

# Bulletin of the Atomic Scientists

<http://bos.sagepub.com/>

---

## **Russian nuclear forces, 2011**

Hans M. Kristensen and Robert S. Norris  
*Bulletin of the Atomic Scientists* 2011 67: 67  
DOI: 10.1177/0096340211407147

The online version of this article can be found at:  
<http://bos.sagepub.com/content/67/3/67>

---

Published by:



<http://www.sagepublications.com>

On behalf of:

[Bulletin of the Atomic Scientists](#)

**Additional services and information for *Bulletin of the Atomic Scientists* can be found at:**

**Email Alerts:** <http://bos.sagepub.com/cgi/alerts>

**Subscriptions:** <http://bos.sagepub.com/subscriptions>

**Reprints:** <http://www.sagepub.com/journalsReprints.nav>

**Permissions:** <http://www.sagepub.com/journalsPermissions.nav>



## Russian nuclear forces, 2011

Hans M. Kristensen and Robert S. Norris

### Abstract

With Russia's ratification of New START in January 2011 comes a commitment to bilateral nuclear reductions. With a 2018 deadline as the goal, the treaty sets out to limit the number of deployed strategic nuclear warheads and the number of deployed ballistic missiles and heavy bombers. But, the authors write, there are other numbers to watch—those that are not limited by New START; Russia is positioned to maintain thousands of other non-deployed strategic and nonstrategic warheads. The authors assess the country's nuclear forces, providing clear analysis of intercontinental ballistic missiles, nuclear-powered ballistic submarines, strategic bombers, and nonstrategic tactical weapons.

### Keywords

ICBM, intercontinental ballistic missiles, New START, nonstrategic tactical weapons, nuclear-powered ballistic submarines, Russia, SSBN, strategic bombers, US

On January 25, 2011, Russia ratified the New Strategic Arms Reduction Treaty (START) with the United States, recommitting itself to bilateral nuclear reductions. The treaty limits Russian (and US) deployed strategic nuclear warhead levels to 1,550 and deployed ballistic missiles and heavy bombers to 700 (combined), with a deadline of 2018. Yet Russia can be expected to maintain thousands of other non-deployed strategic and nonstrategic warheads, since New START does not place any limit on the total stockpile size, capping only the number of deployed strategic warheads allowed on long-range delivery vehicles (Kristensen, 2011).

We estimate that as of March 2011, Russia had approximately 2,430 nuclear warheads assigned to operational intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and heavy bombers. Russia also has a large inventory of 3,700–5,400 nonstrategic nuclear warheads, plus an additional 3,000 warheads awaiting dismantlement, for a total inventory of nearly 11,000 nuclear warheads.<sup>1</sup>

Of Russia's 2,430 strategic offensive nuclear weapons, we estimate 1,583 are deployed on approximately 455 ballistic missiles, with another 844 warheads assigned to 76 heavy bombers. (In normal circumstances, bombers are

**Table 1.** Russian nuclear forces, 2011

Type/name	Russian designation	Launchers	Year deployed	Warheads x yield (kilotons)	Total warheads
<i>Strategic offensive weapons</i>					
<b>ICBMs</b>					
SS-18 M6 Satan	RS-20V	50	1988	10 × 500/800 (MIRV)	500
SS-19 M3 Stiletto	RS-18	50	1980	6 × 400 (MIRV)	300
SS-25 Sickle	RS-12M (Topol)	120	1985	1 × 800	120
SS-27 Mod 1	RS-12M2 (Topol-M)	51	1997	1 × 800	51
SS-27 Mod 1	RS-12M1 (Topol-M)	18	2006	1 × 800?	18
SS-27 Mod 2	RS-24	6	2010	3 × 400? (MIRV)	18
<b>Subtotal</b>		<b>295</b>			<b>1,007</b>
<b>SLBMs</b>					
SS-N-18 M1 Stingray	RSM-50	4/64	1978	3 × 50 (MIRV)	192
SS-N-23 Skiff	R-29RM	1/16	1986	4 × 100 (MIRV)	64
SS-N-23 M1	RSM-54 (Sineva)	5/80	2007	4 × 100 (MIRV) <sup>1</sup>	320
SS-N-32	RSM-56 (Bulava)	(1/16)	(2011)	6 × 100 (MIRV)	(96)
<b>Subtotal</b>		<b>10/160</b>			<b>576</b>
<b>Bombers/weapons</b>					
Bear-H6	Tu-95 MS6	32	1984	6 × AS-15A ALCMs, bombs	192
Bear-H16	Tu-95 MS16	31	1984	16 × AS-15A ALCMs, bombs	496
Blackjack	Tu-160	13	1987	12 × AS-15B ALCMs or AS-16 SRAMs, bombs	156
<b>Subtotal</b>		<b>76</b>			<b>844<sup>2</sup></b>
<b>Subtotal strategic offensive forces</b>					<b>~2,430</b>
<i>Nonstrategic and defensive weapons</i>					
<b>ABM/Air defense</b>					
SA-10 Grumble		1,900	1980	1 × low	~630
53T6 Gazelle		68	1986	1 × 10	68 <sup>3</sup>
<b>Land-based air</b>					
Bombers/fighters		~682		ASM, bombs	~800
<b>Ground-based<sup>4</sup></b>					
Short-range ballistic missiles		?		1 × ?	?
<b>Naval</b>					
Submarines/surface ships/air				SLCM, ASW, SAM, ASM, DB, torpedoes	~590
<b>Subtotal nonstrategic and defensive forces</b>					<b>~2,080<sup>5</sup></b>
<b>Total</b>					<b>~4,500<sup>6</sup></b>

<sup>1</sup>The Sineva probably carries at least four MIRVed warheads. US intelligence in 2006 estimated that the missile can carry up to 10 warheads but lowered the estimate to four warheads in 2009.

<sup>2</sup>The bomber weapons are kept in storage, not deployed on the aircraft. We estimate that only a few hundred weapons are present at the two bomber bases, with the remainder in central storage.

<sup>3</sup>All 32 Gorgon missiles apparently have been removed from the ABM system.

<sup>4</sup>NATO's International Military Staff (IMS) briefed the North Atlantic Council (NAC) in November 2009 that the Russian Zapad and Ladoga exercises in August – September 2009 included "missile launches, some of which may have simulated the use of tactical nuclear weapons" (*Aftenposten*, 2011).

<sup>5</sup>Numbers may not add up due to rounding. All nonstrategic warheads are in central storage. The 2,080 listed make up the estimated nominal load for nuclear-capable delivery platforms. An additional 1,600–3,300 nonstrategic warheads are awaiting dismantlement, for a total inventory of 3,700–5,400 nonstrategic warheads.

<sup>6</sup>In addition to nonstrategic warheads, we estimate that an additional 3,000 retired strategic warheads are awaiting dismantlement, for a total inventory of approximately 11,000 warheads.

**Key**

ABM: Antibalistic missile, ALCM: Air-launched cruise missile, ASM: Air-to-surface missile, ASW: Antisubmarine weapon, DB: Depth bomb, 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.

not loaded with nuclear weapons; we estimate that all but a few hundred bomber weapons have been transferred to central storage sites.) New START counts the actual number of warheads deployed on ballistic missiles, but it does not count actual bomber weapons; instead, it attributes a single weapon to each aircraft—regardless of its actual assigned load.<sup>2</sup> Under these warhead accounting rules, Russia's current arsenal would count as 1,659 deployed strategic warheads, which means that by 2018, Russia will have to reduce its deployed levels by about 110 warheads.

In 2010, Russia adopted a new military doctrine that describes its policy of nuclear weapons use. Despite conjecture that the new doctrine deepens Russian reliance on nuclear weapons and increases the chances of potential first-use, the document generally appears to reaffirm a retaliatory posture with an option to preempt if necessary.

The new doctrine describes the role of nuclear weapons as “preventing the outbreak of nuclear military conflicts and military conflicts involving the use of conventional means of attack (a large-scale war or regional war),” with nuclear forces maintained for “strategic stability” at an “adequate level.” According to the document, Russia “reserves the right to utilize nuclear weapons *in response* to the utilization of nuclear and other types of weapons of mass destruction against it and (or) its allies, and also in the event of aggression against the Russian Federation involving the use of conventional weapons when the very existence of the state is under threat” (emphasis added).<sup>3</sup> In 2009, a Russian official said that Moscow did not rule out preemptive nuclear strikes in critical situations for national

security, but such a scenario is not included in the public version of the 2010 doctrine.

## ICBMs

Russia deploys nearly 300 ICBMs of six types, loaded with just over 1,000 nuclear warheads. This is a reduction of 30 missiles over the last year, caused by the ongoing retirement of SS-18 (RS-20V), SS-19 (RS-18), and SS-25 (RS-12M) missiles, which are being replaced (on less than a one-for-one basis) by SS-27 missiles. Russia's missiles are organized in three missile armies with 11 divisions.

The SS-27 (Topol-M) comes in three variants: the SS-27 Mod. 1, a single-warhead missile that can be either mobile (RS-12M1) or silo based (RS-12M2); and the SS-27 Mod. 2 (RS-24), a mobile missile equipped with multiple independently targetable reentry vehicles. All new Russian ICBMs deployed over the next decade will be RS-24s. Deployment of the silo-based SS-27 Mod. 1 has reached 51 operational missiles, organized into five regiments. Russia deploys 18 mobile SS-27 Mod. 1s north-east of Moscow at Teykovo, where six SS-27 Mod. 2s (each estimated to carry three warheads) are deployed with the 54th missile regiment.

By 2016, the three Topol-M variants will constitute approximately 80 percent of the ICBM force, according to the Russian military (RIA Novosti, 2010a). To reach that goal, Moscow will need to increase the pace of retirement of SS-18, SS-19, and SS-25 missiles and double production and deployment of the silo-based SS-27 Mod. 1 and mobile SS-27 Mod. 2.

Roughly half of Russia's deployed ICBM warheads are carried on approximately 50 SS-18s, a 10-warhead heavy ICBM first deployed in 1988. Sergey Karakayev, commander of the Strategic Rocket Forces, announced that the service life of the SS-18 would be extended and the missile kept in service until 2026 (RIA Novosti, 2010 b). Approximately 300 warheads are deployed on the silo-based, six-warhead SS-19, which first entered service in 1980; the service life of the missile has also been extended, possibly through 2016. The single-warhead SS-25 is rapidly being reduced, with approximately 27 missiles withdrawn from service each year. The missile, which first entered service in 1985, will probably be retired by 2015.

Defense Minister Vladimir Popovkin stated in early 2011 that a new "heavy ICBM" is included in Russia's arms procurement program through 2020.<sup>4</sup> The new missile would carry up to 10 warheads and be deployed in 2018 (Gorenburg, 2011; VPK News, 2011).

### **Nuclear-powered ballistic missile submarines (SSBNs)**

Russia's 10 active SSBNs (six Delta IVs and four Delta IIIs) are equipped with 160 submarine-launched ballistic missiles (SLBMs) and carry an estimated 576 warheads. Russian submarines can launch their missiles while docked pier-side, if necessary. As in 2010, the Delta IVs remain part of the Northern Fleet based at Yagelnaya Bay on the Kola Peninsula, and the Delta IIIs are based at Rybachiy on the Kamchatka Peninsula as part of the Pacific Fleet.

The Delta III boats will eventually be replaced by Borey-class SSBNs; however, development of the new class and

the missile it will carry, the Bulava (SS-N-32), has been slow. In fact, the first Borey boat, *Yuri Dolgoruki*, has been under development for more than 10 years. After test failures in 2008 and 2009, the Bulava SLBM—which can carry up to six warheads and has a range of up to 9,000 kilometers—had two successful test-launches in late 2010 from a converted Typhoon-class SSBN; however, for the system to enter service, the *Yuri Dolgoruki* will have to successfully test-launch Bulavas in 2011. The second Borey-class SSBN, the *Alexander Nevsky*, has been delayed until later this year at the earliest, and the third is slated for completion in 2012 but might also be delayed. Russia plans to build up to eight Borey-class SSBNs, able to carry 16 Bulava SLBMs each. It also has plans to develop, by 2020, a fifth-generation SSBN that would carry both ballistic and cruise missiles (RIA Novosti, 2011).

Russia is upgrading its Delta IV SSBNs to carry the Sineva SLBM, an improved version of the SS-N-23 missile. Upgrades are complete for five of the subs (*Bryansk*, *Karelia*, *Tula*, *Verkhoturie*, and *Ekaterinburg*); the sixth boat (*Novomoskovsk*) began its modernization in 2009 and is expected to return to service in 2012.

Russia conducted six SLBM test-launches in 2010. On August 6, the *Tula* test-launched two SLBMs, one of which was a Sineva, from the Barents Sea. On October 7, the Delta III Typhoon-class *Dmitrii Donskoi* launched a Bulava, also from the Barents Sea (the first successful launch following a string of failures). On October 28, two SLBMs were test-launched from opposite ends of Russia: in the east, an SS-N-18 from the Sea of Okhotsk by the

Delta III *Svyatoi Georgii Pobedonosets*, and in the west, a *Sineva* from the Barents Sea by the Delta IV *Bryansk*; the next day, the *Dmitrii Donskoi* successfully test-launched another Bulava from the Barents Sea. A third Bulava test-launch, the first from the *Yuri Dolgoruki*, was scheduled for December 2010 but was delayed until mid-2011.

Russian SSBNs conducted seven strategic deterrent patrols in 2010, down from nine the previous year. Russia does not run continuous at-sea deterrent patrols (unlike Western powers), but it occasionally deploys SSBNs on training patrols.

### Strategic bombers

Russia deploys 76 strategic bombers (though not all of them are fully operational): 13 Tu-160s (Blackjacks), 32 Tu-95MS6s (Bear H6s), and 31 Tu-95MS16s (Bear H16s). Russia continues to modernize the targeting and navigation systems in many of these strategic aircraft (RIA Novosti, 2008c). In total, the bombers are capable of carrying up to 844 weapons. As described above, the weapons are not deployed on the bombers; instead, we estimate that a few hundred weapons are stored at the bomber bases and that the rest are kept in central storage facilities. The Tu-160s and Tu-95MSs are equipped to carry various nuclear bombs, as well as the nuclear AS-15 A (Kh-55) air-launched cruise missile (ALCM). Russia is converting some of its nuclear ALCMs into conventional missiles (designation Kh-555). An advanced nuclear cruise missile (Kh-102) has been in development for more than 10 years but is still not deployed.

Russia has begun developing a new strategic bomber that is expected to

enter service in 2025–30.<sup>5</sup> The new bomber would replace the Tu-160 and Tu-95MS heavy bombers and the nuclear-capable medium-range bomber Tu-22M3, according to Maj. Gen. Anatoly Zhikharev, the commander of strategic aviation (Itar-Tass, 2010; RIA Novosti, 2009).

During 2010, Russian heavy bombers continued their long-range training exercises into the Pacific, North Atlantic, and Arctic oceans, where they were intercepted by US, Canadian, British, Norwegian, and Japanese aircraft. While the Russian exercises receive much attention, the combat effectiveness of the bombers is probably limited due to aging equipment and limited support aircraft.

### Nonstrategic (tactical) weapons

Russia's inventory of nonstrategic nuclear weapons—far larger than the US inventory—remains a flash point in security discussions, as illustrated by the US Senate debate over New START and NATO's statements in its new Strategic Concept. The Russian government says it has reduced its nonstrategic nuclear weapon inventory by 75 percent since 1991 (Russian Federation, 2010b). Because this figure is much greater than the 60 percent reduction that Col. Gen. Vladimir Verkhovtsev cited in 2007 (*Pravda*, 2007), it seems Russia may have dismantled additional nonstrategic weapons over the last four years.

Estimates of the 1991 Soviet inventory of nonstrategic nuclear weapons range from 15,000 to 21,700.<sup>6</sup> Based on the Russian government's claim of a 75 percent reduction, the current Russian nonstrategic nuclear arsenal would

comprise some 3,700–5,400 warheads; this number roughly matches the range of “3,000–5,000 plus” mentioned in a September 2009 US embassy cable (Hedgehogs.net, 2010). We estimate Russia’s nonstrategic inventory includes as many as 5,390 weapons: 2,270 naval warheads; 2,000 warheads for the air force; and up to 1,120 missile- and air-defense warheads. Some ground-launched warheads might remain.

These warhead numbers far exceed the capacity of Russia’s nuclear-capable nonstrategic naval, air force, and air-defense delivery platforms, which we estimate may be assigned a nominal inventory of 2,080 warheads. Most of the remaining 3,310 nonstrategic weapons are probably retired and awaiting dismantlement; given this, we anticipate that the Russian nonstrategic nuclear arsenal might decline by as much as 50 percent over the next decade.

When one considers the actual capacity of the nonstrategic delivery vehicles in the Russian armed forces, however, the distribution of Russia’s nonstrategic nuclear weapons inventory takes on a different look. Using assumptions about the nominal load for each type of delivery platform, we estimate that approximately 800 AS-4 air-to-surface missiles and bombs are assigned for delivery by Tu-22 M (Backfire) intermediate-range bombers and by Su-24 (Fencer) fighter-bombers (bombs only). Some of the Su-24s are undergoing a modernization program, but the aircraft will be replaced by Su-34 (Fullback) fighter-bombers, which might inherit the nuclear fighter-bomber strike role.

We estimate that Moscow’s antiballistic missile system and mobile air-defense systems are allocated nearly 700 warheads for the Gazelle ballistic missile

interceptors and SA-10 Grumble air-defense system (and possibly also the SA-12 Growler system). The air-defense interceptors apparently have some capacity against ballistic missiles as well. Several SA-12 regiments, each of which have about eight launchers and 32 missiles, are deployed around Moscow, and Russia plans to deploy at least 18 systems by 2015 that will form the core of Russia’s air and missile defenses through at least 2020 (RIA Novosti, 2008a, 2008b).

Naval nonstrategic delivery platforms are allocated an estimated 590 warheads for cruise missiles, antisubmarine weapons, anti-air missiles, torpedoes, and depth bombs (we believe that surface ships are no longer assigned nuclear torpedoes). The first new Severodvinsk-class nuclear-powered attack submarine is expected to enter service this year with a nuclear capability, including land-attack cruise missiles.

Rumors about Russian nonstrategic nuclear weapons deployments near NATO re-emerged in 2010 with an article in the *Wall Street Journal* describing a classified US intelligence assessment that “Russia has expanded tactical [nonstrategic] nuclear deployments near NATO allies several times in recent years” (Entous and Weisman, 2010). The report was followed in early 2011 by Lithuanian Defense Minister Rasa Juknevičienė’s claim that Russia deploys nonstrategic nuclear weapons in the Kaliningrad region (Agence-France Presse, 2011). While Russia might have nuclear-capable delivery systems in Kaliningrad, we do not believe it stations any nuclear warheads in the oblast.

Although Russia has declared that it would eliminate all of its ground-launched tactical (nonstrategic) nuclear warheads in accordance with the 1991

presidential nuclear initiatives agreed by George H. W. Bush and Mikhail Gorbachev, it appears that some ground-launched nonstrategic warheads remain. In a briefing to the North Atlantic Council about two September 2009 Russian military exercises, NATO's International Military Staff reported that the exercises included "missile launches, some of which may have simulated the use of tactical nuclear weapons" (*Aftenposten*, 2011). NATO concluded that the Russian armed forces were "not able to conduct large scale conventional operations"—and that Russia was "still relying on the use of tactical nuclear weapons, even in local or regional conflicts" (*Aftenposten*, 2011).

### Acknowledgements

Jana Honkova, an intern at FAS, provided valuable research.

### Notes

1. We believe that Russia stores its weapons at 48 permanent storage sites across Russia (Norris and Kristensen, 2009: 86–98). Other essential references for following Russian strategic nuclear forces include the New START aggregate data that will be released by the US and Russian governments twice a year; the Open Source Center (available [with registration] at: [www.opensource.gov/](http://www.opensource.gov/)); Pavel Podvig's (2011) website on Russian strategic nuclear forces; and the Russia profile maintained by the James Martin Center for Nonproliferation Studies (2011) for the Nuclear Threat Initiative.
2. Depending on aircraft type, Russian bombers can carry up to 16 weapons; hence, it would be possible for a Russian aircraft to be loaded with 16 weapons but have only one warhead attributed to it under New START.
3. Emphasis added; see Russian Federation (2010a), paragraphs 16, 19(c), 22. The Russian military doctrine also includes a secret annex, the content of which is not

publicly known. For analyses of the military doctrine, see Giles, 2010; Sokov, 2010.

4. The term "heavy ICBM" generally refers to large Russian (or Soviet) ICBMs with a throw-weight of 5–9 metric tons and the capability to carry many warheads.
5. For detailed discussion about future Russian strategic bombers, see Volodin, 2010.
6. For estimate range, see Norris and Arkin, 1991; Arbatov, 1999: 320.

### References

- Aftenposten* (2011) 23:11:2009: NATO-Russia: NAC discusses Russian military exercises. Wikileaks document, posted February 13. Available at: [www.aftenposten.no/spesial/wikileaksdokumenter/article4028273.ece](http://www.aftenposten.no/spesial/wikileaksdokumenter/article4028273.ece).
- Agence-France Presse (2011) Lithuania claims Russia deployed warheads near border. February 8. Available at: [www.spacedaily.com/reports/Lithuania\\_claims\\_Russia\\_deployed\\_warheads\\_near\\_border\\_999.html](http://www.spacedaily.com/reports/Lithuania_claims_Russia_deployed_warheads_near_border_999.html).
- Arbatov A (1999) Deep cuts and de-alerting: A Russian perspective. In: Feiveson H (ed.) *The Nuclear Turning Point: A Blueprint for Deep Cuts and De-Alerting of Nuclear Weapons*. Washington, DC: Brookings Institution, 305–324.
- Entous A and Weisman J (2010) Russian missiles fuel US worries. *Wall Street Journal*, November 30. Available at: [online.wsj.com/article/SB10001424052748704584804575645212272670200.html](http://online.wsj.com/article/SB10001424052748704584804575645212272670200.html).
- Giles K (2010) The military doctrine of the Russian Federation 2010. NATO Research Review, NATO Defence College, February. Available at: [www.ndc.nato.int/download/downloads.php?icode=170](http://www.ndc.nato.int/download/downloads.php?icode=170).
- Gorenburg D (2011) Popovkin provides more details on armaments program. Russian Military Reform, March 8. Available at: [russiamil.wordpress.com/2011/03/09/popovkin-provides-more-details-on-armaments-program/](http://russiamil.wordpress.com/2011/03/09/popovkin-provides-more-details-on-armaments-program/).
- Hedgehogs.net (2010) US embassy cables: US targets terrorists with conventional warheads fitted to nuclear weapons. Wikileaks document. Available at: [www.hedgehogs.net/pg/newsfeeds/hhwebadmin/item/6728052/us-embassy-cables-us-targets-terrorists-with-conventional-warheads-fitted-to-nuclear-weapons](http://www.hedgehogs.net/pg/newsfeeds/hhwebadmin/item/6728052/us-embassy-cables-us-targets-terrorists-with-conventional-warheads-fitted-to-nuclear-weapons).
- Itar-Tass (2010) *New strategic bomber's R&D to be completed in 2010—source*. World News Connection (trans.), 6 April.
- James Martin Center for Nonproliferation Studies (2011) Russia: General nuclear weapons developments profile. Nuclear Threat Initiative. Available

- at: [www.nti.org/e\\_research/profiles/Russia/index.html](http://www.nti.org/e_research/profiles/Russia/index.html).
- Kristensen HM (2011) New START: It's in the bag. FAS Strategic Security Blog, January 26. Available at: [www.fas.org/blog/ssp/2011/01/newstartbag.php](http://www.fas.org/blog/ssp/2011/01/newstartbag.php).
- Norris RS and Arkin W (1991) Nuclear notebook: Estimated Soviet nuclear stockpile. *Bulletin of the Atomic Scientists* 47(6): 47–48.
- Norris RS and Kristensen HM (2009) Nuclear notebook: Worldwide deployments of nuclear weapons, 2009. *Bulletin of the Atomic Scientists* 65(6): 86–98. Available at: [bos.sagepub.com/content/65/6/86.full](http://bos.sagepub.com/content/65/6/86.full).
- Podvig P (2011) Russian strategic nuclear forces website. Available at: [www.russianforces.org](http://www.russianforces.org).
- Pravda (2007) Russia determined to keep tactical nuclear arms for potential aggressors. October 31. Available at: [english.pravda.ru/russia/kremlin/31-10-2007/99911-nuclear\\_arms-0/](http://english.pravda.ru/russia/kremlin/31-10-2007/99911-nuclear_arms-0/).
- RIA Novosti (2008a) Russia to deploy second S-400 regiment near Moscow in 2008. January 21. Available at: [en.rian.ru/russia/20080121/97447013.html](http://en.rian.ru/russia/20080121/97447013.html).
- RIA Novosti (2008b) Moscow to deploy S-400 air defense systems in Northwest Russia. February 7. Available at: [en.rian.ru/russia/20080207/98672029.html](http://en.rian.ru/russia/20080207/98672029.html).
- RIA Novosti (2008c) Russia to upgrade strategic bombers in 2009. December 23. Available at: [en.rian.ru/russia/20081223/119141502.html](http://en.rian.ru/russia/20081223/119141502.html).
- RIA Novosti (2009) Russia to commission new stealth bomber in 2025–2030. December 22. Available at: [en.rian.ru/mlitary\\_news/20091222/157324925.html](http://en.rian.ru/mlitary_news/20091222/157324925.html).
- RIA Novosti (2010a) Russia's missile force to replace Topol-M with multiple-warhead RS-24. November 30. Available at: [en.rian.ru/mlitary\\_news/20101130/161558446.html](http://en.rian.ru/mlitary_news/20101130/161558446.html).
- RIA Novosti (2010b) Russia to keep Satan ballistic missiles in service until 2026. December 17. Available at: [en.rian.ru/mlitary\\_news/20101217/161824781.html](http://en.rian.ru/mlitary_news/20101217/161824781.html).
- RIA Novosti (2011) Russian 5G subs to be equipped with ballistic, cruise missiles—source. March 19. Available at: [en.rian.ru/mlitary\\_news/20110319/163091053.html](http://en.rian.ru/mlitary_news/20110319/163091053.html).
- Russian Federation (2010a) The military doctrine of the Russian Federation. Approved by Russian Federation by presidential edict, February 5, paras 16, 19(c), 22. Translated by the US Open Source Center. Available (in Russian) at: [www.scrf.gov.ru/documents/33.html](http://www.scrf.gov.ru/documents/33.html).
- Russian Federation (2010b) Practical steps of the Russian Federation in the field of nuclear disarmament. *Brochure at 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons*, 3–28. May.
- Sokov N (2010) The new, 2010 Russian military doctrine: The nuclear angle. James Martin Center for Nonproliferation Studies, February 5. Available at: [cns.miis.edu/stories/100205\\_russian\\_nuclear\\_doctrine.htm](http://cns.miis.edu/stories/100205_russian_nuclear_doctrine.htm).
- Volodin V (2010) Bombers flying into the future. *Nezavisimoe Voennoe Obozrenie*, July 30. Available (in Russian) at: [nvo.ng.ru/armament/2010-07-30/6\\_avia.html](http://nvo.ng.ru/armament/2010-07-30/6_avia.html).
- VPK News (2011) My ne mozhem lojevolit' sebe jeakulat' plohoe vooruzhenie [We cannot afford to buy poor equipment]. March 2. Available (in Russian) at: [vpk-news.ru/articles/7182#article](http://vpk-news.ru/articles/7182#article).

## Author biographies

**Hans M. Kristensen** is the director of the Nuclear Information Project with the Federation of American Scientists (FAS) in Washington, DC. His work focuses on researching and writing about the status of nuclear weapons and the policies that direct them. Kristensen is a co-author to the world nuclear forces overview in the *SIPRI Yearbook* (Oxford University Press) and a frequent adviser to the news media on nuclear weapons policy and operations. He has co-authored Nuclear Notebook since 2001. Inquiries should be directed to FAS, 1725 DeSales St., NW, Sixth Floor, Washington, DC, 20036 USA; +1 (202) 546-3300.

**Robert S. Norris** is senior research associate with the Natural Resources Defense Council in Washington, DC. His principal areas of expertise include writing and research on all aspects of the nuclear weapons programs of the United States, Soviet Union/Russia, Britain, France, and China, as well as India, Pakistan, and Israel. He is the author of *Racing for the Bomb: General Leslie R. Groves, the Manhattan Project's Indispensable Man* (Steerforth) and co-author of *Making the Russian Bomb: From Stalin to Yeltsin* (Westview). He has co-authored or contributed to the chapter on nuclear weapons in the 1985–2000 editions of the *SIPRI Yearbook* (Oxford University Press), and has co-authored Nuclear Notebook since 1987.