

# **SIPRI YEARBOOK 2013**

Armaments, Disarmament and International Security

## US nuclear forces

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## I. US nuclear forces

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As of January 2013, the United States maintained an estimated arsenal of approximately 2150 deployed nuclear warheads, consisting of roughly 1950 strategic and 200 non-strategic warheads (see table 6.2). In addition to this operational arsenal, about 2500 warheads are held in reserve, for a total stockpile of approximately 4650 warheads. Another 3000 retired warheads are awaiting dismantlement for a total inventory of roughly 7700 warheads.

The operational force level is comparable to the estimate presented in *SIPRI Yearbook 2012*.<sup>1</sup> The reduction in the total stockpile reflects the retirement of the nuclear-tipped Tomahawk sea-launched cruise missile (SLCM).

As of 1 September 2012, the USA was counted under the 2010 Russian–US Treaty on Measures for the Further Reduction and Limitation of Strategic Offensive Arms (New START) as having 1722 strategic warheads attributed to 806 deployed missiles and bombers, a modest reduction of 15 warheads and 6 launchers compared with the count six months earlier, in March 2012.<sup>2</sup> The total reduction since the treaty entered into force in February 2011 was 78 strategic warheads and 76 launchers.<sup>3</sup>

The reductions have involved, first and foremost, the elimination of so-called ‘phantom’ launchers (i.e. bombers that are no longer assigned a nuclear delivery mission but are still counted under New START as nuclear launchers), as well as fluctuations in the number of launchers in overhaul at any given time. The elimination of actual nuclear launchers will not occur until 2015, when the US Navy will begin reducing the number of missile tubes on each nuclear-powered ballistic missile submarine (SSBN) from 24 to 20. The US Air Force (USAF) will probably reduce the inter-continental ballistic missile (ICBM) force from 450 to 400 missiles later in the decade.

### **Nuclear modernizations**

Over the next decade, the US Government intends to spend as much as \$214 billion to modernize nuclear delivery vehicles, warheads and

<sup>1</sup> Kile, S. N., Schell, P. and Kristensen, H. M., ‘US nuclear forces’, *SIPRI Yearbook 2012*.

<sup>2</sup> For a summary and other details of New START see annex A in this volume.

<sup>3</sup> For analysis of the 2012 New START aggregate numbers see Kristensen, H. M., ‘New detailed data for US nuclear forces counted under New START Treaty’, Strategic Security Blog, Federation of American Scientists, 30 Nov. 2012, <<http://blogs.fas.org/security/2012/11/newstart2012-2/>>.

**Table 6.2.** US nuclear forces, January 2013

Type	Designation	No. deployed <sup>a</sup>	Year first deployed	Range (km) <sup>b</sup>	Warheads x yield	No. of warheads
<b>Strategic forces</b>						<b>~1 950</b>
<i>Bombers</i>		<i>111/60</i>				<i>300</i>
B-52H	Stratofortress	91/44	1961	16 000	ALCM 5–150 kt	200 <sup>c</sup>
B-2A	Spirit	20/16	1994	11 000	B61-7, -11, B83-1 bombs	100 <sup>d</sup>
<i>ICBMs</i>		<i>449/500</i>				<i>500</i>
LGM-30G	Minuteman III					
	Mk-12A	200	1979	13 000	1–3 x 335 kt	250
	Mk-21 SERV	250	2006	13 000	1 x 300 kt	250
<i>SSBNs/SLBMs<sup>e</sup></i>		<i>239/288</i>				<i>1 152</i>
UGM-133A	Trident II (D5) <sup>f</sup>					
	Mk-4	..	1992	>7 400	4 x 100 kt	368
	Mk-4A	..	2008	>7 400	4 x 100 kt	400
	Mk-5	..	1990	>7 400	4 x 475 kt	384
<b>Non-strategic forces</b>						<b>200</b>
B61-3, -4 bombs		..	1979	..	0.3–170 kt	200 <sup>g</sup>
<b>Total deployed warheads</b>						<b>~2 150</b>
Reserve warheads						~2 500
<b>Total military stockpile</b>						<b>~4 650</b>
Retired awaiting dismantlement						~3 000
<b>Total inventory</b>						<b>~7 700<sup>h</sup></b>

.. = not available or not applicable; ALCM = air-launched cruise missile; ICBM = inter-continental ballistic missile; kt = kiloton; SERV = security-enhanced re-entry vehicle; SLBM = submarine-launched ballistic missile; SLCM = sea-launched cruise missile; SSBN = nuclear-powered ballistic missile submarine.

<sup>a</sup> The first figure in the 'No. deployed' column is the number counted as 'deployed' under New START. The second figure is the number assigned for nuclear missions.

<sup>b</sup> Aircraft range is for illustrative purposes only; actual mission range will vary according to flight profile and weapon loading.

<sup>c</sup> The B-52H can also carry B61-7 and B83-1 gravity bombs but is currently only planned for the delivery of ALCMs. The total ALCM inventory has been reduced to 528, of which an estimated 200 are deployed. New START only attributes one weapon to each aircraft and does not count weapons stored at bomber bases.

<sup>d</sup> Only the B-2A bomber is assigned to deliver nuclear gravity bombs for strategic missions.

<sup>e</sup> Of 14 SSBNs, 2 or more are normally undergoing overhaul at any given time. Their missiles and warheads are not included in the deployed total.

<sup>f</sup> Although D5 missiles were counted under New START as carrying 8 warheads each, the US Navy is estimated to have downloaded each missile to an average of 4–5 warheads.

<sup>g</sup> Since 2001 the number of B61 bombs deployed in Europe has been unilaterally reduced by almost two-thirds, from 480 to nearly 200. An additional 300 non-strategic bombs are in reserve. The nuclear Tomahawk land-attack missile (TLAM/N) has been retired.

<sup>h</sup> In addition to these 7700 intact warheads, c. 15 000 plutonium pits are stored at the Pantex Plant, Texas, and c. 5000 uranium secondaries are stored at the Y-12 facility at Oak Ridge, Tennessee.

*Sources:* US Department of Defense, various budget reports and press releases; US Department of Energy, various budget reports and plans; US Department of Defense, various documents obtained under the Freedom of Information Act; US Air Force, US Navy and US Department of Energy, personal communications; 'Nuclear notebook', *Bulletin of the Atomic Scientists*, various issues; and authors' estimates.

warhead-production facilities. This includes designing a new class of ballistic missile submarines, a new long-range bomber with nuclear capability and a new air-launched cruise missile; studying options for the next-generation land-based ICBM; deploying a new nuclear-capable combat aircraft; producing or modernizing three types of nuclear warhead; and building new nuclear weapon-production facilities.

All existing US warhead types are scheduled to undergo extensive life-extension and modernization programmes over the next several decades. Full-scale production of approximately 1200 W76-1 warheads for the Trident II (designated D5) submarine-launched ballistic missile (SLBM) is well under way, scheduled for completion in 2018. Production of the B61-12 precision-guided nuclear bomb—a consolidation of the B61-3, -4, -7 and -10 bombs—is scheduled to follow in 2019–21. The programme is estimated to cost in excess of \$10 billion. Design work has begun on a new 'common or adaptable warhead', using components from excess W87 warheads, for possible deployment on both ICBMs and SLBMs. Many of these programmes were described in the financial year (FY) 2012 Stockpile Stewardship and Management Plan.<sup>4</sup>

The 2010 Nuclear Posture Review (NPR) pledged that the USA 'will not develop new nuclear warheads' but consider the 'full range' of life-extension programme options, including 'refurbishment of existing warheads, reuse of nuclear components from different warheads, and replacement of nuclear components'.<sup>5</sup> This is intended to obviate the need to resume nuclear explosive testing, which the USA halted in 1992. The NPR also decided that any life-extension programme 'will use only nuclear components based on previously tested designs, and will not support new military missions or provide for new military capabilities'.<sup>6</sup> However, this will depend on how such capabilities are defined, since the installation of a new

<sup>4</sup> US Department of Energy (DOE), National Nuclear Security Administration (NNSA), *FY 2012 Stockpile Stewardship and Management Plan*, Report to Congress (DOE: Washington, DC, 15 Apr. 2011). See also Roth, N., Kristensen, H. M. and Young, S., 'Nuclear plan conflicts with new budget realities', 'Ambitious warhead life extension programs', 'Hydrodynamic tests: not to scale', and 'Produce to reduce: the hedge gamble', Strategic Security Blog, Federation of American Scientists, 12–19 Sep. 2011, <<http://blogs.fas.org/security/2011/09/stockpileplan2011/>>.

<sup>5</sup> US Department of Defense (DOD), *Nuclear Posture Review Report* (DOD: Washington, DC, Apr. 2010), p. xiv.

<sup>6</sup> US Department of Defense (note 5), p. xiv.

arming, fusing and firing (AF&F) unit or a guided tail kit, for example, can significantly enhance a warhead's ability to destroy certain types of target.<sup>7</sup>

### **Nuclear strategy and planning**

The completion of the long-awaited review of nuclear weapon targeting by the US administration (sometimes referred to as the post-NPR review or NPR implementation study) was delayed by the November 2012 presidential election. The review is intended to identify options for further reductions in the US nuclear stockpile, including potential changes in targeting requirements and alert postures.

A presidential decision directive (PDD) will be issued to form the basis of a Nuclear Weapons Employment Policy (NUWEP) prepared by the Secretary of Defense and a nuclear supplement to the Joint Strategic Capabilities Plan (JSCP-N) prepared by the chairman of the Joint Chiefs of Staff. These documents will then guide the revision by the US Strategic Command (STRATCOM) of the strategic nuclear war plan, now known as Strategic Deterrence and Global Strike (or OPLAN 8010). The changes could take several years to implement.

The post-NPR review has reportedly determined that the USA can meet its national security and allied commitments with 1000–1100 deployed strategic warheads, about 500 fewer than permitted by New START.<sup>8</sup>

### **Bombers**

The US Air Force currently operates a fleet of 20 B-2 and 91 B-52H bombers at three Air Force bases (AFBs). Of these aircraft, 18 B-2s and 76 B-52Hs are nuclear-capable, but only 60 bombers (16 B-2s and 44 B-52Hs) are thought to have nuclear missions at any given time.<sup>9</sup> Under New START, individual bombers are counted as carrying only one weapon, even though each dedicated B-2 can carry up to 16 nuclear bombs (B61-7, B61-11 and B83-1) and each dedicated B-52 can carry up to 20 air-launched cruise missiles (ALCMs).

The USAF is designing a new bomber intended to begin replacing existing bombers from the mid-2020s. Procurement of 80–100 aircraft is envisioned, some of which are planned to be nuclear-capable, at a cost of

<sup>7</sup> Kristensen, H. M., 'Small fuze—big effect', Strategic Security Blog, Federation of American Scientists, 14 Mar. 2007, <[http://blogs.fas.org/security/2007/03/small\\_fuze\\_-\\_big\\_effect/](http://blogs.fas.org/security/2007/03/small_fuze_-_big_effect/)>.

<sup>8</sup> Smith, R. J., 'Obama administration embraces major new nuclear weapons cut', Center for Public Integrity, 8 Feb. 2013, <<http://www.publicintegrity.org/2013/02/08/12156/obama-administration-embraces-major-new-nuclear-weapons-cut>>.

<sup>9</sup> New START counted 141 nuclear bombers as of 1 Sep. 2012, an anomaly caused by counting so-called phantom bombers that no longer have a nuclear task but still carry some equipment that makes them accountable under the treaty.

perhaps \$55 billion. The new bomber might be equipped to deliver the B83-1 gravity bomb (if it is retained in the stockpile) or the planned B61-12 precision-guided bomb. The USAF is also planning a nuclear ALCM, currently known as the Long-Range Stand-Off (LRSO) missile. The current ALCM is scheduled to remain operational until the 2020s.

### **Land-based ballistic missiles**

The US Air Force operates a force of 450 silo-based Minuteman III ICBMs split evenly across three wings: the 90th Missile Wing at Francis E. Warren AFB, Wyoming; the 91st Missile Wing at Minot AFB, North Dakota; and the 341st Missile Wing at Malmstrom AFB, Montana. New START data shows that 449 Minuteman III missiles were operational on 1 September 2012, and another 263 ICBMs (including 58 MX Peacekeeper ICBMs retired in 2003–2005) were in storage.<sup>10</sup> To comply with New START's limit on deployed nuclear delivery vehicles, the USA is expected to reduce the ICBM force to no more than 400 missiles.

Each Minuteman III carries either the 335-kiloton W78 warhead or the 300-kt W87 warhead. Nearly all missiles carry a singled warhead; downloading of the remaining missiles with a multiple independently targetable re-entry vehicle (MIRV) began in 2012, but no announcement has yet been made that the download has been completed. The Minuteman force will retain a MIRV capability as an option, with hundreds of warheads kept in storage.

The USAF is carrying out a multibillion dollar, decade-long Minuteman modernization programme. Although the USA is officially not deploying a new ICBM, the upgraded Minuteman IIIs 'are basically new missiles except for the shell'.<sup>11</sup> The programme is scheduled to be completed in 2015 and will extend the service life of the Minuteman III until 2030.

The USAF budget request for 2013 includes \$9.4 million to study a replacement for the Minuteman III missiles, and on 17 May 2012 the Air Force Requirements Oversight Council signed off on an 'initial capabilities document' for a next-generation ICBM.<sup>12</sup> One potential option is a mobile ICBM that would increase survivability and reduce the requirement to keep missiles on high alert.

In 2012 the US Air Force conducted two successful Minuteman flight tests from Vandenberg AFB, California, the same number as in 2011. The first test occurred on 25 February and the second on 12 November and

<sup>10</sup> Kristensen (note 3).

<sup>11</sup> Pampe, C., 'Life extension programs send missiles into the future', Air Force Global Strike Command, 24 Oct. 2012, <<http://www.afgsc.af.mil/news/story.asp?id=123323606>>.

<sup>12</sup> Grossman, E. M., 'U.S. Air Force approves concept for future ICBM, eyes Navy collaboration', Global Security Newswire, 1 June 2012, <<http://www.nti.org/gsn/article/us-air-force-approves-concept-future-icbm-eyes-navy-collaboration/>>.

involved missiles taken from silos at Warren AFB and Malmstrom AFB, respectively. In addition to the flight tests, two simulated launches—known as Simulated Electronic Launch–Minuteman (SELM)—were carried out in 2012 and were intended to test personnel and equipment ‘from the initial “on alert” transmission all the way to simulated first stage ignition’.<sup>13</sup>

### **Ballistic missile submarines**

All of the US Navy’s 14 Ohio class SSBNs carry Trident II SLBMs. Eight of the SSBNs are based in the Pacific and six in the Atlantic. Normally, 12 are considered operational with the 13th and 14th boat in overhaul at any given time, but New START data shows that fewer than 12 SSBNs are fully equipped with missiles. As of 1 September 2012, for example, only 239 missiles were counted as deployed, 49 fewer than the capacity of 12 boats, so three SSBNs were not deployed at the time of the count. Starting in 2015, the number of missile tubes on each Ohio class SSBN will be reduced from 24 to 20. The reduction is intended to reduce the number of deployed SLBMs to no more than 240 SLBMs at any given time to meet the limit on deployed strategic delivery vehicles set by New START for 2018.

US SSBN operations are being modified, with each SSBN now conducting an average of 2.5 patrols per year, compared with 3.5 patrols a decade ago. More than 60 per cent of the patrols take place in the Pacific Ocean. At any given time, approximately 8 of the 12 operational SSBNs are at sea, with about half of these on ‘hard alert’ (i.e. in patrol areas within range of designated targets in accordance with the strategic war plan). The remaining boats are in port, probably in dry dock with their missiles removed.

The US Navy has ambitious modernization plans to replace the Ohio class SSBNs with a new design. The Navy has chosen a submarine that is 2000 tonnes larger than the Ohio class submarine but equipped with 16 missile tubes instead of 24.<sup>14</sup> Twelve replacement SSBNs (tentatively known as SSBNX) are planned, a reduction of two boats compared with the current fleet of 14, at an estimated cost of \$90.4 billion. Procurement of the first boat is scheduled for 2021, with deployment starting in 2031.<sup>15</sup>

At least during the first decade of its service life, the SSBNX will be armed with a life-extended version of the current Trident II SLBM, desig-

<sup>13</sup> Tyson, M., ‘Another year, another SELM test complete for the Mighty Nine’, Air Force Print News Today, 12 Oct. 2012, <[http://www.afgsc.af.mil/news/story\\_print.asp?id=123322003](http://www.afgsc.af.mil/news/story_print.asp?id=123322003)>; and Balken, S., ‘91st MW successfully completes simulated launch’, Air Force Print News Today, 9 May 2012, <[http://www.minot.af.mil/news/story\\_print.asp?id=123299257](http://www.minot.af.mil/news/story_print.asp?id=123299257)>.

<sup>14</sup> For an unclassified overview of the SSBNX programme see Brougham, W. J., ‘Ohio replacement program’, Presentation to the 2012 Navy Submarine League, 18 Oct. 2012, <<http://news.usni.org/news-analysis/documents/ohio-replacement-program>>.

<sup>15</sup> See O’Rourke, R., *Navy Ohio Replacement (SSBN[X]) Ballistic Missile Submarine Program: Background and Issues for Congress*, Congressional Research Service (CRS) Report for Congress R41129 (US Congress, CRS: Washington, DC, 10 Dec. 2012).

nated the D5LE. The D5LE, which has a new guidance system designed to 'provide flexibility to support new missions' and make the missile 'more accurate', will also be back-fitted onto existing Ohio class SSBNs, starting in 2017.<sup>16</sup>

The US Navy conducted one Trident II (D5) SLBM flight test in 2012. On 22 February the USS *Tennessee* launched a missile equipped with the new D5 life-extension guidance system. The launch took place off of the coast of Florida and marked 136 consecutive successful flight tests of the D5 missile.<sup>17</sup>

### **Non-strategic nuclear weapons**

As of January 2013, the USA retained an inventory of approximately 500 non-strategic (tactical) nuclear weapons, all B61 gravity bombs. All remaining nuclear Tomahawk land-attack cruise missiles (TLAM/Ns) and their W80-0 warheads have now been retired.<sup>18</sup> This completes a decades-long unilateral elimination of all US non-strategic naval nuclear weapons.

Nearly 200 of the US B-61 bombs are deployed at six airbases in five European member states of the North Atlantic Treaty Organization (NATO): Belgium, Germany, Italy, the Netherlands and Turkey. Approximately half of the bombs are earmarked for delivery by US F-15E and F-16 combat aircraft. The Belgian, Dutch, and Turkish air forces (with F-16 combat aircraft) and German and Italian air forces (with PA-200 Tornado aircraft) are assigned nuclear strike missions with the US nuclear weapons.

The NATO Summit meeting in Chicago in May 2012 approved the conclusion of the Deterrence and Defence Posture Review (DDPR) that the existing 'nuclear force posture currently meets the criteria for an effective deterrence and defence posture'.<sup>19</sup> However, NATO plans to modernize its nuclear posture in Europe. This will involve the deployment of the new B61-12 nuclear bomb and the stealthy F-35A (Joint Strike Fighter) combat aircraft. The B61-12 will also be deliverable by F-15E, F-16 and PA-200 Tornado fighter-bombers as well as the US Air Force's B-2 long-range bomber.

<sup>16</sup> Draper Laboratory, 'Keeping Trident ever ready', *Explorations*, Spring 2006, p. 8; and Naval Surface Warfare Center Crane Division, 'Underwater wonder, submarines: a powerful deterrent', *Warfighter Solutions*, fall 2008, p. 14.

<sup>17</sup> Benedict, T. (Rear Admiral), US Navy, Strategic Systems Program, 'FY2013 Strategic Systems', Statement before the US Senate, Armed Services Committee, Subcommittee on Strategic Forces, 28 Mar. 2012, <<http://www.armed-services.senate.gov/hearings/event.cfm?eventid=be752ef61c2a4052a676d149c98615b9>>, p. 5.

<sup>18</sup> Kristensen, H. M., 'US Navy instruction confirms retirement of nuclear Tomahawk cruise missile', Strategic Security Blog, Federation of American Scientists, 18 Mar. 2012, <<http://blogs.fas.org/security/2013/03/tomahawk/>>.

<sup>19</sup> North Atlantic Treaty Organization, 'Deterrence and defence posture review', 20 May 2012, <[http://www.nato.int/cps/en/natolive/official\\_texts\\_87597.htm](http://www.nato.int/cps/en/natolive/official_texts_87597.htm)>, para. 8. On the DDPR see also chapter 7, section III, in this volume.

Compared with the B61-3 and -4 bombs currently deployed in Europe, the B61-12 will bring significant new military capabilities when deployment begins in 2018. The new bomb will use the nuclear explosive package of the B61-4, which has a maximum yield of approximately 50 kilotons. However, since the B61-12 also has to meet the mission requirements of the more powerful strategic B61-7 (360-kt maximum), the bomb will be equipped with a \$1 billion guided tail kit to increase its accuracy. This will improve the B61-12's capability to destroy underground targets and enable strike planners to select lower yields for existing targets to reduce collateral damage.<sup>20</sup>

<sup>20</sup> For a description of the B61-12 and its implications see Kristensen, H. M., 'B61 LEP: increasing NATO nuclear capability and precision low-yield strikes', Strategic Security Blog, Federation of American Scientists, 15 June 2011, <<http://www.fas.org/blog/ssp/2011/06/b61-12.php>>.