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Nuclear Notebook: U.S. nuclear forces, 2009

The United States has officially reached the upper limit of 2,200 operationally deployed strategic warheads set by the Moscow Treaty, yet warhead dismantlement is proceeding slowly.

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The election of Barack Obama as the 44th president of the United States promises significant changes in U.S. nuclear policy and priorities compared with the George W. Bush administration. During the 2008 presidential campaign, candidate Obama pledged to "set a new direction in U.S. nuclear weapons policy and show the world that America believes in its existing commitment under the Nuclear Non-Proliferation Treaty [NPT] to work to ultimately eliminate all nuclear weapons." An abundance of proposals by nongovernmental organizations and former government officials support this pledge. For example, two articles by four former U.S. statesmen have galvanized international calls for renewed progress toward the elimination of nuclear weapons.[1] These aspirations resemble but go further than the significant arms control agreements and reductions in nuclear weapons undertaken and implemented in the early 1990s.

To meet these high expectations, the new administration will need to show leadership, reduce the country's nuclear forces, and reorient the role of nuclear weapons within U.S. security policy.

U.S. operational nuclear forces are approaching levels set forth in the agreements that emerged from the 1997 Helsinki summit between Russian President Boris Yeltsin and U.S. President Bill Clinton, which set the framework for the never-finished START III Treaty. Over the past year, we estimate that the United States has removed from operational status more than 1,000 warheads and has reached the upper limit of 2,200 warheads set by the Strategic Offensive Reduction Treaty (SORT) (otherwise known as the Moscow Treaty) three and a half years early. SORT promises to reduce Russian and U.S. "operationally deployed strategic warheads"

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to no more than 2,200 by 2012. These recent reductions affect all three arms of U.S. nuclear forces: intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and the weapons assigned to long-range bombers.

As of January 2009, the U.S. stockpile contained an estimated 5,200 nuclear warheads: approximately 2,700 operational warheads comprised of 2,200 strategic and 500 nonstrategic warheads; and about 2,500 additional warheads in reserve (including some 150 spares).[2] An additional 4,200 warheads await dismantlement as a consequence of the Bush administration's announcement in 2004 to reduce the U.S. stockpile by "nearly 50 percent" by 2012.[3] This reduction was achieved in December 2007, five years early, and an additional 15 percent reduction is scheduled to be completed by 2012, leaving a stockpile of approximately 4,600 warheads.[4]

The requirement for this many weapons arises from the Nuclear Weapons Employment Policy, signed by then–defense secretary Donald Rumsfeld in 2004, which states in part: "U.S. nuclear forces must be capable of, and be seen to be capable of, destroying those critical war-making and war-supporting assets and capabilities that a potential enemy leadership values most and that it would rely on to achieve its own objectives in a post-war world."[5] The most recent military translation of this guidance is Operations Plan (OPLAN) 8010-08 Global Deterrence and Strike, a new strategic war plan put into effect on February 1, 2008. This plan differs significantly from the Cold War–era Single Integrated Operational Plan by including a more diverse "family of plans applicable in a wider range of scenarios" that were first developed for the previous plan, OPLAN 8044 Revision 05, in October 2004. The family of plans is meant to provide national command authorities with "more flexible options to assure allies, and dissuade, deter, and if necessary, defeat adversaries in a wider range of contingencies."[6] OPLAN 8010 also includes a series of executable, scenario-based strike options, first created in 2003, against regional states with weapons of mass destruction programs, including North Korea and Iran.[7]

To achieve further significant reductions—down to say 1,000–1,500 warheads—U.S. nuclear force structure will have to change, as will the guidance that sets out the role of nuclear weapons.[8] This size arsenal would not support a war plan that requires the military to hold at risk all forms of weapons of mass destruction targets; command and control facilities; political and military leadership; and the war-making industries of Russia, China, and a handful of regional states. It would also make it excessive and too expensive to maintain a triad of sea-, land-, and air-based delivery platforms. It will be a formidable challenge, even for a committed executive branch, to bring about the necessary alterations within

THE U.S. NUCLEAR ARSENAL, 2009

TYPE/DESIGNATION	NO.	YEAR DEPLOYED	WARHEADS X YIELD (KILOTONS)	DEPLOYED/SPARES
ICBMS				
LGM-30G Minuteman III				
Mk-12	~0	1970	1–3 W62 x 170 (MIRV)	~0
Mk-12A	250	1979	1–3 W78 x 335 (MIRV)	350/20
Mk-21/SERV	200	2006[1]	1 W87 x 300	200/10
TOTAL	**450**			**550/30**
SLBMs[2]				
UGM-133A Trident II D5	288			
Mk-4		1992	4–6 W76 x 100 (MIRV)	718/40
Mk-4A		2008	4–6 W76-1 x 100 (MIRV)	50/10
Mk-5		1990	4–6 W88 x 455 (MIRV)	384/20
TOTAL	**288**			**1,152/70**
Bombers				
B-52H Stratofortress	93/44[3]	1961	ALCM/W80-1 x 5–150	350/25
B-2A Spirit	20/16	1994	B61-7/-11, B83-1	150/25
TOTAL	**113/60**			**500/50**[4]
Nonstrategic forces				
Tomahawk SLCM	325	1984	1 W80-0 x 5–150	100
B61-3, -4 bombs	n/a	1979	0.3–170	400[5]
TOTAL	**325**			**500**
GRAND TOTAL				**~2,702/150**[6]

1. The W87 was first deployed on the MX/Peacekeeper in 1986.

2. Two additional subs with 48 missiles are normally in overhaul and not available for deployment. Their 288 warheads are considered part of the responsive force of reserve warheads. Delivery of the W76-1/Mk-4A began in late October 2008, and we estimate that the warhead is currently being deployed.

3. 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 assigned for nuclear and/or conventional missions.

4. The large pool of bombs and cruise missiles allows for multiple loading possibilities depending on the mission. We estimate that the force level of 350 ALCMs of all categories by 2012 has already been achieved in preparation for reaching the SORT level in 2010, two years early.

5. Approximately 200 of these are deployed at six bases in five European NATO countries. Nuclear Tomahawk SLCMs also support NATO and Northeast Asian extended deterrence.

6. The U.S. government does not count spares as operational warheads. We have included them in the reserve, which we estimate contains approximately 2,500 warheads. Another 4,200 warheads are awaiting dismantlement.

ALCM: air-launched cruise missile

ICBM: intercontinental ballistic missile; MIRV: multiple independently targetable reentry vehicle

SLCM: sea-launched cruise missile

SLBM: submarine-launched ballistic missile.

the military services and combatant commands and gain congressional approval for these changes. Achieving the larger goal of global nuclear disarmament will require other nuclear weapon states to reduce their arsenals as well, an additional hurdle.

ICBMs. The United States reduced its Minuteman III missile force to 450 operational missiles in 2008 when it deactivated the last of 50 ICBMs (and five launch control centers) of the 564th Missile Squadron of the 341st Space Wing at Malmstrom Air Force Base (AFB) in Montana. This reduction is in line with the 1994 Nuclear Posture Review that established the goal of an ICBM force of "450/500 Minuteman III missiles, each carrying a single warhead," though the air force was not ordered to implement the decision until the 2006 Quadrennial Defense Review.

We estimate that the air force has nearly completed the download of the ICBM force to 500 warheads in preparation for the formal retirement of the W62 warhead later this year and thus have removed the warheads from our estimate of deployed weapons. To compensate for W62 retirement and to improve the effectiveness of the ICBM force, the air force is equipping many of its Minuteman IIIs with more powerful W87/Mk-21 warheads, which were formerly deployed on the now-retired MX Peacekeeper ICBMs. This upgrade, scheduled for completion in 2011, is part of a multibillion dollar, eight-part overhaul of the entire Minuteman III force that involves replacing the missiles' engines, fuel, guidance sets, and software.

A majority of the Minuteman III force will carry one warhead each, either the W87/Mk-21 or the W78/Mk-12A. We estimate that about 50 missiles will continue to carry two W78/Mk-12As each, a reversal of the single-warhead decision stated in the 1994 NPR. Hundreds of additional warheads will be kept in reserve for redeployment if necessary.

Four Minuteman IIIs were test-launched during 2008, an increase from the atypical single test-launch in 2007. The first test on April 2 delivered a single reentry vehicle to an impact area near Kwajalein Atoll in the Marshall Islands. The second test on May 22 was flown to an extended range; the reentry vehicle "traveled approximately 5,250 [nautical] miles before hitting its pre-determined target in a broad ocean area 230 nautical miles southwest of Guam," according to air force officials. This impact area was approximately 9,720 kilometers from the missile launch point at Vandenberg AFB, some 2,500 kilometers further west than the normal impact area near Kwajalein. The test was described as "unique in its use of the extended range assets from the Navy's Mobile Instrumentation System on a T-AGS class ship."[9] The third test on August 13 used a missile with three reentry vehicles removed from Malmstrom AFB and flew 6,790 kilometers from Vandenberg to an impact area near Kwajalein. The final test on

November 5 delivered a single reentry vehicle some 6,740 kilometers to an impact area near Kwajalein and was launched by an E-6B TACAMO Airborne Command Post from the 625th Strategic Operations Squadron based at U.S. Strategic Command (STRATCOM).

Defense officials completed a mission need statement and concept of operations documents for a new ICBM in 2003 and 2004 with the goal of deploying the new missile in 2018. The delivery of this replacement missile was delayed until 2030 after the 2006 defense review reduced the ICBM force to 450 missiles. Follow-on development research continues, however, and an ICBM Future Warhead Concept Study is scheduled for 2008–2009.[10]

The latest SLBM test-flight was the 124th consecutive successful launch of the Trident II D5 weapon system since 1989, a performance unmatched by any other ballistic missile system in the world.

Submarines and SLBMs. The U.S. fleet of nuclear-powered ballistic missile submarines (SSBNs) is comprised of 14 Ohio-class submarines (two of which are considered in overhaul at any given time) that we estimate carry approximately 1,152 warheads—nearly 43 percent of the operational nuclear arsenal. We estimate that the Trident D5s have now been downloaded to an average of four warheads per missile.

The navy completed its upgrade of Pacific-based SSBNs in 2008, and all U.S. SSBNs now carry the longer-range and more accurate Trident II D5 SLBM. The Trident D5s carry three types of warheads: the 100-kiloton W76/Mk-4, the 100-kiloton W76-1/Mk-4A, and the 455-kiloton W88/Mk-5 warhead, the highest-yield ballistic missile warhead in the U.S. arsenal.

In late October 2008, the Energy Department's National Nuclear Security Administration (NNSA), which oversees the U.S. nuclear weapons complex, began delivery of the W76-1/Mk-4A, an improved version of the W76/Mk-4 that extends the warhead's service life. The Bush administration decided in 2005 to modify 63 percent of the approximately 3,200-warhead W76 inventory. This $6 billion program is scheduled to run through 2021 and deliver an estimated 2,000 W76-1/Mk-4A warheads. In 1997, Rear Adm. George P. Nanos, then-director of the navy's Strategic Systems Program stated that equipping the 100-kiloton warhead with a more capable fuze to take advantage of the D5's increased accuracy would give the warhead a "significant improvement" in military capability over the W76/Mk-4 and allow the W76-1/Mk-4A to "meet the original D5 hard target requirement."[11]

The SSBN *Alaska* arrived at its new home port at Kings Bay, Georgia, in 2008 following a refueling overhaul at Virginia's Norfolk Naval Shipyard. Its transfer from the Pacific Fleet completed a five-

year reorganization of the SSBN fleet that leaves eight boats in the Pacific and six in the Atlantic. The SSBN force continues to patrol at rates equal to those during the Cold War. The difference today is that more than 60 percent of all U.S. SSBN patrols take place in the Pacific, compared to an average of only 15 percent during the 1980s.

The navy purchased 12 life-extended variants of the Trident II D5 in 2008, and 24 D5LEs will be produced each year through 2012 for a total of 108 missiles at a cost of $15 billion, or some $139 million per missile. The new missiles will arm the Ohio-class SSBNs through 2042 and replace older missiles that will be expended in future test-launches. The first modified D5 is scheduled for deployment on U.S. SSBNs in 2013 and also on Britain's next-generation SSBNs. The navy has begun design development studies for a new class of nuclear-powered ballistic missile submarine, tentatively known as SSBN(X).

The navy test-launched four Trident II D5s in 2008. The *Nebraska* launched two missiles from the Pacific Test Range off the California coast on May 21. The *Louisiana* followed on August 25 by launching two missiles from approximately the same location. The missiles were equipped with the Lockheed Martin-integrated navigation subsystem designed to provide "highly accurate and reliable navigation data required to support today's stringent Trident Weapon System performance requirements."[12] These tests marked the first time that all U.S. SLBM test-flights in a given year were carried out in the Pacific. The last test-flight was the 124th consecutive successful launch of the Trident II D5 weapon system since 1989, a performance unmatched by any other ballistic missile system in the world.

Bombers and bomber weapons. The U.S. Air Force deploys approximately 500 nuclear weapons for delivery by long-range B-2A Spirit and B-52H Stratofortress bombers. One B-2A bomber, the Spirit of Kansas, crashed shortly after takeoff on Guam on February 23, 2008, followed by the crash of a B-52H on July 21, 2008. This leaves 113 long-range bombers in the U.S. inventory, of which we estimate that 60 have a secondary nuclear mission.

B-2A and B-52H aircraft can carry two types of nuclear bombs, the B61-7 strategic bomb and the B83-1 high-yield strategic bomb. The B-2A can also carry the B61-11 "bunker buster," which is a rebuilt B61-7 bomb, and the B-52H can also carry air-launched cruise missiles (ALCMs) equipped with a W80-1 warhead. A modified warhead for ALCMs, the W80-3, was scheduled for delivery in 2008, but the program was delayed in favor of the Reliable Replacement Warhead (RRW) Program. The W80-3 program is scheduled to resume in 2029 with warhead production occurring in 2036–2039, although changes to long-term nuclear cruise missile requirements could change those plans.[13] The air force is designing a follow-on to the ALCM and began a Phase 6.2 study (feasibility study and option

down-select) for the Enhanced Cruise Missile in the fall of 2008. The study coincides with production of Nuclear Weapons Requirements Documents for the new missile.[14]

Following the loss of control of six nuclear Advanced Cruise Missiles at Minot AFB in August 2007 and the subsequent discovery that three W62/Mk-12 nose cones had previously been mistakenly transferred to Taiwan, a series of internal air force and Pentagon-wide investigations identified numerous security breaches and a general lack of attention to the nuclear mission. In an effort to "reinvigorate" its nuclear mission, the air force has decided, among other initiatives and reorganizations, that a second B-52H squadron will be added to the 5th Bomber Wing at Minot AFB. This decision reverses an earlier plan to reduce the overall B-52H inventory and is intended to transition the bomber force to a "Global Deterrence Force" under which one of the four B-52H squadrons (two at Minot and two at Barksdale) will be solely dedicated to the nuclear deterrence mission for a one-year period on a rotational basis.

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The new arrangement does not return the long-range bombers to the full-alert status they operated under prior to 1991, yet it is intended to increase the nuclear readiness of the force. According to the so-called Schlesinger Report, "In a manner similar to the missile squadrons assigned to U.S. STRATCOM, the designated nuclear-capable bomber squadron is likewise 'deployed' to its employment location, ready to assume nuclear alert and disperse upon direction or execute nuclear tasking if so ordered."[15]

Nonstrategic nuclear weapons. The number of U.S operational nonstrategic (tactical) nuclear weapons remains approximately 500, with another 600 weapons in the inactive stockpile. Nonstrategic weapons include the B61-3 and B61-4 gravity bombs, as well as the W80-0 warhead, which is used on the nuclear Tomahawk land-attack cruise missile (TLAM/N).

In 2007 and 2008, we disclosed that the U.S. Air Force had quietly removed its nuclear weapons from Lakenheath Air Base in Britain and from Ramstein Air Base in Germany.[16] Six other bases in five NATO countries continue to host an estimated 200 B61-3 and -4 gravity bombs for delivery by various U.S. and NATO aircraft. The 4th Fighter Wing at Seymour Johnson AFB in North Carolina also has a nuclear strike mission in support of overseas contingencies. Additional inactive tactical bombs in reserve status are stored at Nellis AFB in Nevada and Kirtland AFB in New Mexico.

Approximately 100 TLAM/Ns are thought to be active, and another 200 are kept in inactive reserve. None of the weapons is deployed at sea, kept instead at the Strategic Weapons Facilities at Bangor, Washington, and King's Bay, Georgia, alongside strategic weapons for the SSBNs. No life extension is planned for the missile's W80-0 warhead, which may be retired in the near future.

The United States has formally withdrawn the W84 warhead from its stockpile, two decades after the ground-launched cruise missiles that carried it were retired and destroyed according to provisions in the 1987 Intermediate-Range Nuclear Forces Treaty. Since 1987, the Pentagon retained the warheads as part of the inactive stockpile (i.e., without tritium). The last of the approximately 380 W84s appear to have been withdrawn sometime in 2006 and now await eventual dismantlement at the Pantex Plant in Texas.

Nuclear warhead production. The United States resumed small-scale production of W88 nuclear warheads in 2007; it last produced new warheads in 1992. The program involves producing up to 10 W88 pits per year to replace older warheads destroyed in reliability tests. After W88 production is completed, the NNSA intends to produce pits for other stockpiled warheads. In December 2008, NNSA proposed altering previous Bush administration plans to build a new nuclear weapons production facility with a capacity to produce hundreds of nuclear weapons per year (later scaled back to 50–80 per year). This latest proposal calls for replacing the Chemistry and Metallurgy Research Facility at Los Alamos National Laboratory with a Chemistry and Metallurgy Research Replacement Nuclear Facility that would contribute to the production of 20 plutonium pits per year.[17] The outcome of the many ongoing nuclear reviews will contribute to decisions on whether to increase production capacity further.

In 2007 and 2008, Congress rejected developing new warheads under the RRW Program to replace some Trident W76-1 warheads, as well as other types. A 2007 technical review by the Jasons concluded that the RRW certification plan was inadequate, and that "additional experiments and analysis are needed that explore failure modes, and assess the impact on performance of new manufacturing processes. Substantial work remains on the physical understanding of the surety mechanisms that are of high priority to the RRW program." The Jasons added, "It is too early to assess how the [RRW] will impact the modernization and streamlining of NNSA's production complex."[18] Congress subsequently directed the Energy Department to establish an enhanced certification subprogram within NNSA's existing science program to better answer these complex questions.[19]

The Obama administration has stated that it will not produce "new" nuclear weapons. Rather than a full-fledged RRW Program,

future production of replacement or significantly modified warheads may instead be carried out by expanding the scope of Life-Extension Program work to add new features to existing warhead designs. Congress authorized $13 million in 2009 to develop a new arming, fuzing, and firing unit that can be used on a modified existing design or be used on an RRW. The B83-1 is scheduled to receive a new fuze in 2029 and the W76-1/Mk-4A in 2039.[20]

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Warhead dismantlement. Mindful that its plans to resume production of new warheads could give the impression that the United States is preparing to increase its nuclear arsenal, in 2007 NNSA announced "an astounding 146 percent increase in dismantled nuclear weapons over the previous year's rate, almost tripling its goal of a 49 percent increase."[21] Another 20 percent increase was announced in 2008. Drawing further attention to U.S. efforts, the U.S. special representative for nuclear nonproliferation, Christopher Ford, in April 2008 told the Second Session of the Preparatory Committee for the 2010 NPT Review Conference that the United States was "busily dismantling warheads . . . at an accelerated rate."[22]

This statement was disingenuous. The dismantlement percentages used by the NNSA mask the relatively small warhead numbers involved. The NNSA keeps the number of dismantled warheads secret, but we do know that the Bush administration's warhead dismantlement rate is the lowest since the Eisenhower years. We estimate that approximately 100 warheads were dismantled in 2006, roughly 250 in 2007, about 300 in 2008. This rate will probably increase to about 350 in 2009. Although the rate is increasing, it is a far cry from the average of almost 1,800 warheads dismantled per year during the 1990s, or the all-time peak of 3,045 warheads dismantled in 1969. At the current rate, the dismantlement of the backlog of retired nuclear weapons from all announced reductions will take through 2022 to complete.[23]

The number of warheads scheduled for dismantlement will force the Pantex Plant in Texas to increase its storage capacity to house plutonium pits. Pantex currently stores more than 14,000 plutonium pits and is expected to run out of room in 2014. To increase the storage capacity to 20,000 pits (the maximum permitted by the site's environmental impact statement), the plant operator BWXT has asked the NNSA for authorization to build six new storage magazines.[24] ■

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ation of American Scientists. Direct inquiries to NRDC, 1200 New York Avenue, N.W., Suite 400, Washington, D.C., 20005 (or 202-289-6868), and visit www.thebulletin.org for more nuclear weapons data.

NOTES

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3. Official statements are unclear about the size of the reduction, with some saying "nearly 50 percent" while others say "over 40 percent." Even a small difference in percentage is not trivial given that the reduction was from a 10,000-warhead stockpile; just a 1-percent difference corresponds to 100 warheads.

4. See: White House, Office of the Press Secretary, "President Bush Approves Significant Reduction in Nuclear Weapons Stockpile," December 18, 2007; Energy Department, National Nuclear Security Administration (NNSA), "NNSA Releases Draft Plan to Transform Nuclear Weapons Complex," December 18, 2007; "U.S. Accelerates Nuclear Stockpile Cuts: White House," Agence-France Presse, December 19, 2007.

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8. Ivo Daalder and Jan Lodal, "The Logic of Zero: Toward a World Without Nuclear Weapons," *Foreign Affairs*, vol. 87, no. 6 (November/December 2008), pp. 80–95.

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10. U.S. Air Force, "Department of the Air Force Fiscal Year (FY) 2009 Budget Estimates, Research, Development, Test and Evaluation," descriptive summaries, vol. 2, budget activities 4-6, February 2008, p. 737.

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13. Defense Department and NNSA, "FY08 Refurbishment Planning Schedule," as of January 25, 2008. Obtained from NNSA.

14. U.S. Air Force, "Department of the Air Force Fiscal Year (FY) 2009 Budget Estimates."

15. Office of the Secretary of Defense, "Report of the Secretary of Defense Task Force on Nuclear Weapons Management, Phase 1: The Air Force's Nuclear Mission," September 2008, pp. 54–55.

16. See: Hans M. Kristensen, "U.S. Nuclear Weapons Withdrawn From the United Kingdom," FAS Strategic Security Blog, June 29, 2008; Hans M. Kristensen, "United States Removes Nuclear Weapons From German Base, Documents Indicate," FAS Strategic Security Blog, July 9, 2007.

17. Energy facilities would have a maximum production capacity of 80 pits per year. Energy Department, NNSA, "Record of Decision for the Complex Transformation Supplemental Programmatic Environmental Impact Statement—Operations Involving Plutonium, Uranium, and the Assembly and Disassembly of Nuclear Weapons," *Federal Register*, vol. 73, no. 245, December 19, 2008, p. 77,647, http://www.complextransformationspeis.com/project.html

18. Jasons, "Reliable Replace [sic] Warhead Executive Summary," MITRE Corporation, JSR-07-336E, September 7, 2007, p. 1.

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20. Defense Department and NNSA, "FY08 Refurbishment Planning Schedule," as of January 25, 2008. Obtained from NNSA.

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