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To cite this article: Hans M. Kristensen & Robert S. Norris (2016) Russian nuclear forces, 2016, Bulletin of the Atomic Scientists, 72:3, 125-134, DOI: [10.1080/00963402.2016.1170359](https://doi.org/10.1080/00963402.2016.1170359)

To link to this article: <https://doi.org/10.1080/00963402.2016.1170359>



Published online: 15 Apr 2016.



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NUCLEAR NOTEBOOK

Russian nuclear forces, 2016

Hans M. Kristensen and Robert S. Norris

ABSTRACT

Russia is in the middle of a broad modernization of its strategic and nonstrategic nuclear forces, including some new developments. The authors estimate that as of early 2016, the country had a stockpile of approximately 4500 nuclear warheads assigned for use by long-range strategic launchers and shorter range tactical nuclear forces. In addition, as many as 2800 retired but still largely intact warheads awaited dismantlement, for a total inventory of about 7300. The modernization program reflects the government's conviction that strategic nuclear forces are indispensable for Russia's security and status as a great power. Unless a new arms reduction agreement is reached in the near future, the shrinking of Russia's strategic nuclear arsenal that has characterized the past two decades will likely come to an end, with the force leveling out at around 500 launchers with roughly 2400 assigned warheads. Combined with an increased number of military exercises and operations, as well as occasional explicit nuclear threats against other countries, the modernizations contribute to growing concern abroad about Russian intentions.

KEYWORDS

Ballistic missiles; cruise missiles; nuclear weapons; stockpile; arsenal; Russia; ICBM; SLBM; nuclear modernization; SSBN

Russia is in the middle of a broad modernization of its strategic and nonstrategic nuclear forces. While much of this process continues well-known programs that have been underway for many years, some developments are new. The modernizations, combined with an increased number of military exercises and operations, as well as occasional explicit nuclear threats against other countries, contribute to growing concern about Russian intentions and, in turn, help justify nuclear modernization programs and political opposition to reductions in other nuclear weapon states.

As of early 2016, we estimate that Russia has a stockpile of approximately 4500 nuclear warheads assigned for use by long-range strategic launchers and shorter-range tactical nuclear forces. Of these, roughly 1800 strategic warheads are deployed on missiles and at bomber bases. Another 700 strategic warheads are in storage along with nearly 2000 nonstrategic warheads. In addition to the military stockpile for operational forces, a large number – perhaps 2800 – of retired but still largely intact warheads await dismantlement,¹ for a total inventory of 7300 warheads. (see [Table 1](#))

With its total inventory of roughly 550 deployed strategic launchers, Russia is already well below the limit of 700 set by New START for February 2018. Since the treaty entered into force on 5 February 2011; however, Russia has increased the number of accountable deployed launchers by 5 (from 521 to 526), and increased the number of warheads attributed

to those launchers by 111 (from 1537 to 1648) (US State Department [2011](#), [2016](#)). Those increases are temporary fluctuations, however, Russia is still expected to be in compliance with New START limits by February 2018.

Overall, Russia's nuclear modernization effort will present the international arms control community with new challenges. Unless a new arms reduction agreement is reached in the near future, the shrinking of Russia's strategic nuclear arsenal that has characterized the past two decades will likely come to an end, with the force leveling out at around 500 launchers with roughly 2400 assigned warheads. To remain below the New START limit of 1550 deployed strategic warheads after 2018, Russia will probably have to reduce the warhead loading on some of its missiles.

The broad modernization reflects the government's conviction that nuclear forces – in particular strategic nuclear forces – are indispensable for Russia's security and status as a great power. Moscow is motivated in part by a strong desire to maintain parity with the United States, but the development of multiple versions of the same missiles also indicates the strong influence of Russia's military industrial complex on nuclear planning.

The ambitious nuclear modernization program is likely to be challenged by Russia's financial crisis. Finance Minister Anton Siluanov warned in October 2014 that

Table 1. Russian nuclear forces, 2016.

Type/name	Russian designation	Launchers	Year deployed	Warheads × yield (kilotons)	Total warheads
<i>Strategic offensive weapons</i>					
ICBMs					
SS18 M6 Satan	RS-20V	46	1988	10 × 500/800 (MIRV)	460
SS-19 M3 Stiletto	RS-18 (UR-100NUTTH)	20	1980	6 × 400 (MIRV)	120
SS25 Sickle	RS-12M (Topol)	90	1988	1 × 800	90 ^a
SS-27 Mod. 1 (mobile)	RS-12M1 (Topol-M)	18	2006	1 × 800?	18
SS-27 Mod. 1 (silo)	RS-12M2 (Topol-M)	60	1997	1 × 800	60
SS-27 Mod. 2 (mobile)	RS-24 (Yars)	63	2010	4 × 100? (MIRV)	252
SS-27 Mod. 2 (silo)	RS-24 (Yars)	10	2014	4 × 100? (MIRV)	40
SS-27 Mod. ? (mobile)	RS-26 (Yars-M)	–	(2016)	3 × 100? (MIRV)	–
SS-27 Mod. ? (rail)	Barguzin	–	?	4 × 100? (MIRV)	–
SS-? “heavy” (silo)	RS-28 (Sarmat)	–	(2020)	10 × 500? (MIRV)	–
Subtotal		307			1040
SLBMs					
SSN18 M1 Stingray	RSM-50	2/32	1978	3 × 50 (MIRV)	96 ^b
SS-N-23 M1	RSM-54 (Sineva)	6/96	2007	4 × 100 (MIRV) ^c	384 ^d
SS-N-32	RSM-56 (Bulava)	3/48	2014	6 × 100 (MIRV)	288
Subtotal		11/176			768 ^e
Bombers/weapons					
Bear-H6	Tu-95 MS6	27	1984	6 × AS-15A ALCMs, bombs	162
Bear-H16	Tu-95 MS16	30	1984	16 × AS-15A ALCMs, bombs	480
Blackjack	Tu-160	13	1987	12 × AS-15B ALCMs or AS-16 SRAMs, bombs	156
Subtotal		70			798 ^f
Subtotal strategic offensive forces					~2600 ^g
<i>Nonstrategic and defensive weapons</i>					
ABM/Air/Coastal defense					
S-300 (SA-10/20) ^h		~1000	1980/2007	1 × low	~400
53T6 Gazelle		68	1986	1 × 10	68 ⁱ
SSC-1B Sepal		33	1973	1 × 350	~15
Land-based air					
Bombers/fighters (Tu-22M3/Su-24M/Su-34)		~390	1974/2006	ASM, bombs	~570
Ground-based ^j					
Short-range ballistic missiles (SS-21/SS-26)		~140	1981/2005	1 × ?	~140
GLCM		?	n.a.	1 × ?	?
Naval					
Submarines/surface ships/air				SLCM, ASW, SAM, DB, torpedoes	~760
Subtotal nonstrategic and defensive forces					~1950 ^k
Total					~4500 ^l

ABM, antiballistic missile; ALCM, air-launched cruise missile; AS, air-to-surface; ASM, air-to-surface missile; ASW, antisubmarine weapon; DB, depth bomb; GLCM, ground-launched cruise missile; ICBM, intercontinental ballistic missile; MIRV, multiple independently targetable reentry vehicle; SAM, surface-to-air missile; SLBM, submarine-launched ballistic missile; SLCM, sea-launched cruise missile; SRAM, short-range attack missile.

^aIt is possible that more of these SS-25 regiments at bases undergoing upgrades to RS-24 have been inactivated.

^bThe remaining Delta IIIs in the Pacific are being replaced by new Borei SSBNs.

^cThe Sineva is a modified SS-N-23 and probably carries four MIRVed warheads. In 2006, US intelligence estimated that the missile could carry up to 10 warheads, but it lowered the estimate to four warheads in 2009.

^dAt any given time, only 320 of these warheads are deployed on five operational Delta IV submarines, with the sixth boat in overhaul.

^eAt any given time, two thirds of the 11 SSBNs are in overhaul and do not carry nuclear weapons, so not all 798 warheads are deployed.

^fBomber weapons are not deployed on the aircraft under normal circumstances. We estimate that a couple hundred weapons are present at the two bomber bases, with the remainder in central storage.

^gOnly about 1800 of these warheads are deployed on missiles and at bomber bases. New START counts fewer deployed warheads because it does not count weapons in storage and because at any given time, some SSBNs are not fully loaded.

^hIt is unknown whether the SA-21 on the S-400 system has nuclear capability. If it does, the number of air-defense warheads could be higher.

ⁱAll 32 Gorgon missiles have apparently been removed from the Moscow ABM system.

^jRussia is replacing the SS-21 with the SS-26.

^kNumbers may not add up due to rounding. All nonstrategic warheads are in central storage. The 1950 listed make up the estimated nominal load for nuclear-capable delivery platforms.

^lIn addition to these warheads, we estimate that an additional 2800 retired warheads are awaiting dismantlement, for a total inventory of nearly 7300 warheads.

the country's wider plan to modernize the armed forces was unaffordable (Reuters 2014), and the budget crunch is already forcing trade-offs between nuclear and conventional programs. Plans to build a rail-based intercontinental ballistic missile (ICBM) appear to have been delayed or

canceled (Novichkov 2016), the Russian Defense Ministry's construction company has been forced to cut back on key projects (Novosti 2015a), and engine deliveries for some warships and submarines have been disrupted (Novosti 2015b).

Nuclear doctrine

Like the other nuclear-armed states, Russia does not publish much information about its nuclear strategy or the circumstances under which it would consider using nuclear weapons. The government published its military doctrine in December 2014, stating that Russia “shall reserve for itself the right to employ nuclear weapons in response to the use against it and/or its allies of nuclear and other kinds of weapons of mass destruction, as well as in the case of aggression against the Russian Federation with use of conventional weapons when the state’s very existence has been threatened” (Russian Federation 2014). This formulation is almost identical to the previous version from 2010 (Russian Federation 2010).

Yet, since 2008, Russian officials have made several statements about potential use of nuclear weapons that appear to go beyond the published doctrine. They have, for example, said that Russia may use nuclear weapons against NATO missile defense facilities,² and may increase the readiness of its nuclear forces in reaction to limited regional scenarios that do not involve WMD attacks or threats to its “very existence.”³

In addition, several Russian military exercises have, according to NATO documents and officials, simulated nuclear attacks against Western countries. A 2009 NATO briefing concluded that the Ladoga and Zapad exercises held in western Russia and Belarus in August and September of that year included “missile launches, some of which may have simulated the use of tactical nuclear weapons.” The briefing described an exercise scenario in which Russian conventional forces apparently could not repel a NATO attack launched from Poland and Lithuania, and said the Russians “still rely on the use of tactical nuclear weapons, even in local or regional conflicts” (US NATO Mission 2009).

Most recently, the NATO secretary general’s annual report for 2015 stated that Russian exercises over the past 3 years (even before the invasion of Ukraine) have included “simulated nuclear attacks on NATO Allies (e.g. ZAPAD) and on partners (e.g. March 2013 simulated attacks on Sweden)” (NATO 2016). The simulated attack on Sweden apparently involved two nuclear-capable Tu-22M3 (Backfire) bombers from Shaykovka Air Base in western Russia.

The alleged simulated nuclear attack on NATO countries during the Zapad exercise in 2013 is a surprise because it was not mentioned in the 2013 and 2014 NATO annual reports. Moreover, a 2013 report from the Jamestown Foundation reported that the exercise included “virtually the entire spectrum of military operations *except nuclear strikes...*” (emphasis

added) (Blank 2013). The 2015 NATO report does not specify which “NATO Allies” were the targets of the simulated nuclear attacks, but given the location of the exercises – the Western Military District of Russia and Belarus – they might have involved simulated counterattacks against military bases in Poland and one or more Baltic States.

Meeting in February 2015, NATO defense ministers reportedly discussed an internal study of Russia’s nuclear strategy that expressed concern that Moscow may be lowering the threshold for potential use of nuclear weapons in a conflict. “What worries us most in this strategy is the modernization of the Russian nuclear forces, the increase in the level of training of those forces, and the possible combination between conventional actions and the use of nuclear forces, including possibly in the framework of a hybrid war,” one diplomat told *Reuters* (Reuters 2015). NATO did not release information from the study.

The most surprising nuclear development in 2015 may have been the apparently intentional disclosure of a briefing slide during Russian President Vladimir Putin’s annual meeting with defense chiefs, which showed plans for a nuclear-armed, submarine-launched, and self-propelled underwater craft. The craft appears similar to a Russian nuclear drone the US Pentagon has code-named Kanyon (Gertz 2015). The briefing slide described the mission of the weapon: “Damaging the important components of the adversary’s economy in a coastal area and inflicting unacceptable damage to a country’s territory by creating areas of wide radioactive contamination that would be unsuitable for military, economic, or other activity for long periods of time” (Podvig 2015). Such indiscriminate damage would appear to violate the proportionality and distinction principles of the laws of war. The video showing the slide was quickly removed from Russian news media, but can still be seen on YouTube. (YouTube 2015)

ICBMs

Russia deploys an estimated 307 ICBMs that can carry approximately 1040 warheads, nearly 40% of the country’s total strategic warheads. The ICBMs are organized under the Strategic Rocket Forces in three missile armies, with a total of 12 divisions with approximately 40 regiments.

The replacement of Soviet-era ICBMs with modern types is more than halfway done and scheduled for completion in 2022. Deployment of the first-generation SS-27 Mod. 1 (Topol-M) is complete; deployment of the second-generation SS-27 Mod. 2 is continuing at an

accelerated pace; and development of a compact version of the SS-27 (RS-26) is in progress. The remaining Soviet-era ICBMs include:

SS-18 (RS-20 V). The SS-18 is a silo-based, 10-warhead heavy ICBM first deployed in 1988. The missile is being gradually retired with approximately 46 SS-18s with 460 warheads remaining in the 13th Missile Division at Dombrovsky and the 62nd Missile Division at Uzur. The SS-18 is scheduled to remain in service until the early 2020s, when it will be replaced by the RS-28 (Sarmat) ICBM.

SS-19 (RS-18 or UR-100NUTTH). The silo-based, six-warhead SS-19 entered service in 1980 and is gradually being retired and replaced by the silo-based SS-27 Mod. 2 (RS-24). We estimate that a total of 20 missiles remain in service with 120 warheads, possibly split between the 60th Missile Division at Tatishchevo and the 28th Guards Missile Division at Kozelsk. The SS-19 is scheduled to be retired in 2019.

SS-25 (RS-12 M or Topol). Russia is retiring SS-25 missiles at a rate of one to three regiments (nine to 27 missiles) each year and replacing them with the SS-27 Mod. 2 (RS-24) and the new RS-26. We estimate there are 90 SS-25s left, although the number could be as low as 72 if divisions converting to the SS-27 Mod 2 retire all SS-25s in one step instead of gradually, regiment by regiment. The last SS-25s will be withdrawn from service in 2021.

The new ICBMs include SS-27 Mods. 1 and 2 (Topol-M and RS-24). The SS-27 Mod. 1 is a single-warhead missile, known in Russia as Topol-M, that comes in either mobile (RS-12M1) or silo-based (RS-12M2) variants. Deployment of the SS-27 Mod. 1 was completed in 2012 with a total of 78 missiles: 60 silo-based missiles with the 60th Missile Division in Tatishchevo, and 18 road-mobile missiles with the 54th Guards Missile Division at Teykovo, northeast of Moscow.

The SS-27 Mod. 2, known in Russia as the RS-24 or Yars, is a modified SS-27 Mod 1 (Topol-M) that carries a multiple independently targetable reentry vehicle (MIRV). Following initial deployment of the first two regiments of SS-27 Mod. 2 in 2010–2012, with a total of 18 mobile missiles at the 54th Guards Missile Division at Teykovo, deployment is now well underway at the Novosibirsk and Nizhniy Tagil divisions, where the first regiments went on combat duty in late 2013. Altogether, the Russian military says that six new SS-27 Mod. 2 (RS-24) regiments were put on combat duty in 2015 (Russian Federation Defense Ministry 2016), but some of those were only partially armed.

Novosibirsk, the home of the 39th Guards Missile Division, received its first SS-27 Mod. 2 regiment in

late 2013. A second regiment entered service in 2014 and a third followed in 2015. A fourth and last regiment will probably follow in 2016 or 2017, for a total of 36 missiles with an estimated 144 warheads at this division.

Nizhniy Tagil, home of the 42nd Missile Division, received its first SS-27 Mod. 2 regiment in late 2013, followed by a second regiment in 2014 and a third regiment in 2015–2016, for a total of 27 launchers with an estimated 108 warheads at this division.

Introduction of the first SS-27 Mod. 2 regiment started at the Yoshkar-Ola division in 2015. The 14th Missile Division is expected to complete installment of three regiments by 2017–2018, with a total of 27 missiles and 108 warheads.

Deployment of the silo-based SS-27 Mod. 2 version is well underway at the Kozelsk division in western Russia, home of the 28th Missile Guards Division. The first two missiles were loaded in late 2014, and the first full regiment of 10 missiles was complete by late 2015. Installment of the second 10 missiles is under way, replacing the remaining SS-19s at Kozelsk. How many of the original 60 SS-19 silos will be converted for SS-27 Mod. 2s is unknown, but at least 30 seems plausible.

The Russian military says it plans to put five new missile regiments on combat duty in 2016 (Russian Federation Defense Ministry 2016). But several of those will probably not be fully armed right away; the Strategic Rocket Forces are scheduled to receive 20 SS-27 Mod. 2 missiles in 2016 (TASS 2016) – only enough to arm two regiments. Bringing new missile regiments online will include completing installment of mobile launchers at Novosibirsk and Tagil, and continuing with deployment of the second regiment of silos at Kozelsk.

Upgrade of the missile divisions at Yoshkar-Ola and Irkutsk started in 2015 and each is scheduled to receive one SS-27 Mod. 2 regiment in 2016 (VPK-News 2015), although neither regiment is expected to be fully loaded until later. The 51st Guards Missile Division at Irkutsk will be the first equipped with the new version of the SS-27, known as RS-26 or Yars-M, a compact and lighter version of the SS-27 Mod. 2 that will also carry multiple warheads.⁴ Initial deployment was scheduled for 2015 but has been delayed to 2016.

Announcements have not yet been made about upgrades to the two remaining road-mobile ICBM divisions at Barnaul and Vypolzovo. But Strategic Rocket Forces commander Lt. Gen. Sergei Karakayev said in early 2016 that Russia plans to continue to operate 12 missile divisions in the future (Interfax 2016), which implies that both Barnaul and

Vypolzovo might be upgraded to SS-27 Mod. 2 or RS-26 as well.

A rail-based version of the SS-27 Mod. 2, known in Russia as Barguzin, has been reported to be in early design development. But this program may have been delayed or even canceled because of Russia's financial crisis (*Jane's Defence Weekly* 2016).

Russia is also developing the RS-28, or Sarmat, which is intended to replace the SS-18 (RS-20 V) in the early 2020s. A "pop-up" test launch (involving ejection without engine ignition) scheduled for 2015 was delayed, but Deputy Defense Minister Yuriy Borisov says the plan is to start up serial production before 2020, with deliveries beginning in 2018 or 2019 (Interfax 2015a). General Karakayev has said the RS-28 will carry "new types of warheads" (VPK-News 2015), and Borisov says the missile "will be able to carry equipment for surmounting missile defense" and "have a sufficient power reserve to fly over the North or South Pole." Borisov has also said the RS-28 "will be equipped with maneuverable warheads" (Rossiyskaya Gazeta 2014). It is possible that the program may be delayed by the financial crisis.

Despite the modernization of the ICBMs, it seems likely that the size of the Strategic Rocket Forces will drop below 300 missiles by the early 2020s. Because this force is significantly smaller than the 400-strong ICBM force the United States plans to retain, Russian planners are compensating by increasing the share of ICBMs equipped with multiple warheads. Although, the overall number of ICBM warheads is unlikely to increase, the composition of the force is changing significantly: Prior to 2010, no mobile ICBMs carried MIRVs; by the early 2020s, all will do so.

Russian road-mobile ICBM forces normally conduct two large-scale exercises each year: a winter exercise in January or February and a summer exercise in July or August. The winter exercise in 2015 involved SS-25 and SS-27 launchers from about 20 regiments at six divisions: Bernaul, Irkutsk, Teykovo, Vypolzovo, Yoskar-Ola, and Yurya. The summer exercise was even bigger, involving 30 regiments, including silo-based ICBMs.

SSBNs and SLBMs

The Russian Navy operates a fleet of 12 nuclear-powered ballistic missile submarines (SSBNs) of three classes: Six Delta IVs (Project 667BRDM), three Delta IIIs (Project 667BRD), and three Boreis (Project 955).⁵ Each submarine can carry 16 submarine-launched ballistic missiles (SLBMs) for a combined total of nearly 800 warheads.

For the remainder of this decade, the mainstay of Russia's nuclear submarine force will continue to be the six third-generation Delta IVs built between 1985 and 1992, each equipped with 16 SLBMs. All Delta IVs are part of the Northern Fleet and based at Yagelnaya Bay on the Kola Peninsula. Since 2007, Russia has been upgrading the Delta IVs to carry a modified SS-N-23 SLBM known as the Sineva. Each missile carries up to four warheads. All six boats have now completed an overhaul and conversion to the Sineva. Up to five of the six Delta IVs are operational at any given time.

There are news media rumors that the Delta IV SSBNs will be upgraded to carry a modified version of the Sineva SLBM known as the Layner (or Liner) (Izvestia 2012). Some speculate that the Layner is a new missile with 10 warheads, but it appears to be a modified Sineva with four warheads: "It is in fact a Sineva. Only the warhead is new," said a Russian navy spokesperson. The Layner may carry an enhanced payload, which might include modified warheads and additional penetration aids.

Two Delta III nuclear submarines remain operational with Russia's Pacific Fleet on the Kamchatka Peninsula. Each boat is equipped with 16 SS-N-18 M1 Stingray (RSM-50) SLBMs with three warheads each. One of the Delta IIIs – *Podolsk (K-223)* – launched an SS-N-18 on 3 November 2015. The other boat – *Saint George (K-433)* – returned from a combat patrol in December 2015. Launched in the late 1970s, the Delta IIIs are outdated and will be replaced by Borei-class SSBNs over the next few years.

The first three new Borei (Project 955/A) SSBNs are in service, with another five in various stages of construction. The first boat, *Yuri Dolgoruki (K-535)*, is based at Yagelnaya in the Northern Fleet, from where it conducted its first two-month patrol under the Arctic ice from August to October of 2015 (Interfax 2015b). The second boat, *Alexander Nevsky (K-550)*, arrived at its home base at Rybachiy near Petropavlovsk in September 2015, where it will be joined by the third Borei, *Vladimir Monomakh (K-551)*, in 2016 or 2017.

A total of eight Borei-class submarines are listed in Russia's 2014–2020 defense plan. The first three are each armed with 16 SS-N-32 (Bulava) SLBMs that can carry up to six warheads apiece. The subsequent Borei-class submarines will be of an improved design known as Borei II (Project 955A). The first improved Borei, *Knyaz Vladimir*, will be delivered in 2016 for service in 2017. The keels for the fifth and sixth boats – *Knyaz Oleg* (or *Alexander Suvorov*) and *Generalissimus Suvorov* – were laid down in 2014 for possible completion in 2018 or 2019. The schedule for the last three boats means that the eight-boat program will probably not be completed until the early- to mid-2020s.

The Borei-class modernization will increase the capability of the Russian SSBN fleet. The Borei submarines will carry SS-N-32 (Bulava) SLBMs. The SS-N-32 carries six warheads, compared with three and four on the SS-N-18 and SS-N-23 respectively. As a result, the future SSBN fleet will be able to carry more warheads than the current one. The implication is that the strategic importance of the SSBN fleet will increase, which will make it more important for Russia's adversaries to threaten that fleet should there be a war.

Strategic bombers

Russia operates two types of nuclear-capable heavy bombers: the Tu-160 Blackjack and the Tu-95MS Bear H. We estimate that there are 70–80 bombers in the inventory, of which about 60 are counted as deployed under New START. Both bomber types can carry the nuclear AS-15 Kent (Kh-55) air-launched cruise missile (ALCM)⁶ and possibly gravity bombs,⁷ and the Tu-160 can also carry the nuclear AS-16 Kickback (Kh-15) short-range attack missile.⁸ A new long-range nuclear cruise missile, designated the Kh-102, is being fielded and will probably replace the older nuclear missiles.

Estimating the size and operational status of the Russian heavy bomber force is difficult because neither Russia nor Western intelligence provide substantial information. Moreover, as the Tu-160 and Tu-95MS bombers are being modernized, they change operational status. New START counts all bombers with some residual nuclear-capable equipment, not just those currently assigned a nuclear mission. Russia will have to eliminate 77 launchers to meet the New START limit of 800 deployed and nondeployed launchers by 2018, so some of the Tu-95MS bombers will probably be denuclearized or retired.

Our current estimate of roughly 60 deployed nuclear bombers is based largely on commercial satellite images, which show an average of 54–57 bombers typically present at the two strategic bomber bases, Engels and Ukrainka. Another half a dozen or so aircraft from these bases might be on training flights or temporarily at other bases. (On 8 October 2015, for example, two Tu-160s from Engels were present at the Tu-22M3 base at Belaya.) Satellite images show another 23 to 26 bombers typically present at the Ryazan training base, the Kazan production plant, and the Zhukovsky design plant, for a total inventory of 77–83 bombers. These numbers are probably a little high because some of the visible bombers may have been retired, some were Tu-142 naval bombers, and the satellite images were not all taken on the same day. Nevertheless, by averaging the numbers

visible in the available images of all six sites, we arrive at a rough estimate of approximately 70 nuclear-capable bombers in service.

It is a great unknown how many nuclear weapons are assigned to the heavy bombers. Each Tu-160 can carry up to 12 nuclear AS-15A air-launched cruise missiles. The Tu-95MS can carry 6–16 cruise missiles, depending on configuration. Combined, the 60 operational bombers could potentially carry an estimated 670 cruise missiles. The Tu-160 may also have a secondary mission with nuclear gravity bombs, but it seems unlikely that the old and slow Tu-95 would stand much of a chance against modern air defense systems. Most bomber-appropriate nuclear weapons are probably in central storage, with only a couple of hundred deployed at the two bomber bases.⁹

Nearly all of the ageing Tu-160s and most of the Tu-95MSs are undergoing various upgrades. The first seven upgraded Tu-160s and Tu-95MSs returned to service in 2014 (Interfax 2014), and two more Tu-160s and seven Tu-95MSs will be delivered in 2016 (TASS 2015a). Only a few dozen of the Tu-95MSs – perhaps around 44 – will be modernized, while at least 10 Tu-160s will be modernized by 2019 (TASS 2015b; Novosti 2012). Modernizing 10 aircraft would cost at least 34 billion rubles (\$10 billion) (Novosti 2013a). The future bomber force will likely include 50–60 aircraft.

In addition to modernizing some existing bombers, in 2015, the Russian Ministry of Defense announced that it plans to restart production of the Tu-160. According to Deputy Defense Minister Yuriy Borisov, production will begin sometime after 2023, and Russian Air Force Commander Col. Gen. Viktor Bondarev reportedly said that the plan is to buy at least 50 of the new version, known as Tu-160M2 (Sputnik News 2015). If so, this would probably result in retirement of all remaining Tu-95MSs.

The plan to reopen production of the Tu-160 indicates that the next-generation bomber known as PAK-DA, which has been in development for several years, will be delayed. In 2013, the government signed a contract with manufacturer Tupolev in 2013 to construct the PAK-DA at the Kazan factory, and the first flight was planned for 2019 with delivery to the Russian Air Force around 2023 (Novosti 2014). It is unlikely, though, that the Russian aviation industry has enough capacity to develop and produce two strategic bombers at the same time.

Nonstrategic (tactical) weapons

In addition to modernizing its strategic nuclear forces, Russia is also updating some of its shorter-range, so-

called nonstrategic nuclear forces. This effort is less clear and comprehensive than the strategic forces modernization plan, but also involves phasing out Soviet-era weapons and replacing them with newer but fewer arms. The emergence of more advanced conventional weapons will likely have a stronger impact on the numbers and composition of nonstrategic nuclear forces than on strategic forces, and result in retirement of many nonstrategic weapons over the next decade.

Nonetheless, the Russian military continues to attribute importance to nonstrategic nuclear weapons for use by naval, tactical air, and air- and missile-defense forces, as well as on short-range ballistic missiles. Part of the rationale is that nonstrategic nuclear weapons are needed to offset the superior conventional forces of NATO, and particularly the United States. Russia also appears to be motivated by a need to counter China's large and increasingly capable conventional forces in the Far East, and by the fact that having a sizable inventory of nonstrategic nuclear weapons helps Moscow keep overall nuclear parity with the combined nuclear forces of the United States, Britain, and France.

We estimate that Russia has roughly 2000 nonstrategic nuclear warheads assigned for delivery by air, naval, and various defensive forces.¹⁰ Like the US government, the Russian government does not provide any information on how many or what kinds of nonstrategic nuclear weapons it possesses. We estimate that the Russian inventory is declining and will continue to do so over the next decade with or without an arms control agreement. The Russian government has repeatedly said that all of its nonstrategic nuclear weapons are in central storage.

The biggest user of nonstrategic nuclear weapons is the Russian Navy, which we estimate has an inventory of approximately 760 warheads for use by cruise missiles, antisubmarine rockets, anti-aircraft missiles, torpedoes, and depth charges on submarines, aircraft carriers, cruisers, destroyers, frigates, corvettes, and naval aircraft.

Naval modernization programs include work on the next class of nuclear attack submarines, the Severodvinsk (known in Russia as Project 885M or Yasen). The first of these boats entered service in 2015 and is thought to be equipped with a nuclear version of the Kalibr sea-launched cruise missile (the SS-N-30A) (Gertz 2015). The subsequent seven planned boats will have an improved design. The Severodvinsk-class submarines will also be able to deliver SS-N-16 (Veter) nuclear antisubmarine rockets, as well as nuclear torpedoes. Other upgrades of naval nonstrategic nuclear platforms include those planned for the Sierra class (Project 945), the Oscar II class (Project 949A) and the Akula

class (Project 971). While the conventional version of the Kalibr is being fielded on a wide range of submarines and ships, the nuclear version will likely replace the current SS-N-21 nuclear land-attack cruise missile on select attack submarines.

Tactical air forces are Russia's second largest user of nonstrategic nuclear weapons, with an estimated 570 assigned for delivery by Tu-22M3 (Backfire) intermediate-range bombers, Su-24M (Fencer-D) fighter-bombers, and the new Su-34 (Fullback) fighter bomber. All types can deliver nuclear gravity bombs and the Tu-22M3 can also deliver AS-4 (Kitchen) ALCMs. NATO reported in early 2016 that Tu-22M3s carried out a simulated nuclear strike exercise against Sweden in March 2013 (NATO 2016). The Tu-22M3 and Su-24M are being upgraded. The Su-34, which will gradually replace the Su-24M, has already been deployed to the Voronezh and Morozovsk bases in western Russia. A total of 120 Su-34s are planned through 2020.

Russia's air- and missile-defense forces are also upgrading nuclear-capable systems. The S-300 air-defense system with nuclear-capable SA-10/20 interceptors is deployed across Russia and is slowly being upgraded to the S-400 system with SA-21 interceptors, and an upgrade of the nuclear-tipped A-135 antiballistic missile defense system around Moscow is said to be underway.

It is highly uncertain how many nuclear warheads exist for the air-defense forces or which interceptor types are nuclear-capable, but Russian officials have stated that about 40 percent of the 1991 stockpile remains. Alexei Arbatov, then a member of the Russian Federation State Duma defense committee, wrote in 1999 that the 1991 inventory included 3000 air-defense warheads (Arbatov 1999). Many of those were probably from systems that had been retired, and US intelligence officials estimated that the number had declined to around 2500 by the late 1980s (Cochran, et al. 1989), in which case the 1991 inventory might have been closer to 2000 air defense warheads. In 1992, Russia promised to destroy half of its nuclear air-defense warheads, and Russian officials said in 2007 that 60 percent had been destroyed (Pravda 2007).

If those officials were correct, the number of nuclear warheads for Russian air defense forces might have been 800–1000 a decade ago, significantly more than the 68–166 warheads assumed by a 2012 study (Sutyagin 2012). Assuming the inventory has shrunk since then (due to the improving capabilities of conventional air-defense interceptors), we estimate that roughly 400 nuclear warheads remain for air-defense forces today, plus an additional 80 for the Moscow A-135 missile defense system and coastal defense units, for a total inventory of about 480 warheads.

The Russian Army is in the middle of a modernization of its short-range ballistic missile force that involves replacing the SS-21 (Tochka) with the SS-26 (Iskander-M). Whereas, the SS-21 launcher carries a single missile with a range of 120 kilometers (km), the SS-26 launcher carries two missiles with a range of about 300 km. We estimate there are roughly 140 warheads for short-range ballistic missiles.

In 2014, the US government formally accused Russia of being “in violation of its obligations under the Intermediate-Range Nuclear Forces Treaty not to possess, produce, or flight-test a ground-launched cruise missile (GLCM) with a range capability of 500–5500 km, or to possess or produce launchers of such missiles” (US State Department 2014). Russia’s GLCM presumably is intended for potential deployment with Army forces, but neither Russia nor the United States has provided public details about the weapon system (Kristensen 2015).

Notes

1. We estimate that Russia stores its nuclear weapons at approximately 40 permanent storage sites across the country, including about 10 national-level central storage sites (Kristensen and Norris 2014, 2–9). Essential references for following Russian strategic nuclear forces include the general New START aggregate data released by the US and Russian governments biannually; BBC Monitoring; Pavel Podvig’s website on Russian strategic nuclear forces, <http://russianforces.org/>; and the Russia profile maintained by the James Martin Center for Nonproliferation Studies for the Nuclear Threat Initiative, here: <http://www.nti.org/learn/countries/russia/nuclear/>
2. See for example the Local DK (2015) or De Quetteville and Pierce (2008).
3. See for example Meyer (2015) and Johnston (2015).
4. For details of the RS-26, see Kristensen and Norris (2015).
5. Three Typhoon-class (Project 941) submarines also remain afloat, of which one has been converted to a missile test platform. None carry nuclear weapons.
6. The Tu-95MS is equipped with the AS-15A and the Tu-160 with the AS-15B, which has a longer range. Each bomber can carry 6–16 weapons, depending on type; hence, it would be possible for 70 bombers to be loaded with nearly 800 warheads but only be attributed as 70 warheads under New START.
7. One normally well-informed source says there are no nuclear gravity bombs for the Tu-95MS and Tu-160 aircraft (Podvig 2005).
8. There are rumors that the AS-16 may have been retired or placed in storage.
9. Russia is also adding conventional cruise missiles to its bomber fleet, a capability that was showcased in

September 2015 when Tu-160 and Tu-95MS bombers launched several long-range conventional kh-555 and kh-101 cruise missiles against targets in Syria. New storage facilities have been added to Russia’s bomber bases over the past few years that might be related to the introduction of conventional cruise missiles.

10. A US embassy cable stated in September 2009 that Russia had “3000–5000 plus” nonstrategic nuclear weapons (Hedgehogs.net 2010), a number that comes close to our estimate at the time (Kristensen 2009). James Miller, the US principle deputy under-secretary of defense for policy, stated in 2011 that nongovernmental sources estimated Russia might have 2000–4000 nonstrategic nuclear weapons (Miller 2011). For a more in-depth overview of Russian and US nonstrategic nuclear weapons, see Kristensen (2012). Some analysts estimate that Russia has significantly fewer warheads assigned to nonstrategic forces (Sutyagin 2012).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research was carried out with grants from the New Land Foundation and the Ploughshares Fund.

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