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Nuclear notebook

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US nuclear forces, 2015

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Abstract

As of early 2015, the authors estimate that the US Defense Department maintains about 4,760 nuclear warheads. Of this number, they estimate that approximately 2,080 warheads are deployed while 2,680 warheads are in storage. In addition to the warheads in the Defense Department stockpile, approximately 2,340 retired but still intact warheads are in storage under the custody of the Energy Department and awaiting dismantlement, for a total US inventory of roughly 7,100 warheads. Since New START entered into force in February 2011, the United States has reported cutting a total of 158 strategic warheads and 88 launchers. It has plans to make some further reductions by 2018. Over the next decade, it also plans to spend as much as $350 billion on modernizing and maintaining its nuclear forces.

Keywords

ballistic missiles, cruise missiles, nuclear capable aircraft, nuclear weapons, United States, US Air Force, US Navy

At the beginning of 2015, the US Defense Department maintained a stockpile of an estimated 4,760 nuclear warheads for delivery by more than 800 ballistic missiles and aircraft. The stockpile did not shrink significantly over the last year, but has shrunk by roughly 350 warheads compared with September 2009 when the United States announced that the nuclear arsenal contained 5,113 warheads.[1]

Most of the warheads in the stockpile are not deployed but stored for potential upload onto missiles and aircraft. We estimate that approximately 2,080 warheads are deployed, of which roughly 1,900 strategic warheads are deployed on ballistic missiles and at bomber bases in the United States. Another 180 warheads are deployed in Europe. The remaining 2,680 warheads—more than 56 percent of the total—are in storage as a so-called hedge against technical or geopolitical surprises.

In addition to the warheads in the Defense Department stockpile, approximately 2,340 retired but still intact warheads are in storage under the custody of the Energy Department and awaiting dismantlement, for a total US inventory of roughly 7,100 warheads (see Table 1).

Implementing New START

Under the New Strategic Arms Reduction Treaty (New START), the United States and Russia report the size of their nuclear arsenals every six months.

Table 1. The US nuclear arsenal, 2015

TYPE/DESIGNATION	NO.	YEAR DEPLOYED	WARHEADS X YIELD (KILOTONS)	DEPLOYED
ICBMs				
LGM-30G Minuteman III				
Mk-12A	200	1979	1 W78 x 335 (MIRV)	200
Mk-21/SERV	250	2006[1]	1 W87 x 300	250
TOTAL	**450**			**450**[2]
SLBMs				
UGM-133A Trident II D5	288[3]			
Mk-4		1992	4 W76 x 100 (MIRV)	168
Mk-4A		2008	4 W76-1 x 100 (MIRV)	600
Mk-5		1990	4 W88 x 455 (MIRV)	384
TOTAL	**288**			**1,152**
Bombers				
B-52H Stratofortress	93/44[4]	1961	ALCM/W80-1 x 5–150	200
B-2A Spirit	20/16	1994	B61-7/-11, B83-1	100
TOTAL	**113/60**			**300**[5]
Nonstrategic forces				
B61-3, -4 bombs	n/a	1979	0.3–170	180[6]
TOTAL				**180**
TOTAL DEPLOYED				**~2,080**[7]
RESERVE				~2,680
TOTAL STOCKPILE				**~4,760**
AWAITING DISMANTLEMENT				**~2,340**
TOTAL INVENTORY				**~7,100**

1. The W87 was initially deployed on the MX/Peacekeeper in 1986.
2. It is possible that 20–30 of the 450 missiles have already been inactivated as part of implementing the New START Treaty.
3. Two additional submarines with 48 missile tubes (total) are normally in overhaul and not available for deployment. They are not assigned nuclear weapons. Sometimes more than two submarines are in overhaul.
4. The first figure is the aircraft inventory, including those used for training, testing, and backup; the second is the primary mission aircraft inventory—the number of operational aircraft—as signed for nuclear and/or conventional missions.
5. The pool of bombs and cruise missiles allows for multiple loading possibilities depending on the mission. The Air Force has 528 ALCMs, of which an estimated 200 are deployed at Minot AFB. Although B-52Hs can also carry B61-7 and B83-1 bombs, gravity bombs are only planned for delivery by the B-2s.
6. These are deployed in Europe. Another 300 bombs are in storage in the United States, for a total inventory of 500 nonstrategic bombs.
7. The US government does not count spares as operational warheads. We have included them in the reserve.

ALCM: air-launched cruise missile
ICBM: intercontinental ballistic missile
LGM: silo-launched ground-attack missile
MIRV: multiple independently targetable reentry vehicle
SERV: security-enhanced reentry vehicle
SLCM: sea-launched cruise missile
SLBM: submarine-launched ballistic missile
UGM: underwater-launched ground attack missile

As of September 1, 2014, the United States reported that its nuclear arsenal contained 1,642 strategic warheads attributed to 794 deployed missiles and bombers—an increase of 57 warheads and 16 launchers compared with the previous count in March 2014. The increase is an anomaly, however, reflecting fluctuations in the number of launchers being overhauled at any given time rather than an actual increase of strategic forces. Since the treaty entered into force in February 2011, the United States has reported cutting a total of 158 strategic warheads and 88 launchers.

Except for a couple of bombers, the United States has yet to begin reducing deployed nuclear forces under New START. So far, implementation efforts have involved eliminating so-called phantom launchers, that is, missile silos and bombers that are not actually deployed

or assigned a nuclear mission but nonetheless count as non-deployed launchers. To meet the treaty limit on non-deployed launchers by 2018, the US Air Force plans to eliminate 104 empty intercontinental ballistic missile (ICBM) silos. This includes 50 silos at Malmstrom Air Force Base in Montana, which until 2008 housed the 50 Minuteman III missiles of the 564th Missile Squadron; 50 silos at Francis E. Warren Air Force Base in Wyoming, which until 2005 were used for Peacekeeper (MX) ICBMs of the 400th Missile Squadron; and one Peacekeeper and three Minuteman III test-launch silos at Vandenberg Air Force Base in California. Destruction of the Malmstrom silos began in February 2014 and was expected to be complete in early 2015. Destruction of the 50 missiles at Warren will follow in 2015 and 2016, and destruction of the four test-launch silos at Vandenberg is planned for 2017.

To meet the treaty limit on operational launchers by 2018, the Air Force will eventually remove 50 Minuteman missiles from their silos, although the plan is, at least for now, to retain the missiles in storage and keep the 50 silos "warm" for potential reloading if necessary.

After eliminating nuclear equipment from all B-1B and B-52G bombers (neither of which were actually assigned nuclear weapons), the Air Force has started removing nuclear capability from a small number of B-52H bombers. The plan is to denuclearize approximately half of its current inventory of 89 accountable B-52H bombers to reduce the total bomber force to no more than 60 nuclear-capable aircraft by 2018.

In 2015 and 2016, the Navy will reduce the number of missile tubes from 24 to 20 on every nuclear missile submarine. The objective is to reduce the number of deployed submarine-launched ballistic missiles (SLBMs) to no more than 240 by 2018.

Nuclear weapons planning

Since the White House issued Presidential Policy Directive 24 in June 2014, containing the updated Nuclear Weapons Employment Strategy, the Pentagon and armed services have begun updating the Nuclear Weapons Employment Policy (NUWEP) and the Nuclear Supplement to the Joint Strategic Capabilities Plan (JSCP-N). These documents identify the objectives and the resources available to US Strategic Command (STRATCOM) and regional combatant commanders for updating America's strategic war plan and various regional war plans.

To practice execution of these plans, the armed forces conducted several nuclear strike exercises during 2014. STRATCOM's annual Global Lightning exercise, held in May, involved heavy bombers, ICBMs, ballistic missile submarines, and space and cyber capabilities. The various commands and military services practiced executing nuclear and conventional strike scenarios and command-and-control procedures. STRATCOM commander Adm. Cecil Haney said that the exercise, which included participation from some allies, demonstrated the military's "preparedness and ability to use strategic capabilities to deter, dissuade and defeat current and future threats to the U.S. and our allies" (US Strategic Command Public Affairs, 2014a).

Global Lightning coincided with Air Force Global Strike Command's annual Constant Vigilance nuclear deterrence and long-range strike exercise, which deployed B-2 and B-52H bombers. In the

words of one US Air Force pilot, "these exercises are crucial to our nation's nuclear posture and to show the world that we have the capability to strike anywhere in the world at a moment's notice." The exercise was conducted shortly after Russia's invasion of Ukraine, but the military said the timing had been long-planned and was unrelated to real-world events (Pfiester, 2014).

Large-scale nuclear exercises followed in the fall, including Valiant Shield 14, which took place in September and stretched from Goose Bay in Canada to Guam. As part of the exercise, B-2s and B-52s deployed to Andersen Air Force Base on Guam; B-52s deployed to Goose Bay in Canada; a Minuteman III ICBM was test-launched from the US West Coast into the Pacific; and a B-52 test-launched an air-launched cruise missile in Utah.

Valiant Shield 14 was followed by Global Thunder 15 in October, a nuclear readiness exercise that included the rapid launch of B-2s from Whiteman Air Force Base and B-52s from Minot and Barksdale Air Force Bases. The STRATCOM-led exercise also involved coordination with the North American Aerospace Defense Command (NORAD) and Canada's Joint Operations Command. According to STRATCOM:

> the scenario integrated, in just eight days, nearly every conceivable strategic threat to our nation and called upon all the USSTRATCOM capabilities that would be provided to geographic combatant commanders in a real-world crisis: space, cyber, intelligence, surveillance and reconnaissance, global strike, and ballistic missile defense capabilities, among them. (US Strategic Command Public Affairs, 2014b)

In addition to these large-scale national-level exercises, smaller exercises included rapid-launch maneuvers and long-range deployments of heavy bombers in April and June. In response to Russia's invasion of Ukraine and increased air operations in Europe and elsewhere, two B-2s and three B-52Hs deployed to Britain's Royal Air Force Fairford base and practiced long-range strike scenarios in Central Europe and North Africa (Wilson, 2014).

Nuclear modernization

Over the next decade, the US government plans to spend as much as $350 billion on modernizing and maintaining its nuclear forces (US Congressional Budget Office, 2013). This will include designing a new class of nuclear-powered ballistic missile submarines (SSBNs), a new long-range bomber with nuclear capability, and a new air-launched cruise missile (ALCM). Plans also include studying options for the next-generation land-based ICBM; deploying a new nuclear-capable tactical fighter aircraft; completing full-scale production of one nuclear warhead and beginning modernization work on two others, including the first-ever guided nuclear bomb; modernizing nuclear command-and-control facilities; and building new nuclear weapon production and simulation facilities.

The nuclear warheads intended for the modernized arsenal are scheduled to undergo extensive life-extension and modernization programs over the next several decades. Full-scale production of approximately 1,600 W76-1 warheads for the Trident II (D5) SLBM is well under way, scheduled for completion in 2019 at a total cost of approximately $3.7 billion (US Energy Department, 2014). The production of the B61-12, a guided standoff nuclear gravity bomb, is scheduled to be completed by 2025 at a cost of

about $10 billion.[2] The production of the W80-4, a modified version of the W80-1 warhead intended for a new ALCM known as the Long-Range Standoff (LRSO), will cost another $7 billion to $8 billion through 2033. The cost of developing the new cruise missile to carry the W80-1 warhead will increase the cost of the LRSO even further, in one estimate by perhaps as much as $20 billion (Wolfsthal et al., 2014).

The National Nuclear Security Administration (NNSA) has also presented a plan for a new family of so-called "interoperable" (previously called "common or adaptable") warheads that can be used on both ICBMs and SLBMs.[3] But Congress and sectors of the military have challenged the plan because of uncertainty about the technical requirements and risks that could affect reliability. The first of these new warheads would be the Interoperable Warhead 1—built with components from the W78, W88, and possibly W87 warheads—which could cost $10 billion to $15 billion. In contrast, simpler life-extension of existing designs could provide reliable warheads at a fraction of the cost.

The significant redesign of the interoperable warheads would challenge the pledge made in the 2010 Nuclear Posture Review, which said that the United States "will not develop new nuclear warheads" but will consider the "full range" of life-extension program options, including "refurbishment of existing warheads, reuse of nuclear components from different warheads, and replacement of nuclear components" (US Defense Department, 2010b: xiv). This pledge was intended to prevent resumption of nuclear explosive testing and adhere to the 1996 Comprehensive Nuclear Test Ban Treaty. The Nuclear Posture Review also stated that any life-extension programs "will use only nuclear components based on previously tested designs, and will not support . . . new military capabilities" (US Defense Department, 2010b: xiv). Of course, compliance depends on how "new" military capabilities are defined, since the addition of new or improved features outside the nuclear explosive package may increase a weapon's military capabilities. It is anticipated that the United States will generally seek to increase the accuracy of its nuclear weapons in order to lower the yield of modified warheads with improved performance margins.

The United States is also planning upgrades and replacements for its land-based ballistic missiles, nuclear-powered ballistic missile submarines, and strategic bombers, as discussed below.

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 Warren Air Force Base; the 91st Missile Wing at Minot Air Force Base; and the 341st Missile Wing at Malmstrom Air Force Base. Each wing has three squadrons, each with 50 missiles controlled by five launch-control centers. Under New START, the US Air Force plans to reduce the ICBM force to 400 missiles, probably by retiring one of three missile squadrons at one of the three bases, leaving two bases with 150 missiles each and one with 100 missiles.

Each Minuteman missile carries either the 335-kiloton (kt) W78 warhead or the 300-kt W87 warhead. Downloading of the ICBM force was completed on June 16, 2014, when the last remaining Minuteman III at Malmstrom Air Force Base with multiple warheads was downloaded

to single warhead configuration (US Air Force Global Strike Command Public Affairs, 2014a). The downloading program started during the George W. Bush administration and although the US military refers to it as "de-MIRVing," a reference that suggests the missiles have lost their ability to carry multiple warheads, Minuteman IIIs configured for the Mk12A reentry vehicle will retain hundreds of W78 warheads in storage for "re-MIRVing" if called for.[4]

The United States plans to reduce the ICBM force to 400 deployed missiles under New START to meet the treaty's limit of no more than 700 deployed nuclear missiles and heavy bombers by 2018. Rather than eliminating one squadron of 50 missiles from one of the three ICBM bases, however, the Air Force plans to spread the reduction across all three bases. Moreover, the 50 empty silos will not be destroyed but retained for potential reloading of missiles. The "cut" ICBMs will not be destroyed but kept in storage: The New START Implementation Report lists the same inventory of Minuteman IIIs in 2014 as will exist in 2018, of 454 deployed and non-deployed missiles (US Defense Department, 2014).

A multibillion-dollar, decade-long modernization program to extend the service life of the Minuteman III to 2030 is scheduled for completion in 2015. Although the United States is officially not deploying a new ICBM, the upgraded Minuteman IIIs "are basically new missiles except for the shell" (Pampe, 2012), according to Air Force personnel.

Part of the upgrade involves refurbishing the arming, fuzing, and firing component on the Mk12A and Mk21 (SERV) reentry vehicles. The publicly stated purpose of this refurbishment is to extend the vehicles' service life, but the effort may also involve modifying the fuzes to improve the targeting capability of the warheads. This reportedly involves improving the "burst height compensation" to take advantage of improvements to the Minuteman III guidance system (Postol, 2014). This will enhance the accuracy and target-kill capability of the warheads against hardened nuclear forces, and potentially also allow for lowering the warheads' explosive yield. The fuzes were upgraded from 2010 to 2012 (Kleiman, 2011). The US Navy's W76-1 life-extension program includes a similar upgrade.

The Air Force is studying options for the next-generation ICBM, known as the Ground Based Strategic Deterrent, which is scheduled to replace the Minuteman III beginning in 2030. An analysis-of-alternatives study completed in July 2014 decided on a "hybrid" design concept, partly based on today's Minuteman III, its silos, and its command-and-control system, but incorporating modified features such as new rocket motors, a new guidance system, and upgraded arming, fuzing, and firing units. Apparently, the new system would be more accurate than that of the current Minuteman III. A wild-card option is whether to allow the missiles to be pulled out of their silos and dispersed on trucks or rail (Grossman, 2014), a potential feature that could significantly increase the cost. According to the head of Air Force Global Strike Command, Brig. Gen. Fred Stoss, the new missile is not a completely new follow-on missile but a systematic approach to recapitalizing the existing Minuteman III missile over the long term (Schanz, 2014).

Only one Minuteman III flight-test was conducted in 2014, down from three in 2013. The missile was plucked

from a random silo at Minot Air Force Base and launched from Vandenberg Air Force Base on September 23. In addition to the live Minuteman III test-launch from Vandenberg, several Simulated Electronic Launch-Minuteman (SELM) exercises were conducted at the ICBM bases themselves. Each SELM may include several launch facilities. Warren Air Force Base conducted a SELM over several days in April 2014 that included six silos and two launch control centers, which simulated receiving launch orders and launching missiles in "a variety of new scenarios" against "certain modern threats." According to the Air Force (Valle, 2014), SELM tests are conducted every six months on a rotating basis for the three ICBM bases, which means each missile wing is tested every 18 months.

Nuclear-powered ballistic missile submarines

All of the US Navy's 14 Ohio-class nuclear-powered ballistic missile submarines (SSBNs), eight based in the Pacific and six in the Atlantic, carry Trident II (D5) SLBMs. Normally, 12 of these submarines are considered operational, with the 13th and 14th boat in overhaul at any given time. According to unclassified New START aggregate data, however, not all the remaining 12 submarines are routinely equipped with full missile loadings. As of March 1, 2014, for example, only 240 missiles were counted as deployed, 48 fewer than the capacity of 12 boats, so at most 10 of these submarines carried all their missiles at the time of the count (US State Department, 2014b). Starting in 2015, the number of missile tubes on each Ohio-class SSBN will be reduced by four, from 24 to 20. The reduction is intended to reduce the number of SLBMs that can be deployed at any given time to no more than 240, in order to meet the limit on deployed strategic delivery vehicles set by New START for 2018.

The warhead loading of the deployed SLBMs is not specified in the New START aggregate data. In practice, the missiles probably carry three to six warheads, depending on the requirements of their particular strike package assigned under war plans. Loading with fewer warheads increases the missiles' range and flexibility. As of March 2014, for example, the 240 deployed SLBMs carried an estimated 1,047 warheads, or an average of four to five warheads per missile.

Three versions of two basic warhead types are deployed on the SLBMs: the 100 kt W76-0, the 100 kt W76-1, and the 455 kt W88. The W76-1 is a refurbished version of the W76-0, with the same yield but with dual strong link detonation control added. The Mk4A reentry body that carries the W76-1 is equipped with a new arming, fuzing, and firing unit with improved targeting capabilities compared with the old Mk4/W76 system. Full-scale production of an estimated 1,600 W76-1s is under way at the Pantex Plant in Texas. The halfway point was reached in October 2014 and production is scheduled to be completed in 2019. The Mk4A/W76-1 combination is also being supplied to the United Kingdom for use on its SSBNs (Kristensen, 2011a).

In 2014, the US SSBN fleet celebrated its 4,000th deterrent patrol since it first deployed to sea with nuclear missiles in 1960. The annual number of deterrent patrols that the US SSBN fleet conducts each year has declined by more than 56 percent in 15 years, from 64 patrols in 1999 to fewer than 30 in 2014. More than

60 percent of the patrols take place in the Pacific Ocean, reflecting nuclear war planning against China, North Korea, and Russia.[5]

Design of the next-generation SSBN is well under way to replace the Ohio class. The new submarine, known as SSBNX, will be 2,000 tonnes larger than the Ohio class submarine but equipped with 16 missile tubes rather than 24.[6] Twelve SSBNXs are planned, a reduction of two boats compared with the current fleet of 14, at an estimated cost of $92 billion, or $7.7 billion per submarine (US Congressional Budget Office, 2014). Procurement of the first boat is scheduled for 2021 with deployment on deterrent patrol starting in 2031. During the first decade of its service life, the new SSBNX will be armed with a life-extended version of the current Trident II (D5) SLBM (the D5LE), which has a new guidance system designed to "provide flexibility to support new missions" and make the missile "more accurate," according to the US Navy and Draper Laboratory (Draper Laboratory, 2006: 8; Naval Surface Warfare Center, 2008: 14). Starting in 2017, the D5LE will also be back-fitted onto existing Ohio-class submarines for the remainder of their service life (up to 2042), and will also be deployed on British submarines. Two Trident II (D5) SLBMs were test-launched in the Atlantic in June 2014 from the submarine *West Virginia* (SSBN-736) following completion of its reactor refueling overhaul.

Strategic bombers

The US Air Force currently operates a fleet of 20 B-2 and 93 B-52H bombers. Of those, 18 B-2s and 76 B-52Hs are nuclear-capable. (New START counts 20 B-2s and 89 B-52Hs.) Approximately 60 bombers (16 B-2s and 44 B-52Hs) are thought to be assigned nuclear missions under US nuclear war plans.[7] They are organized into eight bomb squadrons in five bomb wings at three bases: Minot Air Force Base in North Dakota, Barksdale Air Force Base in Louisiana, and Whiteman Air Force Base in Missouri.

Until 2012, only active US Air Force personnel were involved in nuclear bomber missions. But in 2013, two additional wings and squadrons were added using US Air Reserve and US Air National Guard personnel. This includes the 307th Bomb Wing and its 343rd Squadron of B-52Hs (integrated with the 2nd Bomb Wing at Barksdale Air Force Base). The 307th Bomb Wing passed its initial nuclear surety inspection in March 2013, becoming the first Air Reserve unit certified to deliver nuclear weapons. The other new wing, the 313th Bomb Wing and its 110th Squadron with B-2 bombers (integrated with the 509th Bomb Wing at Whiteman Air Force Base), passed its nuclear surety inspection in August 2013, becoming the first Air National Guard unit certified to deliver nuclear weapons.[8]

Each B-2 can carry up to 16 nuclear bombs (B61-7, B61-11, and B83-1 gravity bombs), and each B-52H can carry up to 20 air-launched cruise missiles. An estimated 1,000 nuclear weapons, including 528 air-launched cruise missiles, are assigned to the bombers. Although only 200 to 300 weapons are deployed at the bomber bases under normal circumstances, the remaining 700 to 800 weapons are in central storage at Kirtland Air Force Base in New Mexico.

The US Air Force is planning a new bomber, known as the long-range strike bomber (the LRS-B, or simply the next-generation bomber), to begin replacing existing bombers beginning in the

mid-2020s. Procurement of 80 to 100 aircraft is envisioned, some of which are planned to be nuclear-capable, at a cost of at least $80 billion. The US Air Force reportedly issued a request for proposals in July 2014 and plans to award the first public contract in the spring of 2015. But significant budget increases from $258.7 million in 2013 to $3.5 billion in 2019, as well as a relatively short development and production schedule calling for completion in 2025, indicate that significant long-range strike bomber development may already have been completed using funds from classified budgets (Gertler, 2014).

The long-range strike bomber will be equipped to deliver the new B61-12 guided standoff bomb (which will eventually replace all other gravity bombs) and the long-range standoff cruise missile, or LRSO (which will replace the air-launched cruise missile around 2025). In 2014, the US government's Nuclear Weapons Council selected the W80-1 warhead to arm the long-range standoff. Under the plan, the W80-1 would undergo a life-extension program to extend its service life through the middle of this century. The life-extended warhead would be known as the W80-4 and partly include components and technologies developed for the B61-12 program.[9] The number of long-range standoff cruise missiles planned has not been announced, but it is thought to involve around 500 missiles.

During 2014, nuclear-capable heavy B-2 and B-52H bombers continued rotational deployments to Andersen Air Force Base in Guam, an extended deterrence mission that began in 2004. Since 2011, nuclear-capable B-52H bombers have also started to deploy to Darwin Air Base in Australia as part of their Pacific rotational deployments. The first visit occurred in August 2012, following the signing in 2011 of an agreement to increase the US military presence in Northern Australia, but in 2014 the number of B-52H visits increased to at least three: one in January, one in May (that included two bombers), and one in December. The bombers normally are accompanied by KC-135 tankers. "Most importantly, these bomber rotations provide Pacific air forces and US Pacific Command commanders a global strike and extended deterrence capability against any potential adversary," said Maj. Gen. Scott Vander Hamm, 8th Air Force and Task Force 204 commander (US Air Force Global Strike Command, 2014b).

Nonstrategic nuclear weapons

The United States has one type of nonstrategic weapon in its stockpile—the B61 gravity bomb. The weapon exists in three modifications, the B61-3, B61-4, and B61-10. Approximately 500 tactical B61 bombs of all versions remain in the stockpile. A little over 180 of these (versions -3 and -4) are deployed at six bases in five European countries: Aviano (Italy), Büchel (Germany), Ghedi (Italy), Incirlik (Turkey), Kleine Brogel (Belgium), and Volkel (Netherlands). The Belgian, Dutch, and possibly 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 US nuclear weapons, but the weapons are kept under the control of US Air Force personnel until their use is authorized by the American president and approved by NATO in a war. (A small number of the remaining nonstrategic weapons stored in the United States are for potential use by US fighter-bombers in support of allies outside Europe, including in the Middle East and Northeast Asia.)

NATO is replacing its fleet of 12 weapons maintenance trucks with 10 new Secure Transportable Maintenance System (STMS) trailers (Kristensen, 2014a), which are used to service the B61 nuclear bombs at the six air bases in Europe. During service, the weapons are brought up from their underground storage vaults inside the protective aircraft shelters and hoisted into the trailers and disassembled for replacement of limited-life components or other maintenance.

NATO has approved a modernization of the nuclear posture in Europe through deployment at the beginning of the next decade of the B61-12 guided, standoff nuclear gravity bomb.[10] The B61-12 will use the nuclear explosive package of the B61-4, which has a maximum yield of approximately 50 kt, but will be equipped with a guided tail kit to increase its accuracy and standoff capability. The B61-12 will be a more flexible weapon that is able to hold at risk hardened targets that could not be destroyed with the B61-3 or -4, and it will enable strike planners to select lower yields for existing targets to reduce collateral damage. Moreover, several of the NATO allies that currently have a nuclear strike mission plan to upgrade their fighter-bombers to the stealthy US-built F-35A (Joint Strike Fighter). Until the new aircraft is ready, the B61-12 will be back-fitted onto existing F-15E, F-16, and Tornado aircraft (Kristensen, 2014c). Combined, the guided B61-12 and stealthy F-35A represent a significant enhancement of the US nonstrategic nuclear posture in Europe.[11]

NATO's annual nuclear strike exercise Steadfast Noon was held at Ghedi Air Base in Italy in October 2014 and included aircraft from Belgium, Germany, Italy, Netherlands, Poland, Turkey, and the United States. Unlike aircraft from the other participants, the Polish F-16s are not nuclear-capable but provide non-nuclear support for the nuclear strike package under the so-called SNOWCAT (Support of Nuclear Operations With Conventional Air Tactics) program, a NATO plan designed to enable non-nuclear countries to provide non-nuclear support to the nuclear mission. In addition to these operations in western and southern NATO, nuclear-capable F-16s from US fighter wings are conducting periodic deployments to the Baltic States, Poland, and Romania.[12]

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Notes

1. For official statements about the size of the US nuclear arsenal, see US Defense Department (2010a) and US State Department (2014a). Since September 1, 2013, when the stockpile included 4,804 warheads, it is estimated that a small number of additional warheads have been retired, for a stockpile of approximately 4,760.
2. The cost of approximately $10 billion includes roughly $8 billion for the NNSA and $205 million for the Defense Department for warhead components, another $1.1 billion for the new guided tail kit, plus a few hundred million dollars for integration on the future next-generation long-range bomber. See US Defense Department (2013: 626) and US Energy Department, National Nuclear Security Administration (2014).
3. For a description of the plan, see US Energy Department, National Nuclear Security Administration (2014: 1-2 to 1-4).
4. Minuteman III missiles configured for the Mk21 (SERV) reentry vehicles with the

larger W87 warhead cannot carry multiple warheads.

5. For analysis of US SSBN patrols, see Kristensen (2013).
6. For overviews of the SSBNX program, see Brougham (2012) and O'Rourke (2014).
7. New START counted 109 nuclear bombers as of March 1, 2013, including 89 deployed, an anomaly caused by counting so-called phantom bombers that are no longer nuclear-tasked but still carry some equipment that makes them accountable under the treaty. There are no longer any B-1Bs or B-52Gs with nuclear equipment (US State Department, 2014b).
8. Although the number of nuclear-certified bomber wings has increased, this does not mean the number of bombers has increased.
9. For background on the W80-4 and LRSO program, see Kristensen (2014b).
10. For more on NATO approval of the B61-12 modernization program, see US Government Accountability Office (2011).
11. For analyses of the military implications of the enhanced B61-12, see Kristensen (2011b) and Kristensen (2014e).
12. See Biermann (2014) and Kristensen (2014d).

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