, who also concludes that the 'Avangard' is for the 'Sarmat', Kofman, Michael (2018).

<sup>53</sup> This possibility is noted by Vyatkin, Ya. (2018).

<sup>54</sup> Prezident Rossii (2018). Fomichev, Oleg (2018); Krasnaya zvezda (2018).

<sup>55</sup> Vyatkin, Ya. (2018).

<sup>56</sup> TASS (2018).

<sup>57</sup> Voенно-promyshlennyyi kur'er (2018). Russia is not alone in developing glide vehicles for strategic missiles. The US has been working for some time on at least two systems, the Falcon (HTV-2) and the AHW, the latter tested successfully in October 2017, while China has its DF-17 hypersonic glide vehicle programme, with a test flight in November 2017. Bogdanov, Konstantin (2018b); Panda, Ankit (2017).

<sup>58</sup> The author's unpublished paper, *Russia's 'secret' weapon: the status of 'Status-6', a research note*, November 2015, is available on request.

<sup>59</sup> As was pointed out, the first reference to the weapon system was in August 2015 three months before the 'leak', see Ramm, Aleksei, Korneev, Dmitrii, Boltchenk, Dmitrii (2015).

unmanned undersea apparatus would be able to move at a very great depth over inter-continental distances at a speed in excess of that of submarines, the most modern torpedoes and all types of surface ship, even the very fastest. It would make little noise, be highly manoeuvrable and undetectable by any adversary. Nuclear or conventional munitions could be deployed against a range of potential targets, including aircraft carriers, shore defences and infrastructure.

Putin also revealed that in December 2017 a cycle of testing an innovative nuclear power installation had finally been concluded after many years. It has uniquely small dimensions with a volume 'a hundred times less than the power unit of a modern nuclear submarine', but develops very high levels of power which can be very rapidly reached. The results of testing opened the possibility of moving to the creation of a completely new type of strategic weapons able to carry high-yield nuclear munitions.<sup>60</sup> This formulation indicates that this is a future weapon but one which is now considered technologically realistic. Putin's statement also opens the possibility that the nuclear power unit is similar to the one to be used in a long-range cruise missile, or at least is a product of the same development programme.

Since Putin spoke more details have emerged. According to informed journalists of *Vedomosti*, the nuclear power plant was developed by the Nizhnii-Novgorod OKBM im. I. I. Afrikantov. It is claimed that there are two variants of the drone, one conventionally armed known as 'Tsefalopod', the other nuclear armed, the 'Status-6', now, as a result of the poll, named the 'Poseidon'. Both will be carried by the special-purpose submarines now being built, the project 09852 'Belgorod', which will be the longest submarine ever built, and the project 09851 'Khabarovsk'.<sup>61</sup> According to Viktor Koroley, commander-in-chief of the navy, the autonomous unmanned vehicle will be almost impossible to intercept, will be able to travel very great distances, manoeuvre and be very quiet.<sup>62</sup> He is also quoted as having said that the nuclear power unit of the underwater apparatus had successfully undergone tests.<sup>63</sup>

Russian observers have met some of these claims with scepticism. In particular, there have been serious doubts as to whether that it will be able to travel as quickly and quietly as asserted, or that it will be undetectable.<sup>64</sup> For Fel'gengauer it is simply too expensive and 'immoral', harking back to the 1950s and '60s.<sup>65</sup>

#### *Long-range nuclear-powered cruise missile - 'Burevestnik'*

Probably the most startling of the new systems displayed by Putin was the nuclear powered cruise missile, also the one about which least information has been made available. It is helpful to cite his exact words:

Russia's advanced armaments are founded on the very latest unique achievements of our scientists, designers and engineers. One of them – the creation of a small-scale, very powerful, nuclear power unit which is fitted into a cruise missile of the type of our latest X-101 air-launched missile or the American 'Tomahawk', but will secure a ten times – ten times! – longer distance of flight, which is practically unlimited. It is a low-flying stealth missile carrying a nuclear warhead, with an almost unlimited range, unpredictable trajectory and ability to bypass interception boundaries. It is invincible against all existing and prospective missile and air defence systems. I will repeat this several times today. In late 2017, Russia successfully launched its latest nuclear-powered missile at the Central test site.<sup>66</sup> During its flight, the nuclear power unit reached its design capacity and provided the necessary propulsion. Now that the missile-launch and ground tests were successful, we can begin developing a completely new type of weapon, a strategic nuclear weapons system with a nuclear-powered missile.<sup>67</sup>

---

<sup>60</sup> Prezident Rossii (2018).

<sup>61</sup> Safronov, Ivan, Dzhordzhevich, Aleksandra, Chernenko, Elena (2018).

<sup>62</sup> Tsentr analiza mirovoi trgovli oruzhiem, (2018a).

<sup>63</sup> See, e.g. Riskin, Andrei (2108).

<sup>64</sup> Ibid.

<sup>65</sup> Fel'gengauer, Pavel (2018).

<sup>66</sup> I.e. the Central nuclear test site, Novaya Zemlya, of the 12th main directorate of the Ministry of Defence, responsible for the nuclear weapons of the armed forces.

<sup>67</sup> Prezident Rossii (2018).



It is clear that Putin is referring to a possible future weapon system, one that has still to be developed but made possible, in principle, by the fact that Russia has created a new, compact, nuclear power unit that can be installed in a cruise missile. The type of power unit is not specified. From the video that was shown it would appear that the missile is launched with a solid fuel booster and then at a certain point the nuclear propulsion takes over and propels the missile to its destination.<sup>68</sup> Russian analysts tend to agree that the nuclear unit acts as a heat source for what is essentially a ramjet and that it is probably a compact reactor. A missile such as the US Tomahawk or Russian X-101 has a length of 6-7 m. and a diameter of 0.5-0.75m., indicating just how compact a reactor would have to be.

Nuclear power sources have been used in some Russian space vehicles but it is thought unlikely that they would develop sufficient heat to propel a missile. It is known that in 2010 there was a decision to support a new project to develop a space transport module on the basis of a nuclear power source, a reactor of the megawatt class. It was to be completed by 2017-18. Rosatom was responsible for the reactor, with the Moscow Scientific Research and Design Institute of Power Technology (NIKIET), one of the country's principal reactor R&D centres, as lead organisation, and Roskosmos for the engine as such, with the Moscow 'Research Centre imeni M.V. Keldysha' as lead.<sup>69</sup> But this was for a system travelling in open space, not one for use in the earth's atmosphere. The principal organisation for the development of nuclear reactors for military systems is the Nizhnii-Novgorod OKB 'Mashinostroeniya imeni I. I. Afrikantova', especially for submarines and ships.<sup>70</sup> There is also the Podol'sk OKB 'Gidropress', which is responsible for nuclear power stations, ship and other power units, including lead-bismuth cooled reactors of modest size.<sup>71</sup> Both are under the state corporation Rosatom. It is possible that one of these organisations is responsible for the new nuclear power unit, perhaps working with NIKIET.

It has been observed that when testing a missile with a nuclear power source at the Novaya Zemlya test site three Il-976 research aircraft were in the region probably for telemetric monitoring of the missile's flight and perhaps, it can be speculated, also to monitor any radiation.<sup>72</sup> Two of the planes seen in January 2018 belonged to 'Rosatom', bearing the emblem of the Russian Federal Nuclear Centre – Russian Research Institute of Experimental Physics of the closed city of Sarov devoted to the development of nuclear weapons.<sup>73</sup>

One issue raised by many commentators on the new system is the danger of the release of radioactive particles, making it difficult to test the missile over land. This possibility may account for it being tested over the sea in Novaya Zemlya. There has been speculation that some spikes of very low-level radiation by the isotope Iodine-131 over Norway, Finland and other northern European countries in 2017 and early 2018 could be related to Russian tests of the new missile, although it has been stressed that they presented no danger to health.<sup>74</sup> According to US sources, the Pentagon has been monitoring all the missile tests and claims that all ended in crashes, in their view indicating failure.<sup>75</sup> However, it is not clear from these reports whether they crashed over land or into the sea. The latter would not necessarily indicate failure as it could have been intended as a relatively safe means of disposal of a system probably intended for single use. This is especially the case if the aim of the test was to explore, as Putin suggested, whether the system developed adequate power and thrust.

From the video shown, the experimental cruise missile used for testing the nuclear power source appears to be a 9M730 cruise missile probably a development of the Ekaterinburg 'Novator' OKB. It appears to have a length without booster of about 9m. and a diameter of approximately 1 m., i.e. somewhat larger than an X-101 or

---

<sup>68</sup> Ryabov, Kirill (2018). Ryabov speculates that the start booster is jettisoned when the missile switches to nuclear-driven propulsion.

<sup>69</sup> Emel'yanenkov, Aleksandr (2012).

<sup>70</sup> See its product range, OKB 'Novator' (2018).

<sup>71</sup> See OKB 'Gidropress' (2018).

<sup>72</sup> Ramm, Aleksei (2018); Sdelano u nas (2018). The third Il-976 had 'Aeroflot' markings, perhaps because still without 'Rosatom' livery. SKIP - *samoletnyi komandno-izmeritel'nyi punkt* - aircraft command and tracking station.

<sup>73</sup> BMPD (2018a).

<sup>74</sup> Nilsen, Thomas (2018).

<sup>75</sup> Kofman, Michael (2018a).

Tomahawk.<sup>76</sup> However, this missile used for testing the nuclear power unit may not be the same as the final one to be developed. According to Putin, the completed ground and flight testing now makes possible the development of a strategic nuclear weapons complex, a missile with a nuclear power unit.

How novel is this missile? As observers in both Russia and elsewhere have noted, it has some similarity with a development in the United States during the 1960s, Project 'Pluto', to create a nuclear-powered cruise missile. The aim was to develop Supersonic Low-Altitude Missiles (SLAM), a US Air Force initiative dating originally from 1957. A nuclear reactor for the ramjet was developed at what later became the Lawrence Livermore National Laboratory, an initial prototype tested in 1961 and then a more powerful 500-megawatt version tested to full power in 1964. In 1963 Ling-Temco-Vought were awarded a contract to develop the missile which was to be launched by a solid-fuel booster then reach a speed at which the nuclear unit would take over. After launch, it was to reach a cruising speed of about 4M at an altitude of about 11,000m with an extremely large potential range before homing in on its target at a very low altitude using terrain contour matching guidance. It would then deliver between 14 and 26 thermonuclear warheads ejected one by one. It would have been a formidable weapon but it had a major drawback: the nuclear ramjet released a trail of fission products and radioactive particles.

This problem was so acute that it could not be tested over land and it was realised that when it eventually crashed to earth it would leave an extremely dangerous and long-lasting nuclear legacy. The system, nicknamed the 'flying crowbar', was never tested in the air although this was initially planned for 1967. The project was abandoned in 1964 as too dangerous and by then anyway the development of ICBMs had reached a level rendering the nuclear missile redundant as a basic deterrent.<sup>77</sup> This was all more than fifty years ago and since then there have been many technological advances rendering a project of this kind more feasible, but it still remains a formidable technical challenge and the safety concerns far from fully eliminated. Writing in 1990, a US specialist referred to the SLAM as a 'flying Chernobyl' and it is perhaps no surprise that the same has been said of the new Russian project.<sup>78</sup>

The purpose of the nuclear cruise missile, later named the 'Burevestnik' was not outlined by Putin. It appears to be in the same category as the nuclear torpedo, a weapon of retribution designed to convince a potential adversary that even after a crippling nuclear strike, perhaps of a kind greatly reducing Russia's counter-strike capability, Russia would still possess the option of inflicting an unacceptable level of nuclear annihilation, a kind of deterrence round two. But weapons of retribution of this kind must be extremely costly and one has to doubt whether in present-day Russia they have undergone any serious cost-benefit analysis as instruments enhancing the country's national security.

#### *What about their cost and implications for military spending?*

Many Russians soon raised the issue of the cost of the new systems and their expectation that increased military spending was in prospect. This produced a rapid response from the Minister of Finance, Anton Siluanov. He made it clear that no increased spending was foreseen. The new state armament programme to 2027 had been approved and all that Putin had spoken of had been undertaken on account of resources allocated in earlier years. Additional tasks relating to the weapons would be implemented in the years ahead but they were already in the new programme, so no additional funding was involved. He also emphasised that under the new programme military spending would in fact fall.<sup>79</sup> This was followed by the head of the Russian Union of Industrialists and Entrepreneurs, Aleksandr Shokhin, who said that he had discussed the issue with defence minister Sergei Shoigu after the *poslanie*. The minister had made it clear that no additional funding was needed. The weapons presented had already been created and there were no plans to invest in the creation of new types of armament. Any challenges that emerged would be met by asymmetrical responses, highly effective but of low cost.<sup>80</sup>

---

<sup>76</sup> Military Russia (2018).

<sup>77</sup> See Harken, Gregg (1990); Greenemeier, Larry (2018); Parsch, Andreas (2018).

<sup>78</sup> Harken, Gregg (1990); Fel'gengauer, Pavel (2018).

<sup>79</sup> Izvestiya (2018).

<sup>80</sup> Nemchenko, Il'ya, Kanaev, Petr (2018).

### *Reactions to the poslanie, at home and abroad*

Reactions to the military section of Putin's *poslanie* both within Russia and abroad were rapid but also mixed in their assessments, ranging from enthusiastic support to expressions of serious concern. There were also divergent opinions as to the intended audience of the message, was it for the Russian public on the eve of a presidential election, or addressed mainly to the United States and/or Europe both as a warning and perhaps also a call for new talks on the issue of nuclear strategic stability? As noted by some observers, outside Russia the main audience tended to be seen as domestic, but within Russia many took the view that the military part of the *poslanie* was directed above all to Washington.<sup>81</sup> However, the majority view was that it had two audiences, both domestic and foreign: in the words of Kramnik, it was aimed at *urbi et orbi*.<sup>82</sup> A few commentators suggested that China may also have been an intended recipient, being made aware of Russia's growing military capabilities and the potential for technological partnerships.<sup>83</sup> But Asya Romanovskaya thought many observers would share the view that the message should really have been targeted at European Union, not the United States, which 'long ago lost the ability to listen and hear.'<sup>84</sup>

The style of the presentation attracted much comment, especially the poor, old-fashioned, quality of some of the visual aids. Romanovskaya even made reference to the 'extravagant', almost 'North Korean', form of the military part of the *poslanie*, and another wrote that the 'militaristic fantasy' was accompanied by films, as if learnt from Kim Jong-un.<sup>85</sup> Some commentators likened Putin's claims for the new weapons to some of Nikita Khrushchev's boasts, in particular his 1959 claim that the factories were turning out missiles like sausages, and the 'Soviet' character of the event was noted by the Russian political analyst Tat'yana Stanovaya.<sup>86</sup>

For some Russian political commentators and journalists of a liberal orientation, Putin's focus on new weaponry had a far from enthusiastic reception. There was a fairly general view that in the absence of any significant new initiatives to offer for boosting economic performance and improving living standards Putin had decided to focus his pre-election message on national security and Russia's new-found military, technological, strength, apparently putting the country once again on a great power footing comparable to the United States. The enthusiastic response of his audience in the Manezh indicated that this was a message pleasing to the political elite and it was echoed by the state-controlled media, above all television. Commentators argued that the goal had been to increase turnout in the election and boost support for Vladimir Putin, and indeed the outcome on election-day suggests that this may have been achieved. For some, notably the military journalist Aleksandr Gol'ts, Putin's *poslanie* was yet another manifestation of militarism, which in his view has become an ever more present feature in Russia under Putin's presidency.<sup>87</sup> It was, in short, the declaration of a new Cold War, and Gol'ts likened it to Churchill's famous Fulton speech of March 1946.<sup>88</sup>

### *What prompted the speech?*

As noted by many commentators, a major theme of Putin's speech was the abandonment in 2004 by the United States of the Anti-Ballistic Missile Treaty. This he argued had undermined Russia's security, threatening to weaken, perhaps fatally, the country's deterrence capability. But, as pointed out by informed specialists, both Russian and foreign, the anti-missile capabilities of the US present no real threat as the systems deployed cannot shoot down ICBMs and are unlikely to be able to do so in the foreseeable future.<sup>89</sup> This concern has clearly been heightened by the recent appearance of a number of new US doctrinal documents, above all the

---

<sup>81</sup> Trudolyubov, Maxim (2018).

<sup>82</sup> Kramnik, Il'ya (2018).

<sup>83</sup> Kashin, Vasilii (2018); Frolov, Vladimir (2018). Baev thought that there may have been a hint to China that the 'strategic partnership' should not be taken for granted, Baev, Pavel (2018).

<sup>84</sup> Romanovskaya, Asya (2018).

<sup>85</sup> Ibid.; Gol'ts, Aleksandr (2018a).

<sup>86</sup> Saradzhyan, Simon (2018); Stanovaya, Tat'yana (2018).

<sup>87</sup> Gol'ts, Aleksandr (2018).

<sup>88</sup> Gol'ts, Aleksandr (2018a). This was also the view of Vadim Kozyulin of the PIR Centre, Kozyulin, Vadim (2018). With less hyperbole, another commentator likened Putin's speech to the historic one he gave in Munich in 2007, Romanovskaya, Asya (2018).

<sup>89</sup> See, e.g. Arbatov, Aleksei (2018); Frolov, Vladimir (2018); Kofman, Michael (2018).

Department of Defense's, *Nuclear Posture Review* 2018, published in February.<sup>90</sup> There seems little doubt that it was this important statement of policy that prompted Putin to focus on military issues in his *poslanie*.<sup>91</sup> It also provided grounds for lifting secrecy in relation to a number of new weapon systems as they had already been identified in the document, specifically the 'Sarmat' (implicitly, as one of 'at least two' new ICBMs), the hypersonic glide vehicle and the nuclear-powered undersea autonomous torpedo. The *Review* also made reference to Russia 'building a large, diverse, and modern set of non-strategic systems that are dual capable (may be armed with nuclear or conventional weapons)'.<sup>92</sup> This relates to another issue that may have influenced the decision to present the new weapons, namely Russia's evident concern with the US policy of developing a conventional prompt global strike capability, seen as destabilising and potentially undermining the country's nuclear deterrent.<sup>93</sup>

The key point that Putin sought to convey was that regardless of any moves made by the United States to develop further its anti-missile systems, to upgrade its nuclear capability, or to strengthen its potential to inflict a prompt and extremely damaging conventional strike, Russia is already now able to ensure its own security and will be in an even stronger position to do so in the future, when it will possess an ability to inflict a final devastating 'third strike' in the event of a nuclear attack. Bordachev, Arbatov and other commentators may well be right that Putin was seeking to reassure a somewhat fearful elite and society that regardless of external threats the country's armed forces are ready and able to guarantee Russia's security.<sup>94</sup>

And in the view of some serious expert opinion, it is from this position of confidence that Putin can be seen as sending a signal to Washington that the time has come for serious negotiations on the challenge of retaining strategic nuclear stability in today's rapidly changing world. In the words of the editor of the quality newspaper *Nezavisimaya gazeta*, Konstantin Remchukov, it was an 'exotic way of inviting the USA to the negotiating table'.<sup>95</sup> Putin in his speech complained that earlier the USA had not been prepared to listen, but now he clearly hoped that Russia would be heard and an appropriate response would follow.

#### *Some issues raised by Putin's speech*

The presentation raised a number of interesting issues. In particular, when and how did the new weapons originate and what accounted for the fact that a decision had been made to fund their development? There is general agreement that some of the new systems started as projects initiated in the 1980s as part of an asymmetrical response to Reagan's Strategic Defence Initiative although two probably date back to earlier years, i.e. they are not systems developed from scratch in recent years but build on a legacy of Soviet-era research and development. As Kofman points out, both the nuclear-powered undersea drone and the similarly powered cruise missile are basically ideas of the 1950s and '60s.<sup>96</sup>

Russian development programmes probably began much later, however, perhaps in response to SDI, which may also have prompted the development of a hypersonic glide vehicle. But this does not resolve the issue of why Russia chose to focus on these programmes in more recent times as a response to the withdrawal of the USA from the ABMT. One can only assume that the Russian military and political leadership called on the defence industry to propose development projects that would offer systems able to counter any US anti-missile defences within a reasonably short period of time and, preferably, at not too high a cost. The latter being a reasonable expectation if much development work had been undertaken during earlier years.

In the view of both Baev and Kofman the development of the new weapons was at least in part an outcome of successful lobbying by defence industry interests. In the words of Baev, "They (design bureaus) have managed to sell to the commander-in-chief their "innovative" projects developed back in the 1980s as Soviet asymmetrical

---

<sup>90</sup> US Department of Defense (2108).

<sup>91</sup> This is also the view of many commentators, including Arbatov, Bordachev, Frolov and Michael Kofman.

<sup>92</sup> US Department of Defense (2018), p.9. It made no reference to the nuclear-powered long-range cruise missile or the laser system, the latter no surprise as it is not a nuclear weapon.

<sup>93</sup> On the history, technologies and risks of US PGS policy, see Woolf, Amy F. (2018). For an informed Russian view, see Arbatov, Aleskei (2013).

<sup>94</sup> Bordachev, Timofei (2018); Arbatov, Aleksei (2018).

<sup>95</sup> Remchukov, Konstantin (2018).

<sup>96</sup> Kofman, Michael (2018a).

responses to President Ronald Reagan's Strategic Defense Initiative.<sup>97</sup> According to Kofman, 'various industries in Russia seem to have sold the government on boutique weapons that will plus up Russia's current deterrent.'<sup>98</sup> But it may not be appropriate to mirror-image the US defence industry. The Russian defence sector, still marked to a significant degree by its Soviet past, has its own features, characteristic behaviour and role, not always the same as those typical of defence industries which have developed over decades in countries with more effectively functioning market economies and more democratic political systems. Thus, the appearance of the new weapons as an outcome of defence industry pressure is not entirely convincing. It is likely that the political leadership first consulted the MOD and General Staff and asked for suggestions for new systems to counter any possible development of the anti-missile capability of the US, i.e. military considerations are likely to have predominated. However, the armed forces would have been well aware of the work of the defence industry and the nature of past and present programmes.

Another question is why the Russian leadership became so concerned when the USA withdrew from the ABMT. Did the military leadership really think that the country's nuclear deterrent would be soon undermined? Or did it see an opportunity to secure more funding for military programmes and, with support from defence industry interests, persuaded the political leadership that a danger existed that had to be addressed. As Frolov observes, the development of the new weapons, some exotic, raises the issue of the role in defence decision making, if any, of public discussion.<sup>99</sup>

But he failed to note that for this to be productive independent expertise is needed. Russia possesses some highly authoritative expertise that could have played a valuable role in assessing the validity of the claims of the military and advising the relevant political leadership. Such respected specialists as Aleksei Arbatov, Vladimir Dvorkin and Petr Topychkanov immediately come to mind, but one may doubt whether they were consulted. There is irony here as in the late Soviet period such independent expertise did play an active role, notably Arbatov's father, Georgii, the prominent specialist on the USA and security issues. Given their concern for the predictability of the Russia-US strategic nuclear relationship and their understanding of the current and likely future capabilities of anti-missile defence systems, it seems unlikely that such independent experts would have supported the two 'vengeance' weapons, the nuclear-powered undersea drone and cruise missile.

An issue addressed by many commentators is the likely impact on future arms acquisition of Putin's revelations. There has been a broad consensus in both Russia and the West that they are likely to fuel an arms race. It is unlikely that Putin himself intended this outcome; perhaps he simply did not consider the possibility. In Igor' Yakovenko's words the Pentagon and other defence departments of NATO are 'rubbing their hands with glee' at the prospect of additional funding, while Ivan Erofeev thinks that US defence contractors will be called upon to step up their work to meet the challenge posed by such systems as the hypersonic glide vehicle and the 'Kinzhal'.<sup>100</sup> Steven Pifer in the States has no doubt that the *poslanie*, 'will only encourage those in the Pentagon who push for new US nuclear arms'.<sup>101</sup> There is now an awareness of this possibility in Russian military circles. Yurii Borisov has, for instance, stressed that Putin's speech was not a call for a new arms race but an appeal to sit down at the negotiating table.<sup>102</sup>

#### *Will all the new weapons enter service?*

In two or three cases, there seems little doubt that the new systems presented by Putin will enter service, probably in the next few years. This applies to the 'Kinzhal', although the number of MiG-31s adapted for its use is likely to be small, and to the 'Sarmat' ICBM, still to undergo flight tests and enter serial production, although the 'Krasnash' plant is probably already well-prepared for this. If used with existing missiles which could be deployed without much delay, the 'Avangard' glide vehicle may also enter service in the early 2020s though the number may not be large. The acquisition of the laser weapon is more uncertain as it may be too expensive to build and deploy in quantity. A possible use in small numbers would be as a supplement to the

---

<sup>97</sup> Baev, Pavel (2018).

<sup>98</sup> Kofman, Michael (2018a).

<sup>99</sup> Vladimir Frolov, Vladimir (2018).

<sup>100</sup> Yakovenko, Igor (2018); Erofeev, Ivan (2018).

<sup>101</sup> Pifer, Steven (2018).

<sup>102</sup> Azanov, Roman (2018).

Moscow air defence system. These systems are probably realisable within Russia's existing scientific and technological capabilities without the need for significant additional R&D.

As noted by several commentators, there was one striking contrast between the first part of the *poslanie* on economic and social issues and the second on military matters. In the former Putin spelt out the dangers of lagging behind technologically and implied that this was a matter of concern for Russia, but in the second he proudly declared that the new weapons showed that the country was at the very frontier of technological development. It was not made clear, however, that the new systems he presented drew heavily on past investments in military-related R&D. To a large extent, Russia's achievements in the defence industry during recent years have been based on the inherited scientific and technological legacy from Soviet times, plus highly skilled personnel with Soviet-era training.

But it is often now acknowledged that this potential is nearing its end. Future development will require significant investment in fundamental research and innovative technologies, with the training of a new generation of R&D and design specialists. One member of the Duma's Defence Committee likened it to the challenge to the atomic project of over seventy years ago. He also argued that the first and second parts of Putin's *poslanie* were inextricably linked, noting that the creation of the 'Avangard' glide vehicle was only possible because it used the large Soviet scientific and technological backlog. 'But today', he adds, 'this store is empty, it is necessary to think about fundamental research'.<sup>103</sup>

This is increasingly recognised by the Russian MOD and defence industry and a number of measures have been adopted to meet the challenge. The Fund for Advanced Research (FPI) was created in 2013, modelled on the US DARPA. It does not have its own R&D units but funds research under contracts with industrial and other research centre, now funding more than sixty projects. Priorities include advanced materials, robotics, UVAs, including under-sea, new manufacturing methods, in particular additive technologies, quantum computers and nanotechnology.<sup>104</sup> And, since 2013, the MOD has formed about twelve so-called scientific companies (*nauchnyi roty*) – small groups of young service personnel with scientific skills who work at universities or institutes on specific research problems.<sup>105</sup> In 2018 an innovation 'technopolis' called 'ERA' is also to be created at Anana in Krasnodar krai to undertake R&D into artificial intellect of military purposes and associated technologies.<sup>106</sup> The role of the Russian Academy of Sciences (RAN) in undertaking military-relevant basic research is also being enhanced. Since Soviet times coordination with the military and defence industry has been led by the Section of Defence Problems of the Ministry of Defence of the Presidium of RAN (often referred to euphemistically as the Section of Applied Problems) but until recently it was underfunded and the statute of the academy has placed limits on the extent to which military work can be undertaken. Now the basic law on the Russian Academy is being amended to make explicit its responsibility for defence-related fundamental and exploratory research.<sup>107</sup>

This situation raises a question in relation to the two most exotic new weapons, the nuclear-powered cruise missile and the undersea drone. These are still under development and must pose formidable demands in terms of new materials, control systems and manufacturing technology. Does Russia currently possess all the scientific and technological essentials to turn these experimental systems into actual, deployable, weapons? They may well remain potential systems for a long time and it cannot be ruled out that they will never enter service. Meanwhile, they are probably playing a role in promoting lines of research with potential applications in the future, both military and civil, e.g. the development of relatively small and light nuclear reactors.

---

<sup>103</sup> Khokhlov, Aleksei, Falichev, Oleg (2018).

<sup>104</sup> Fond perspektivnykh issledovaniy (2018); Fond perspektivnykh issledovaniy (2018a).

<sup>105</sup> Novosti VPK (2018).

<sup>106</sup> Valagin, Anton (2017); Prezident Rossii (2018a).

<sup>107</sup> Sistema obespechniya zakonodatel'noi deyatelnosti (2018). <http://sozd.parlament.gov.ru/bill/398393-7>, accessed 19 April 2018.

### *Conclusion*

The second half of Putin's *poslanie* was undoubtedly the highlight of a lacklustre presidential campaign. He evidently set out to surprise his audience and the country at large and without doubt succeeded. It still echoes in the Russian media and new details of the weapons presented continue to emerge. The speech was not a militaristic indulgence, as some Russian liberal critics have asserted, or a signal that in future more would be spent on defence. For Putin, it was probably conceived, not as a new beginning, but as a marking the fact that significant progress has now been made in a process underway over at least the past decade, namely the reestablishment of the country's nuclear strategic parity with the United States, not only in the present, but also in the foreseeable future. It was probably intended as reassurance of the country's population that, notwithstanding an at times threatening international environment, the task of guaranteeing national security had been fulfilled, with the subtext that during his next, final, presidential term it would be possible to concentrate more on resolving Russia's domestic problems, not least the poorly performing economy.

Domestic electoral considerations were to the fore. Russia's most advanced military technologies, normally shrouded in secrecy, were paraded and there was no inhibition in acknowledging that the United States is regarded as the main potential nuclear adversary to be countered. Putin would have been confident that mass public opinion would be highly supportive, with the possible exception of some liberally-minded intellectuals. At the same time, but in a rather opaque manner, Putin was probably signalling that Russia would now welcome negotiations with the United States on strategic issues of mutual concern, to strengthen and prolong the existing treaty regime, perhaps extending it once again to defences against ballistic missiles, recognising the fact that the new weaponry that Russia will soon possess will render such defences even less effective than they already are. The existing strategic arms reduction treaty, New START, which entered into force in February 2011, expires in February 2021. If it is to be extended negotiations will have to begin quite soon. By his speech of 1<sup>st</sup> March Putin has signalled that the time has come to renew their agenda.

## Reference list

Alexeev, Alex (2017), 'Giperzvukovaya sueta: v pogone za skorost'yu', <https://topwar.ru/109481-giperzvukovaya-sueta-v-pogone-za-skorostyu.html>, 22 February.

AO 'Proizvodstvennoe ob"edinenie "Strela"' (2018), <https://www.pa-strela.com/index.php/products/military/>, accessed 17 March.

Aperesov, Sergei, Khlopotov, Aleksei (2017), 'Vyzhigatel': samokhodnyi lazernyi kompleks IK 17 "Szhatie", <https://www.popmech.ru/11215-vyzhigatel-samokhodnye-lazernye-kompleksy/>, 17 October.

Arbatov, Aleksei (2018), "'Vyzov broshen'", *Ogonyok*, 2018, no.9, 12 March, <https://www.kommersant.ru/doc/3568179>.

Arbatov, Aleksei (2013), 'New Global Strike Systems Create Serious Problems for Russia', Moscow Carnegie Center, 24 October, <http://carnegie.ru/2013/10/24/new-global-strike-systems-create-serious-problems-for-russia-pub-53597>.

Axe, David (2018), 'Is Kizhal, Russia's New Hypersonic Missile, a Game Changer?', <https://www.thedailybeast.com/is-kinzhal-russias-new-hypersonice-missile-a-game-changer?ref=home>, 15 March.

Azanov, Roman (2018), 'Vosstanovit' yadernyi paritet: novoe superoruzhnie Rossii poluchio "svidel'stva o rozhdeniya"', <http://tass.ru/armiya-i-opk/5060255>, 23 March.

Baev, Pavel (2018), 'Missiles of March: A political means of last resort for Putin', <http://www.brookings.edu/blog/order-from-chaos/2018/03/07/missiles-of-march-a-political-means-of-last-resort-for-putin>, 7 March.

Baranets, Viktor (2018), 'Grif sekretnosti snyat', *Komsomol'skaya pravda*, 2 March.

BMPD (2018), 'Vzglyad s Zapada na sistemu "Kinzhal" i yadernuyu raketu', <https://bmpd.livejournal.com/3126144.html>, 17 March.

BMPD (2018a), 'Modernizirovannye Il-976 SKIP dlya 'Rosatom'', <https://bmpd.livejournal.com/3030599.html>, 1 January.

BMPD (2017), 'Novye Rossiiskie aviatsionnye krykatye rakety X-50 i GZUR', <https://bmpd.livejournal.com/3016213.html>, 22 December.

Bogdanov, Konstantin (2018), 'Ballistika vysokogo starta', <https://iz.ru/731842/konstantin-bogdanov/ballistika-vysokogo-starta>, 15 April.

Bogdanov, Konstantin (2018a), "'Eto ne blef'", *Profil*, 2018, no.9, 12 March.

Bogdanov, Konstantin (2018b), 'Na starte gipergonki', <https://iz.ru/734151/konstantin-bogdanov/na-starte-gipergonki>, 22 April.

Bordachev, Timofei (2018), 'Poslanie i nashim, i vashim', <http://www.profil.ru/pryamayarech/item/125148-poslanie-i-m=nashim-i-vashim>, 5 March.

Emel'yanenkov, Aleksandr (2012), 'Buksir v nevesomost', *Rossiiskaya gazeta*, 3 October.

Erofeev, Ivan (2018), 'Moya oborona. Kak novoe oruzhie Putina delaet bespoleznymi voennye zatraty SShA', <http://www.forbes.ru/biznes/357991-moya-oborona-kak-novoe-oruzhie-putina-delaet-bespoleznymi-voennye-zatraty-ssha>, 1 March.

Fel'gengauer, Pavel (2018), 'Staya letayushchikh Chernobylei', <https://www.novayagazeta.ru/articles/18/03/03/75688-staya-letayushchih-chernobyley>, 5 March.

Fomichev, Oleg (2018), "'Avangard" rossiiskogo arsenal', *Izvestiya*, 2 March.

Fond perspektivnykh issledovaniy (2018), <http://fpi.gov.ru/>, accessed 20 February.



Fond perspektivnykh issledovaniy (2017), 'Andrei Grigor'ev: segdonya my voploshchaem pochtu 120 innovatsionnykh idei', [http://fpi.gov.ru/press/media/andrey\\_grigoryev\\_segodnya\\_mi\\_voploshchaem\\_pochtu\\_120\\_innovatsionnih\\_idey](http://fpi.gov.ru/press/media/andrey_grigoryev_segodnya_mi_voploshchaem_pochtu_120_innovatsionnih_idey), 29 December.

Frolov, Vladimir (2018), 'Sderzhat' Putina ne udalos'. Okakom chudo-oruzhii pn govorit', <https://republic.ru/posts/89804>, 2 March.

Gol'ts, Aleksandr (2018), 'Rossiya militaristskaya', <https://newtimes.ru/articles/detail/151996>, 12 March.

Gol'ts, Aleksandr (2018a), "'Kholodnaya voyna" - eto uzhe real'nost', <http://mvvc44tv.cmlle.ru/a=note&id=32192>, 1 March.

Gosudarstvennyi lazernyi poligon "Raduga" (2018), <http://trassa.org/>, accessed 15 March.

Greenemeier, Larry (2018), 'Russia's New Nukes Are Similar to a Risky Project the U.S. Abandoned', <https://www.scientificamerican.com/article/russias-new-nukes-are-similar-to-a-risky-project-the-u-s-abandoned/>, 2 March.

Grishchenko, Nikolai (2018), 'Rossiiskie boevye lazery prevzoshli amerikanskoe lazernoe oruzhie', <https://rg.ru/2018/03/23/rossijskie-boevye-lazery-prevoshodiat-amerikanskoe-lazernoe-uruzhie.html>, 23 March.

Harken, Gregg (1990), 'The Flying Crowbar', *Air & Space Magazine*, vol.5, no.1, April/May, <http://www.merkle.com/pluto/pluto.html>

Izvestiya (2018), 'Siluanov oproverg uvelichenie raskhodov na oboronu', <https://iz.ru/715011/2018-03-01/siluanov-oproverg-uvelichenie-raskhodov-na-oboronu>, 1 March.

Kashin, Vasiliy (2018), 'Poslanie prezidenta Rossii: zayavkana uchastie', <http://www.globalaffairs.ru/global-processes/Poslanie-prezidenta-Rossii-zayavka-na-chastie-19402>, 6 March.

Khokhlov, Aleksei, Falichev, Oleg (2018), 'Vakansiya dlya Berii. Novyi atomnyi proekt dolzhno delat's drugoe pravitel'stvo', <http://www.vpk-news.ru/articles/42228>, 16 April.

Kofman, Michael (2018), 'Emerging Russian Weapons: Welcome to the 2020s (Part 1 - Kinzhal, Sarmat, 4202)', <https://russianmilitaryanalysis.wordpress.com/2018/03/04/emerging-russian-weapons-welcome-to-the-2020s-part-1-kinzhal-sarmat-4202/>, 4 March.

Kofman, Michael (2018a), 'Emerging Russian Weapons: Welcome to the 2020s (Part 2 - 9M730, Status-6, Klavesin-2R)', <https://russianmilitaryanalysis.wordpress.com/2018/03/06/emerging-russian-weapons-welcome-to-the-2020s-part-2-9m730-status-6-klavesin-2r/>, 6 March.

Kolesnikov, Andrei (2018), 'Giperbolid inzhenerov Putina', *Kommersant. Daily*, 2 March.

Kozyulin, Vadim (2018), 'Oruzhie, garantiruyushchee mir', <http://pircenter.org/blog/view/id/325>, 5 March.

Kramnik, Il'ya (2018), 'Destabilizatsiya nestabil'nosti', <http://www.profile.ru/politika/item/125146-destabilizatsiya-nestabilnosti>, 5 March.

Krasnaya zvezda (2018), 'S giperzvukom nam net ravnykh po moshchi', <http://www.redstar.ru/index.php/mohov/item/36346-s-giperzvukom-nam-net-ravnykh-po-moshchi>, 2 March.

Krasnoyarskii mashinostroitel'nyi zavod (2018), <http://krasm.com/news/news.aspx>, accessed 7 March.

Kuzvkov, Viktor (2018), 'Voennye novinki Rossii: est' giperskorosti, no est' li giperzvuk?', <https://topwar.ru/138321-voennye-novinki-rossii-est-giperskorosti-no-est-li-giperzvuk.html>, 23 March.

Lenta (2018), 'Rossiya priznala problemy vsozdaniy giperzvukhogo oruzhiya', <https://lenta.ru/news/2018/01/19/hyper/>, 19 January.

Majumdar, Dave (2018), 'Russia Just Fired a Hypersonic Missile from a MiG-31 Fighter. Should America be Worried?', <http://nationalinterest.org/blog/the-buzz/russia-just-fired-hypersonic-missile-mi-31-fighter-should-24871>, 12 March.

Military Russia (2018), <http://militaryrussia.ru/blog/topic-895.html>, 'Raketa 9M730/krylataya raketa s YaEU', accessed 21 March.

Military Russia (2018a), <http://militaryrussia.ru/blog/index-917.html>, 'Kompleks 2k-22 Tsirkon/ Tsirkon-s, raketa 3M22 - SS-N-33', accessed 17 March.

Military Russia (2018b), <http://militaryrussia.ru/blog/topic-407.html>, 'MiG-31- Foxhound', accessed 12 March.

Military Russia (2018c), presentation on *Gosudarstvennyi nauchnyi tsentr Rossiiskoi Federatsii, FGUP "NPO Astrofizika"*, Available, <http://militaryrussia.ru/forum/viewtopic.php?f=554&t=1483&sid=f8dbcede1880db57234c1baffb57de36f>, accessed 9 March.

Military Russia (2018d), <http://militaryrussia.ru/blog/topic-435.html>, 'RS-28/OKR Sarmat, raketa 15A28 - SS-X-30', accessed 8 March.

Military Russia (2018e), <http://militaryrussia.ru/blog/topic-579.html>, 'R-36M2/RS-20V Voevoda - SS-18 mod.5-6 SATAN', accessed 8 March 2018.

Military Russia (2018f), <http://militaryrussia.ru/blog/topic-807.htm>, '4202, izdelie 15Yu71, kompleks 15P771', 4 March.

Ministry of Defence Russian Federation (2018), <http://vote.mil.ru/>, accessed 25 March.

Nemchenko, Il'ya, Kanaev, Petr (2018), 'Shokhin soobshchil o razgovor s Shoigu o voennom byudzhete posle poslaniya Putina', <https://www.rbc.ru/finances/02/03/2018/5a993add9a79475e43244a95?from=main>, 2 March.

Nezavisimaya gazeta (2018), 'Rossiiskii boevoi lazer mozhet "oslepyat" letyashchie rakety', <http://www.ng.ru/news/611543.html>, 23 March.

Nikitina, Ol'ga (2018), 'Pri sozdanii oruzhiya "napravelnnoi energii" dostignuta "perelomnaya tochka"', <https://vz.ru/news/2018/4/20/918886.html>, 20 April 2018.

Nilsen, Thomas (2018), 'Is Putin's new nuclear systems source of mysterious radioactivity in the air?', <https://thebarentsobserver.com/en/ecology/2018/03/putins-new-nuclear-systems-source-mysterious-radioactivity-air>, 3 March.

Novosti VPK (2018), <https://vpk.name/library/f/nauchnaya-rot.html>, accessed 3 February.

Novosti VPK (2018a), 'Korporatsiya "Takticheskoe raketnoe vooruzhenie" opredelena glavnoi organizatsiei posozdaniyu oruzhiya - gendirektor', [https://vpk.name/news/204786\\_korporatsiya\\_takticheskoe\\_raketnoe\\_vooruzhenie\\_opredelena\\_glavnoi\\_organizatsiei\\_po\\_sozdaniyu\\_giperzvukovogo\\_oruzhiya\\_gendirektor.html](https://vpk.name/news/204786_korporatsiya_takticheskoe_raketnoe_vooruzhenie_opredelena_glavnoi_organizatsiei_po_sozdaniyu_giperzvukovogo_oruzhiya_gendirektor.html), 24 January.

Novye izvestiya (2018), <https://newizv.ru/news/society/01-03-2018/voevoda-i-sarmat-odna-satana-dlya-raznykh-raket-ispolzovali-odno-video>, 1 March.

OKB 'Gidropress' (2018), <http://www.gidropress.podolsk.ru/ru/projects/svbr.php>, accessed 18 March.

OKB 'Novator' (2018), <http://www.okbm.nnov.ru/reactors#asmm>, accessed 18 March.

Okorokov, Gennadii (2017), 'Naperonki so sverkhzvukhom', *Moskovskii komsonolets*, 17 April.

Panda, Ankit (2018), 'Revealed: China's Nuclear-Capable Air-Launched Ballistic Missile', <https://thediplomat.com/2018/04/revealed-chinas-nuclear-capable-air-launched-ballistic-missile/>, 10 April.

Panda, Ankit (2017), 'Introducing the DF-17: China's Newly Tested Ballistic Missile With a Hypersonic Glide Vehicle', <https://thediplomat.com/2017/12/introducing-the-df-17-chinas-newly-tested-ballistic-missile-armed-with-a-hypersonic-glide-vehicle/>, 28 December.

Parsch, Andreas (2018), 'Vought SLAM (Pluto)', *Directory of U.S. Military Rockets and Missiles*, <http://www.designation-systems.net/dusrm/appf/slam.html>, accessed 6 March.

Pifer, Steven (2018), 'Putin on the nukes', <http://www.brookings.edu/blog/order-from-chaos/2018/03/02/putin-on-the-nukes>, 2 March.

Poroskov, Nikolai (2018), "'Po ob'emam vyruchki na cheloveka my dostigli parameterov vedushchikh mirovykh kompanii'", [http://nvo.ng.ru/armament/2018-04-13/1\\_992\\_corporation.html](http://nvo.ng.ru/armament/2018-04-13/1_992_corporation.html). 13 April.

Prezident Rossii (2018), 'Poslanie Prezidenta Federal'nomu Sobraniyu', <http://kremlin.ru/events/president/news/56957>, 1 March.

Prezident Rossii (2018a), 'Prezentatsiya innovatsionnogo tekhnopolisa "ERA"', <http://www.kremlin.ru/events/president/news/56923>, 23 February.

Ramm, Aleksei (2018), 'Bez ogranichenii do dal'nosti', <https://iz.ru/715211/aleksei-ramm/bez-ogranichenii-po-dalnosti>, 2 March.

Ramm, Aleksei, Litovkin, Dmitrii (2017), 'Minoborony poluchit svetovoi mech. Vozrozhden proekt lazernogo kompleksa "Szhatie", osleplyayushchego optiku protivnika', <https://iz.ru/news/660375#ixzz4Y0RBeINo>, 7 February.

Ramm, Aleksei, Korneev, Dmitrii, Boltenkov, Dmitrii (2015), 'Glubochaishaya taina Rossii', *Voenno-promyshlennyi kur'er*, no.30, 11 August, <http://vpk-news.ru/articles/26504>.

Remchukov, Konstantin (2018), 'Poslanie Putina - eksoticheskii sposob priglasit' SShA za stol peregovorov', [http://www.ng.ru/politics/2018-03-05/100\\_echo05022018.html](http://www.ng.ru/politics/2018-03-05/100_echo05022018.html), 5 March.

RIA Novosti (2016), 'Rosssiiskaya armiya prinyala navooruzhenie obrazttsy lazernogo oruzhiya', [https://ria.ru/defense\\_safety/201609802/1473432412.html](https://ria.ru/defense_safety/201609802/1473432412.html), 2 August.

Riskin, Andrei (2018), 'Vladimir Putin oproverg zakony fiziki', [http://www.ng.ru/columnist/2018-03-01/100\\_kolonka010318.html](http://www.ng.ru/columnist/2018-03-01/100_kolonka010318.html), 3 March.

Romanovskaya, Asya (2018), 'Tsel' opravyvaet sredstva', <https://www.vvprf.ru/hot/tsel-opravdyvaet-sredstva.html>, 6 March.

Ryabov, Kirill (2018), 'Novosti ot prezidenta: krylataya raketa so yadernoi energoustanovkoi', <https://topwar.ru/137124-novosti-ot-prezidenta-krylataya-raketa-s-yadernoy-energoustanovkoy.html>, 4 March.

Safronov, Ivan (2016), 'Boris Obnosov o tom, kak pridmyvayutsya, proizvodyatsya i prodavayutsya rakety', <http://www.kommersant.ru/doc/3099581>, 26 September.

Saradzhyan, Simon (2018), 'Putin's Saber-Rattling Bodes Ill for Strategic Stability', <https://www.russiamatters.org/blog/putins-saber-rattling-bodes-ill-strategic-stability>, 1 March.

Sdelano u nas (2018), 'Anshlag v Arkhangel'ske: tri Il-976 SKIP i Il-22', <https://sdelanounas.ru/blogs/103488/>, 2 February.

Shchegolev, Il'ya (2014), 'Kak sovestskie uchenye ukrotili boevye lazery', <https://rg.ru/2014/09/16/reg-urfo/lazeri.html>, 16 September.

Sistema obespechniya zakonodatel'noi deyatel'nosti (2018), <http://sozd.parlament.gov.ru/bill/398393-7>, accessed 19 April.

Skorobogaty, Petr, Khazbiev, Aleksei (2018), 'Vernut' Rossii moshch', *Ekspert*, no.10, March.

Stanovaya, Tat'yana (2018), 'Poslanie prezidenta Federal'nomu Sobraniyu: voennaya chast', <http://politcom.ru/php?id=222923>, 5 March.

- Stepanov, Aleksandr (2018), 'Vraga ispugayut "Burevestnik", "Peresvet" i "Poseidon"', *Moskovskii Komsomolets*, 24 March.
- Surkov, Nikolai (2018), 'Giperzvukovoi "Avangard"', <https://iz.ru/71570/nikolai-surkov/giperzvukovoi-avangard>, 2 March.
- TASS (2018), 'Istochnik: kompleks "Avangard" zamenil "Rubezh" v gosprogramme vooruzheniya do 2027 goda', <http://tass.ru/armiya-i-opk/5055517>, 22 March.
- TASS (2018a), 'Rogozin: modernizatsiya MiG-31 shla odnovremenno s razrabotkoi rakety kompleksa "Kinzhal"', <http://tass.ru/armiya-i-opk/5020622>, 11 March.
- TASS (2018b), 'VKS Rossii vypolnili uchebno-boevoi pusk giperzvukovoi rakety kompleksa "Kinzhal"', <http://tass.ru/armiya-i-opk/5020414>, 11 March.
- TASS (2014), 'Minoborony RF: Rossiya gotovit otvet na iniciativu SShA "Bystryi global'nyi udar"', <http://tass.ru/politika/1229579>, 31 May.
- Trudolyubov, Maxim (2018), 'Putin is Pushing a War Mentality on Unwilling Russians', <https://www.wilsoncenter.org/blog-post/putin-pushing-war-metnality-unwilling-russians>, 5 March.
- Tsentr analiza mirovoi trgovli oruzhiem (2018), 'V blizhaishee vremya RVSN poluchat neskol'ko predseriinykh MBR "Sarmat"', <http://www.armstrade.org/includes/periodics/news/2018/0305/091045675/detail.shtml>, 5 March.
- Tsentr analiza mirovoi trgovli oruzhiem (2018a), 'Glavkom VMF rasskazal o vozmozhnastyakh podvodnogo bespilotnika', March 2018, <http://www.armstrade.org/includes/periodics/news/2018/0302/102545656/detail.shtml>, 2 March.
- US Department of Defense (2018), *Nuclear Posture Review 2018*, <https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>, February.
- Valagin, Anton (2018), 'Nazvan glavnyi sekret "Iskander"', <https://rg.ru/2018/02/11/reg-cfo/nazvan-glavnyj-sekret-iskandera.html>, 11 February.
- Valagin, Anton (2017), 'V Rossii poyavitsya nauchnyi polk', <https://rg.ru/2017/12/12/reg-cfo/v-rossii-poiavitsia-nauchnyj-polk.html>, 12 December.
- Vladykin, Oleg (2018), 'Nasha strana vyrvalas' v lidery voenno-tekhnicheskogo razvitiya', *Krasnaya zvezda*, 5 March.
- Voенно-promyshlennyi kur'er (2018), 'Pervymi nositelyami giperzvukovykh blokov "Avangard" stanut rakety UR-100N UTKh', <http://www.vpk-news.ru/news/41795>, 20 March.
- Vyatkin, Ya. (2018), 'Kozyrnye karty Putina v strategicheskom preferanse (chast' 1)', <https://topwar.ru/137129-kozyrnye-karty-puntia-v-strategicheskom-preferanse-chast-1.html>, 6 March.
- Woolf, Amy F. (2018), 'Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues', *Congressional Research Service Report*, R41464, 6 April, <https://fas.org/sgp/crs/nuke/R41464.pdf>
- Yakovenko, Igor' (2018), 'Putina podzdravili sovramshi', <http://mvvc44tv.cmlle.ru/?a=note&id=32197>, 2 March.

© Julian Cooper, 24 April 2018