

## II. Russian nuclear forces

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As of January 2021, Russia maintained a military stockpile of approximately 4495 nuclear warheads—around 180 more than the estimate for January 2020. About 2585 of these were offensive strategic warheads, of which roughly 1625 were deployed on land- and sea-based ballistic missiles and at bomber bases. Russia also possessed approximately 1910 non-strategic (tactical) nuclear warheads—a slight increase compared with the estimate for January 2020, largely due to the Russian Navy’s fielding of dual-capable non-strategic weapons. All of the non-strategic warheads are thought to be at central storage sites.<sup>1</sup> An estimated additional 1760 retired warheads were awaiting dismantlement (300 fewer than the estimate for 2020), giving a total inventory of approximately 6255 warheads (see table 10.3).

These estimates are based on publicly available information about the Russian nuclear arsenal. Because of a lack of transparency, estimates and analysis of Russia’s nuclear weapon developments come with considerable uncertainty, particularly with regard to Russia’s sizable stockpile of non-strategic nuclear weapons. However, it is possible to formulate a reasonable assessment of the progress of Russia’s nuclear modernization by reviewing satellite imagery and other forms of open-source intelligence, official statements, industry publications and interviews with military officials.

In 2020 Russia remained in compliance with the final warhead limits prescribed by the 2010 Russian–United States Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START).<sup>2</sup> This treaty places a cap on the numbers of Russian and US deployed strategic nuclear forces. The numbers of deployed warheads reported under New START differ from the estimates presented here because the treaty attributes one weapon to each deployed bomber—even though bombers do not carry weapons under normal circumstances—and does not count warheads stored at bomber bases.

<sup>1</sup> For an overview of Russia’s nuclear weapon storage facilities see Podvig, P. and Serrat, J., *Lock Them Up: Zero-deployed Non-strategic Nuclear Weapons in Europe* (United Nations Institute for Disarmament Research: Geneva, 2017).

<sup>2</sup> US Department of State, Bureau of Arms Control, Verification and Compliance, ‘New START Treaty aggregate numbers of strategic offensive arms’, Fact sheet, 1 Dec. 2020. For a summary and other details of New START see annex A, section III. On the negotiation of the renewal of New START see chapter 11, section I, in this volume.

## The role of nuclear weapons in Russian military doctrine

In June 2020 Russian President Vladimir Putin approved an update to the Basic Principles of State Policy of the Russian Federation on Nuclear Deterrence. Russia's deterrence policy lays out explicit conditions under which it could launch nuclear weapons: to retaliate against an ongoing attack 'against critical governmental or military sites' by ballistic missiles, nuclear weapons or other weapons of mass destruction (WMD), and to retaliate against 'the use of conventional weapons when the very existence of the state is in jeopardy'.<sup>3</sup> This formulation is consistent with previous public iterations of Russian nuclear policy, and the timing of the policy update is probably intended to push back against the claim in the USA's 2018 Nuclear Posture Review that Russia might use nuclear weapons early in a conflict to 'de-escalate' it on favourable terms (see section I).<sup>4</sup>

### Strategic nuclear forces

As of January 2021, Russia had an estimated 2585 warheads assigned for potential use by strategic launchers: long-range bombers, land-based intercontinental ballistic missiles (ICBMs), and submarine-launched ballistic missiles (SLBMs). This is an increase of approximately 145 warheads compared with January 2020, due to the fielding of RS-24 Yars (SS-27 Mod 2) ICBMs and the fourth Borei-class nuclear-powered ballistic missile submarine (SSBN).<sup>5</sup>

#### *Aircraft and air-delivered weapons*

Russia's Long-Range Aviation command operates a fleet of approximately 13 Tu-160 (Blackjack) and 55 Tu-95MS (Bear) bombers.<sup>6</sup> Not all of these are fully operational and some are undergoing various upgrades. The maximum possible loading on the bombers is nearly 740 nuclear weapons but, since only some of the bombers are fully operational, it is estimated here that the number of assigned weapons is lower—around 580. SIPRI estimates that approximately 200 of these might be deployed and stored at the two strategic bomber bases: Engels in Saratov oblast and Ukrainka in Amur

<sup>3</sup> 'Basic principles of state policy of the Russian Federation on nuclear deterrence', Approved by Russian Presidential Executive Order no. 355, 2 June 2020.

<sup>4</sup> US Department of Defense (DOD), *Nuclear Posture Review 2018* (DOD: Arlington, VA, Feb. 2018), p. 30.

<sup>5</sup> For the missiles, aircraft and submarines discussed here, a designation in parentheses (in this case SS-27 Mod 2) following the Russian designation (in this case RS-24 Yars) is that assigned by the North Atlantic Treaty Organization (NATO).

<sup>6</sup> The Tu-95MS exists in 2 versions: the Tu-95MS16 (Bear-H16) and the Tu-95MS6 (Bear-H6).

**Table 10.3.** Russian nuclear forces, January 2021

All figures are approximate and are estimates based on assessments by the authors. Totals for strategic and non-strategic forces are rounded to the nearest 5 warheads.

Type/ Russian designation (NATO designation)	No. of launchers	Year first deployed	Range (km) <sup>a</sup>	Warheads x yield	No. of warheads <sup>b</sup>
<b>Strategic nuclear forces</b>					<b>2 585<sup>c</sup></b>
<i>Aircraft (bombers)</i>					<i>580<sup>e</sup></i>
Tu-95MS/M (Bear-H) <sup>f</sup>	68/50 <sup>d</sup> 55/39	1981	6 500– 10 500	6–16 x 200 kt AS-15A or AS-23B ALCMs	448
Tu-160/M (Blackjack)	13/11	1987	10 500– 13 200	12 x 200 kt AS-15B or AS-23B ALCMs, bombs	132
<i>Land-based missiles (ICBMs)</i>					<i>1 189<sup>g</sup></i>
RS-20V (SS-18 Satan)	46	1992	11 000– 15 000	10 x 500–800 kt	460
RS-18 (SS-19 Stiletto)	..	1980	10 000	6 x 400 kt	.. <sup>h</sup>
Avangard (SS-19 Mod 4) <sup>i</sup>	4	2019	10 000	1 x HGV [400 kt]	4
RS-12M Topol (SS-25 Sickle)	27	1985	10 500	1 x 800 kt	27
RS-12M2 Topol-M (SS-27 Mod 1/silo)	60	1997	10 500	1 x 800 kt	60
RS-12M1 Topol-M (SS-27 Mod 1/mobile)	18	2006	10 500	1 x [800 kt]	18
RS-24 Yars (SS-27 Mod 2/mobile)	135	2010	10 500	4 x [100 kt]	540
RS-24 Yars (SS-27 Mod 2/silo)	20	2014	10 500	4 x [100 kt]	80
RS-28 Sarmat (SS-X-29)	..	[2021]	>10 000	MIRV [ . kt]	.. <sup>k</sup>
<i>Sea-based missiles (SLBMs)</i>					<i>816<sup>k</sup></i>
RSM-50 Volna (SS-N-18 M1 Stingray)	1/16	1978	6 500	3 x 50 kt	48
RSM-54 Sineva (SS-N-23 M1)	6/96	1986/ 2007	9 000	4 x 100 kt	384
RSM-56 Bulava (SS-N-32)	4/64	2014	>8 050	6 x [100 kt]	384
<b>Non-strategic nuclear forces</b>					<b>1 910<sup>l</sup></b>
<i>Air, coastal and missile defence</i>					<i>387</i>
53T6 (SH-08, Gazelle)	68	1986	30	1 x 10 kt	68
S-300/400 (SA-20/21)	750 <sup>m</sup>	1992/ 2007	..	1 x low kt	290
3M-55 Yakhont (SS-N-26)	60	[2014]	>400	1 x [ . kt]	25
SSC-1B (Sepal)	8	1973	500	1 x 350 kt	4
<i>Air force weapons<sup>n</sup></i>					<i>500</i>
Tu-22M3 (Backfire-C)	60	1974	..	3 x ASMs, bombs	300
Su-24M/M2 (Fencer-D)	70	1974	..	2 x bombs	70 <sup>o</sup>
Su-34 (Fullback)	120	2006	..	2 x bombs	120 <sup>o</sup>
Su-57 (Felon)	..	[2020]	..	[bombs, ASM]	.. <sup>p</sup>
MiG-31K (Foxhound)	10	2018	..	1 x ALBM	10

Type/ Russian designation (NATO designation)	No. of launchers	Year first deployed	Range (km) <sup>a</sup>	Warheads x yield	No. of warheads <sup>b</sup>
<i>Army weapons</i>	164				90
Iskander-M (SS-26 Stone)	144	2005	350 <sup>p</sup>	[1 x 10–100 kt]	70 <sup>q</sup>
9M729 (SSC-8)	20	2016	2 350	1 x [. kt]	20
<i>Navy weapons</i>	..				935
Submarines/surface ships/naval aircraft	..			Land-attack cruise missiles, sea-launched cruise missiles, anti-submarine weapons, surface-to-air missiles, depth bombs, torpedoes <sup>r</sup>	
<b>Total stockpile</b>					<b>4 495</b>
Deployed warheads					1 625 <sup>s</sup>
Reserve warheads					2 870 <sup>t</sup>
<b>Retired warheads awaiting dismantlement</b>					<b>1 760</b>
<b>Total inventory</b>					<b>6 255</b>

.. = not available or not applicable; [] = uncertain figure; ALBM = air-launched ballistic missile; ALCM = air-launched cruise missile; ASM = air-to-surface missile; HGV = hypersonic glide vehicle; ICBM = intercontinental ballistic missile; kt = kiloton; MIRV = multiple independently targetable re-entry vehicle; NATO = North Atlantic Treaty Organization; SLBM = submarine-launched ballistic missile.

*Note:* The table lists the total number of warheads estimated to be available for the delivery systems. Only some of these are deployed and the strategic warheads do not necessarily correspond to the data-counting rules of the 2010 Russian–US Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START).

<sup>a</sup> For aircraft, the listed range is for illustrative purposes only; actual mission range will vary according to flight profile, weapon loading and in-flight refuelling.

<sup>b</sup> These numbers show the total number of warheads estimated to be assigned to nuclear-capable delivery systems. Only some of these warheads are deployed on missiles and at air bases.

<sup>c</sup> Approximately 1625 of these strategic warheads are deployed on land- and sea-based ballistic missiles and at bomber bases. The remaining warheads are in central storage.

<sup>d</sup> The first figure is the total number of bombers in the inventory; the second is the number of bombers estimated to be counted as deployed under New START. Because of ongoing bomber modernization, there is considerable uncertainty about how many bombers are operational.

<sup>e</sup> The maximum possible loading on the bombers is nearly 740 nuclear weapons but, since only some of the bombers are fully operational, SIPRI estimates that only about 580 weapons are assigned to the long-range bomber force, of which approximately 200 might be deployed and stored at the 2 strategic bomber bases. The remaining weapons are thought to be in central storage facilities.

<sup>f</sup> There are 2 types of Tu-95MS aircraft: the Tu-95MS6, which can carry 6 AS-15A missiles internally; and the Tu-95MS16, which can carry an additional 10 AS-15A missiles externally, for a total of 16 missiles. Both types are being modernized. The modernized aircraft (Tu-95MSM) can carry 8 AS-23B missiles externally and possibly 6 internally, for a total of 14 missiles.

<sup>g</sup> These ICBMs can carry a total of 1189 warheads, but it is estimated here that they have been downloaded to carry just over 800 warheads, with the remaining warheads in storage.

<sup>h</sup> It is possible that the remaining RS-18s have been retired.

<sup>i</sup> The missile uses a modified RS-18 ICBM booster with an HGV payload.

<sup>j</sup> The first figure is the total number of nuclear-powered ballistic missile submarines (SSBNs) in the Russian fleet; the second is the maximum number of missiles that they can

carry. Of Russia's 11 operational SSBNs, 1 or 2 are in overhaul at any given time and do not carry their assigned nuclear missiles and warheads.

<sup>k</sup> The warhead loading on SLBMs is thought to have been reduced for Russia to stay below the New START warhead limit. It is estimated here that only about 624 of the 816 SLBM warheads are deployed.

<sup>l</sup> According to the Russian Government, non-strategic nuclear warheads are not deployed with their delivery systems but are kept in storage facilities. Some storage facilities are near operational bases.

<sup>m</sup> There are at least 80 S-300/400 sites across Russia, each with an average of 12 launchers, each with 2–4 interceptors. Each launcher has several reloads.

<sup>n</sup> The subtotal is based on an estimate of the total number of nuclear-capable aircraft. However, only some of them are thought to have nuclear missions. Most can carry more than 1 nuclear weapon. Other potential nuclear-capable aircraft include the Su-25 (Frogfoot) and the Su-30MK.

<sup>o</sup> These estimates assume that half of the aircraft have a nuclear role.

<sup>p</sup> Although many unofficial sources and news media reports state that the Iskander-M has a range of nearly 500 km, the US Air Force's National Air and Space Intelligence Center (NASIC) lists the range as 350 km.

<sup>q</sup> The estimate assumes that around half of the dual-capable launchers have a secondary nuclear role. It is possible that the 9M728 (SSC-7, sometimes called Iskander-K) cruise missile is also nuclear-capable.

<sup>r</sup> Only submarines are assumed to be assigned nuclear torpedoes.

<sup>s</sup> The deployed warhead number in this table differs from the number declared under New START because the treaty attributes 1 warhead per deployed bomber—even though bombers do not carry warheads under normal circumstances—and does not count warheads stored at bomber bases.

<sup>t</sup> Reserve warheads include c. 960 strategic and c. 1910 non-strategic warheads in central storage (see note l).

Sources: Russian Ministry of Defence, various press releases; US Department of State, START Treaty Memoranda of Understanding, 1990–July 2009; New START aggregate data releases, various years; US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat 2020* (NASIC: Wright-Patterson Air Force Base, OH, July 2020); US Department of Defense (DOD), *Nuclear Posture Review 2018* (DOD: Arlington, VA, Feb. 2018); US Department of Defense (DOD), *2019 Missile Defense Review* (DOD: Arlington, VA, 2019); US Office of the Deputy Assistant Secretary of Defense for Nuclear Matters, *Nuclear Matters Handbook 2020* (US Department of Defense: Arlington, VA, Mar. 2020); US Department of Defense, various Congressional testimonies; BBC Monitoring; Russian news media; Russian Strategic Nuclear Forces website; International Institute for Strategic Studies (IISS), *The Military Balance*, various years; Cochran, T. B. et al., *Nuclear Weapons Databook*, vol. 4, *Soviet Nuclear Weapons* (Harper & Row: New York, 1989); *IHS Jane's Strategic Weapon Systems*, various issues; *Proceedings*, US Naval Institute, various issues; *Bulletin of the Atomic Scientists*, 'Nuclear notebook', various issues; and authors' estimates.

oblast.<sup>7</sup> An upgrade of the nuclear weapon storage site at Engels is under way.<sup>8</sup>

Modernization of the bombers, which includes upgrades to their avionics suites, engines and long-range nuclear and conventional cruise missiles, is

<sup>7</sup> Podvig, P., 'Strategic aviation', Russian Strategic Nuclear Forces, 4 Jan. 2020.

<sup>8</sup> Kristensen, H. M. and Korda, M., 'Nuclear upgrade at Russian bomber base and storage site', Federation of American Scientists (FAS) Strategic Security Blog, 25 Feb. 2019.

progressing, but with some delays.<sup>9</sup> The upgraded Tu-95MS is known as the Tu-95MSM and the upgraded Tu-160 is known as the Tu-160M. The upgraded bombers are capable of carrying the new Kh-102 (AS-23B) nuclear air-launched cruise missile. According to the Kremlin, two Tu-160s and five Tu-95MSs were upgraded in 2020.<sup>10</sup> It seems likely that all of the Tu-160s and most of the Tu-95s will be upgraded to maintain a bomber force of perhaps 50–60 operational aircraft. Russia has also resumed production of the Tu-160 airframes to produce up to 50 Tu-160M2 bombers with new engines and advanced communications suites.<sup>11</sup> The first Tu-160M2 is expected to make its maiden flight in late 2021.<sup>12</sup>

The modernized Tu-95MSM, Tu-160M and Tu-160M2 bombers are intended to be only a temporary bridge to Russia's next-generation bomber: the PAK-DA. This is a subsonic aircraft that may look similar to the flying-wing design of the USA's B-2 bomber. The PAK-DA's production has been delayed and final assembly of the first aircraft is now scheduled for 2021, with serial production expected to begin in 2028 or 2029.<sup>13</sup> The PAK-DA will eventually replace all Tu-95s and Tu-160s as well as the Tu-22s that are deployed with non-strategic forces (see below).<sup>14</sup>

### *Land-based missiles*

As of January 2021, Russia's Strategic Rocket Forces (SRF)—the branch of the armed forces that controls land-based ICBMs—consisted of 11 missile divisions grouped into 3 armies, deploying an estimated 310 ICBMs of different types and variations (see table 10.3).<sup>15</sup> These ICBMs can carry a maximum of about 1189 warheads, but it is estimated here that they have been downloaded to carry around 800 warheads to keep Russia below the New START limit for deployed strategic warheads. These represent approximately half of Russia's 1625 deployed strategic warheads.

Russia's ICBM force is most of the way through a significant modernization programme to replace all Soviet-era missiles with new types, albeit not on a one-for-one basis. The modernization, which began in the late 1990s, also involves substantial reconstruction of silos, launch control

<sup>9</sup> Trevithick, J., 'Russia rolls out new Tu-160M2, but are Moscow's bomber ambitions realistic?', *The Drive*, 16. Nov. 2017.

<sup>10</sup> President of Russia, 'Expanded meeting of the Defence Ministry Board', 21 Dec. 2020.

<sup>11</sup> 'Tu-160M2, Tu-22M3M bombers to get communications suite from latest Su-57 fighter', *TASS*, 12 Aug. 2020.

<sup>12</sup> 'First newly-built Tu-160M to make maiden flight in 4th quarter of 2021', *TASS*, 30 Dec. 2020.

<sup>13</sup> 'Russia begins construction of the first PAK DA strategic bomber—sources', *TASS*, 26 May 2020; and Lavrov, A., Kretsul, R. and Ramm, A., [PAKage agreement: The latest bomber assigned a deadline for production], *Izvestia*, 14 Jan. 2020 (in Russian).

<sup>14</sup> 'Russia to test next-generation stealth strategic bomber', *TASS*, 2 Aug. 2019.

<sup>15</sup> A 12th division, the 40th missile regiment at Yurya, is not nuclear-armed.

centres, garrisons and support facilities.<sup>16</sup> The modernization programme appears to be progressing more slowly than previously envisioned. According to Colonel General Sergey Karakaev, commander of the SRF, over 81 per cent of the ICBM force had been modernized by the end of 2020.<sup>17</sup> This is significantly lower than the goal of 97 per cent announced in 2014 for the end of 2020.<sup>18</sup> In November 2020 the chief designer of the RS-24 suggested that the last Soviet-era ICBM would be phased out by 2024.<sup>19</sup> However, this seems unlikely based on an assessment of the probable time frame for replacing the RS-20V (SS-18; see below).

The bulk of the modernization programme is focused on the RS-24 Yars (SS-27 Mod 2), a version of the RS-12M1/2 Topol-M (SS-27 Mod 1) deployed with multiple independently targetable re-entry vehicles (MIRVs). In December 2020 the Russian Ministry of Defence's television channel declared that approximately 150 mobile and silo-based RS-24 ICBMs had been deployed.<sup>20</sup> Four mobile RS-24 divisions have now been completed (Irkutsk, Nizhny Tagil, Novosibirsk and Yoshkar-Ola), with two more in progress (Barnaul and Vypolzovo—sometimes referred to as Bologovsky).<sup>21</sup> In addition, one completed mobile division at Teykovo is equipped with single-warhead RS-12M1 Topol-M (SS-27 Mod 1) ICBMs. The first silo-based RS-24s have been installed at Kozelsk, Kaluga oblast; one regiment of 10 silos was completed in 2018, and the second regiment was completed in 2020.<sup>22</sup> In December 2020 Karakaev announced that in 2021 the military would begin to install silo-based RS-24s at a third regiment at Kozelsk; however, given how long the previous silo upgrades took, it is unlikely that the third regiment will be completed by the 2024 target date.<sup>23</sup> It is also possible that some of the former RS-18 (SS-19) silos at Tatishchevo Airbase, Saratov oblast, might eventually be upgraded to the RS-24.

In December 2020 two more RS-18 missiles equipped with the Avangard hypersonic glide vehicle (HGV) system were installed in former RS-20V

<sup>16</sup> See e.g. Kristensen, H. M., 'Russian ICBM upgrade at Kozelsk', Federation of American Scientists (FAS) Strategic Security Blog, 5 Sep. 2018.

<sup>17</sup> Andreev, D. and Biryulin, R., [Nuclear missile shield guarantees Russia's sovereignty], *Krasnaya Zvezda*, 16 Dec. 2020 (in Russian).

<sup>18</sup> 'Russian TV show announces new ICBM to enter service soon', TRK Petersburg Channel 5, 21 Apr. 2014, Translation from Russian, BBC Monitoring.

<sup>19</sup> 'Russia to complete rearming Strategic Missile Force with advanced Yars ICBMs by 2024', TASS, 2 Nov. 2020.

<sup>20</sup> Levin, E., [Strategic Rocket Forces commander names the number of Yars complexes entering combat duty], *Krasnaya Zvezda*, 8 Dec. 2020 (in Russian).

<sup>21</sup> Tikhonov, A., [You won't catch them by surprise], *Krasnaya Zvezda*, 28 May 2018 (in Russian); and [The commander of the Strategic Missile Forces announced the completion of the rearmament of the Tagil division], RIA Novosti, 29 Mar. 2018 (in Russian).

<sup>22</sup> [Two regiments of the Strategic Rocket Forces will be re-equipped with 'Yars' missile systems in 2021], TASS, 21 Dec. 2020 (in Russian); and authors' assessment based on observation of satellite imagery.

<sup>23</sup> TASS (note 22).

silos at Dombarovsky Airbase, Orenburg oblast.<sup>24</sup> This missile type has been designated as the SS-19 Mod 4 by the North Atlantic Treaty Organization (NATO).<sup>25</sup> Russia is installing Avangard-equipped missiles at a rate of two per year in upgraded complexes with new facilities and security perimeters. The first Avangard regiment is expected to reach its full complement of six missiles by the end of 2021.<sup>26</sup> Russia plans to install a total of two regiments, each with six missiles, at Dombarovsky by 2027.<sup>27</sup>

Russia is also developing a new 'heavy' liquid-fuelled, silo-based ICBM, known as the RS-28 Sarmat (SS-X-29), as a replacement for the RS-20V. Like its predecessor, the RS-28 is expected to carry a large number of MIRVs (possibly as many as 10), but some might be equipped with one or a few Avangard HGVs. After much delay, full-scale flight testing of the RS-28 is scheduled to begin in mid 2021 at the new proving ground at Severo-Yeniseysky, Krasnoyarsk krai, with serial production expected to begin in 2021—although this would be dependent on a successful flight-test programme.<sup>28</sup> In December 2020 Karakaev announced that the first RS-28 ICBMs would be 'put on combat alert' at the ICBM complex at Uzhur, Krasnoyarsk krai, sometime in 2022.<sup>29</sup>

Russia conducted several large-scale exercises with road-mobile and silo-based ICBMs during 2020. These included combat patrols for road-mobile regiments, simulated launch exercises for silo-based regiments, and participation in command staff exercises.<sup>30</sup>

### *Sea-based missiles*

As of January 2021, the Russian Navy had a fleet of 11 operational nuclear-armed SSBNs. The fleet included 6 Soviet-era Delfin-class or Project 667BDRM (Delta IV) SSBNs, 1 Kalmar-class or Project 667BDR (Delta III) SSBN, and 4 (of a planned total of 10) Borei-class or Project 955 SSBNs.

One of the Borei submarines is of an improved design, known as Borei-A or Project 955A. After delays due to technical issues during sea trials, it

<sup>24</sup> Russian Ministry of Defence, [Installation of the Avangard intercontinental ballistic missile in a silo launcher], YouTube, 16 Dec. 2020 (in Russian).

<sup>25</sup> US Department of Defense (note 4), p. 8; and Kristensen, H. M. and Korda, M., 'Russian nuclear forces, 2019', *Bulletin of the Atomic Scientists*, vol. 75, no. 2 (Mar. 2019), p. 78.

<sup>26</sup> 'Russia's 1st regiment of Avangard hypersonic missiles to assume full strength in 2021', TASS, 23 Dec. 2020.

<sup>27</sup> [Source: The first Avangard complexes will be on duty in 2019], TASS, 29 Oct. 2018 (in Russian).

<sup>28</sup> President of Russia (note 10); and Safronov, I. and Nikolsky, A., [Tests of the latest Russian nuclear missile start at the beginning of the year], *Vedomosti*, 29 Oct. 2019 (in Russian).

<sup>29</sup> Levin (note 20).

<sup>30</sup> Russian Ministry of Defence, [Strategic offensive force management training], YouTube, 9 Dec. 2020 (in Russian).



was accepted into the navy in June 2020.<sup>31</sup> In December 2020 the Russian defence minister, Sergey Shoigu, announced that the navy would receive the next two Borei-A SSBNs in 2021.<sup>32</sup> Two more Borei-As are currently under construction, and the final two boats are expected to be laid down in 2021.<sup>33</sup> Eventually, five Borei SSBNs will be assigned to the Northern Fleet (in the Arctic Ocean) and five will be assigned to the Pacific Fleet.<sup>34</sup>

Assuming that the one remaining Delta III will be retired, the planned deployment of Borei-A SSBNs would bring the number of SSBNs to 12 by the end of 2021. A former Project 941 (Typhoon) SSBN that has been converted to a test-launch platform for SLBMs is not thought to be nuclear-armed.<sup>35</sup>

Each SSBN can be equipped with 16 ballistic missiles and the Russian fleet can carry a total of 816 warheads. However, one or two SSBNs are normally undergoing repairs and maintenance at any given time and are not armed. It is also possible that the warhead loading on some missiles has been reduced to meet the total warhead limit under New START. As a result, it is estimated here that only about 624 of the 816 warheads are deployed.

The Russian Navy is also developing the Poseidon or Status-6 (Kanyon), a long-range, strategic nuclear-powered torpedo. The torpedo is intended for future deployment on two new types of special-purpose submarine: the K-329 *Belgorod* (Project 09852)—a converted Antei-class or Project 949A (Oscar-II) guided-missile submarine (SSGN)—and the Khabarovsk-class or Project 09851 submarine based on the Borei-class SSBN hull.<sup>36</sup> The *Belgorod* was originally scheduled for delivery to the navy by the end of 2020 but has been delayed until 2021.<sup>37</sup> The *Belgorod* and the Khabarovsk submarines will each be capable of carrying up to six Poseidon torpedoes.<sup>38</sup>

### Non-strategic nuclear forces

There is no universally accepted definition of ‘tactical’, ‘non-strategic’ or ‘theatre’ nuclear weapons; however, the US Department of Defense describes them as ‘nuclear weapons designed to be used on a battlefield in military

<sup>31</sup> Russian Ministry of Defence, [On Russia Day, the newest Borei-A class strategic missile submarine ‘Prince Vladimir’ was inaugurated into the Navy], 12 June 2020 (in Russian).

<sup>32</sup> President of Russia (note 10).

<sup>33</sup> ‘Two Borei-A strategic nuclear subs to be laid down in 2021—Defense Ministry’, TASS, 30 Dec. 2020.

<sup>34</sup> [Source: Two more ‘Borei-A’ strategic submarines will be built at ‘Sevmash’ by 2028], TASS, 30 Nov. 2020 (in Russian).

<sup>35</sup> Saranov, V., ‘Behemoths of the seas: Why Russia is retiring its Akula strategic nuclear subs’, Sputnik, 24 Jan. 2018.

<sup>36</sup> Sutton, H. I., ‘Khabarovsk-class-submarine’, Covert Shores, 20 Nov. 2020; and Sutton, H. I., ‘Poseidon torpedo’, Covert Shores, 22 Feb. 2019.

<sup>37</sup> [‘Poseidon’ drone carrier submarine ‘Belgorod’ to be handed over to the fleet in 2021], TASS, 24 Dec. 2020 (in Russian).

<sup>38</sup> [Second ‘Poseidon’ carrier submarine planned to be launched in spring-summer 2021], TASS, 6 Nov. 2020 (in Russian).

situations. This is opposed to strategic nuclear weapons, which are designed to be used against enemy cities, factories, and other larger-area targets to damage the enemy's ability to wage war'.<sup>39</sup>

As of January 2021, Russia had an estimated 1910 warheads assigned for potential use by non-strategic forces, a slight increase of about 35 warheads over early 2020, mainly due to the fielding of the Kalibr land-attack sea-launched cruise missile (SLCM). Russia's non-strategic nuclear weapons—most of which are dual-capable, which means that they can also be armed with conventional warheads—are intended for use by ships and submarines, aircraft, air- and missile-defence systems, and army missiles. In February 2020 the commander of US Strategic Command, Admiral Charles A. Richard, suggested that 'Russia's overall nuclear stockpile is likely to grow significantly over the next decade—growth driven primarily by a projected increase in Russia's non-strategic nuclear weapons'.<sup>40</sup>

Russia's non-strategic nuclear weapons chiefly serve to compensate for perceived weaknesses in its conventional forces and to maintain overall parity with the total US nuclear force level. There has been considerable debate about the role that non-strategic nuclear weapons have in Russian nuclear strategy, including potential first use.<sup>41</sup>

#### *Air, coastal and missile defence*

The Russian air-, coastal- and missile-defence forces are estimated to have around 387 nuclear warheads. Most are assigned for use by dual-capable S-300 and S-400 air defence forces and the Moscow A-135 missile defence system, and a small number are assigned to coastal defence units. Russia is also developing the S-500 air defence system, which might potentially be dual-capable, but there is no publicly available authoritative information confirming a nuclear role.<sup>42</sup>

#### *Air force weapons*

The Russian Air Force is estimated to have approximately 500 nuclear warheads for use by Tu-22M3 (Backfire-C) intermediate-range bombers,

<sup>39</sup> US Office of the Deputy Assistant Secretary of Defense for Nuclear Matters, *Nuclear Matters Handbook 2016* (US Department of Defense: Arlington, VA, 2016), p. 17.

<sup>40</sup> Richard, C. A., Commander, US Strategic Command, Statement, US Senate, Armed Services Committee, 13 Feb. 2020, p. 5.

<sup>41</sup> On this debate see e.g. US Department of Defense (note 4), p. 30; Kofman, M. and Fink, A. L., 'Escalation management and nuclear employment in Russian military strategy', *War on the Rocks*, 23 June 2020; Oliker, O., 'Moscow's nuclear enigma: What is Russia's arsenal really for?', *Foreign Affairs*, vol. 97, no. 6 (Nov./Dec. 2018); Stowe-Thurston, A., Korda, M. and Kristensen, H. M., 'Putin deepens confusion about Russian nuclear policy', *Russia Matters*, 25 Oct. 2018; Tertrais, B., 'Russia's nuclear policy: Worrying for the wrong reasons', *Survival*, vol. 60, no. 2 (Apr. 2018); and Bruusgaard, K. V., 'The myth of Russia's lowered nuclear threshold', *War on the Rocks*, 22 Sep. 2017.

<sup>42</sup> Podvig, P., 'Missile defense in Russia', Working paper, Federation of American Scientists (FAS), Project on Nuclear Dynamics in a Multipolar Strategic BMD World, May 2017.

Su-24M (Fencer-D) fighter-bombers, Su-34 (Fullback) fighter-bombers and MiG-31K (Foxhound) attack aircraft.<sup>43</sup> The new Su-57 (Felon) combat aircraft, also known as PAK-FA, is dual-capable. It is currently in production and the first serially built version was delivered to the Russian Air Force in 2020.<sup>44</sup>

The MiG-31K is equipped with the new Kh-47M2 Kinzhal air-launched ballistic missile.<sup>45</sup> Russia is also developing the nuclear-capable Kh-32 air-to-surface missile, an upgrade of the Kh-22N (AS-4) used on the Tu-22M3.<sup>46</sup>

### *Army weapons*

The Russian Army is thought to have approximately 90 warheads to arm Iskander-M (SS-26) short-range ballistic missiles (SRBMs) and 9M729 (SSC-8) ground-launched cruise missiles (GLCMs). The dual-capable Iskander-M has now completely replaced the Tochka (SS-21) SRBM in 12 missile brigades.<sup>47</sup>

The dual-capable 9M729 GLCM was cited by the USA as its main reason for withdrawing from the 1987 Treaty on the Elimination of Intermediate-Range and Shorter-Range Missiles (INF Treaty) in 2019.<sup>48</sup> It is estimated that four or five 9M729 battalions have so far been co-deployed with four or five of the Iskander-M brigades. In October 2020 President Putin declared his willingness to impose a moratorium on future 9M729 deployments in European territory, 'but only provided that NATO countries take reciprocal steps that preclude the deployment in Europe of the weapons earlier prohibited under the INF Treaty'.<sup>49</sup>

There are also rumours that Russia has nuclear artillery and landmines, but the publicly available evidence is conflicting.

<sup>43</sup> US Department of Defense (DOD), 'US nuclear deterrence policy', Fact sheet, 1 Apr. 2019, p. 3; International Institute for Strategic Studies (IISS), *The Military Balance 2021* (Routledge: London, 2021); and authors' estimate.

<sup>44</sup> D'Urso, S., 'First serial production Su-57 Felon delivered to the Russian Aerospace Forces', *The Aviationist*, 30 Dec. 2020; and US Office of the Deputy Assistant Secretary of Defense for Nuclear Matters, *Nuclear Matters Handbook 2020* (US Department of Defense: Arlington, VA, Mar. 2020), p. 3.

<sup>45</sup> [Sources: First Dagger hypersonic missile tests conducted in Arctic], TASS, 30 Nov. 2019 (in Russian).

<sup>46</sup> US Department of Defense (note 4), p. 8.

<sup>47</sup> Authors' assessment based on observation of satellite imagery. It is possible that the 9M728 (SSC-7, sometimes called Iskander-K) cruise missile is also dual-capable.

<sup>48</sup> US Department of State, Bureau of Arms Control, Verification and Compliance, 'INF Treaty at a glance', Fact sheet, 8 Dec. 2017. For a summary and other details of the INF Treaty see annex A, section III, in this volume. See also Topychkanov, P. and Davis, I., 'Russian-US nuclear arms control and disarmament', *SIPRI Yearbook 2020*, pp. 399-405; and Kile, S. N., 'Russian-US nuclear arms control and disarmament', *SIPRI Yearbook 2018*, pp. 321-24.

<sup>49</sup> President of Russia, 'Statement by Vladimir Putin on additional steps to de-escalate the situation in Europe after the termination of the Intermediate-Range Nuclear Forces Treaty (INF Treaty)', 26 Oct. 2020.

*Navy weapons*

The Russian military service that is assigned the highest number of non-strategic nuclear weapons is the navy, with about 935 warheads for use by land-attack cruise missiles, anti-ship cruise missiles, anti-submarine rockets, depth bombs, and torpedoes delivered by ships, submarines and naval aviation.

The nuclear version of the long-range, land-attack Kalibr SLCM, also known as the 3M-14 (SS-N-30A), is a significant new addition to these weapons.<sup>50</sup> It has been integrated on numerous types of surface ship and attack submarine, including the new Yasen/-M or Project 885/M (Severodvinsk) SSGN. The second boat of this class completed its sea trials in 2020, indicating a potential entry into service in 2021.<sup>51</sup>

Other notable navy weapons include the 3M-55 (SS-N-26) SLCM and the future 3M-22 Tsirkon (SS-NX-33) hypersonic anti-ship missile, which is undergoing final test launches.<sup>52</sup>

<sup>50</sup> There is considerable confusion about the designation of what is commonly referred to as the Kalibr missile. The Kalibr designation actually refers not to a specific missile but to a family of weapons that, in addition to the 3M-14 (SS-N-30/A) land-attack versions, includes the 3M-54 (SS-N-27) anti-ship cruise missile and the 91R anti-submarine missile. For further detail see US Navy, Office of Naval Intelligence (ONI), *The Russian Navy: A Historic Transition* (ONI: Washington, DC, Dec. 2015), pp. 34–35.

<sup>51</sup> US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat 2020* (NASIC: Wright-Patterson Air Force Base, OH, July 2020), p. 36; and 'Newest Russian submarine hits target 1,000 km away with Kalibr cruise missile', TASS, 23 Nov. 2020.

<sup>52</sup> 'Russia plans new trials of Tsirkon hypersonic missile before yearend—source', TASS, 22 Nov. 2019.