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U.S. Strategic Nuclear Forces: Background, Developments, and Issues

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Summary

During the Cold War, the U.S. nuclear arsenal contained many types of delivery vehicles for nuclear weapons. The longer range systems, which included long-range missiles based on U.S. territory, long-range missiles based on submarines, and heavy bombers that could threaten Soviet targets from their bases in the United States, are known as strategic nuclear delivery vehicles. At the end of the Cold War, in 1991, the United States deployed more than 10,000 warheads on these delivery vehicles. That number has declined to around 6,000 warheads today, and is slated, under the 2002 Moscow Treaty, to decline to 2,200 warheads by the year 2012.

At the present time, the U.S. land-based ballistic missile force (ICBMs) consists of 500 Minuteman III ICBMs, each deployed with between one and three warheads, for a total of 1,200 warheads. The Air Force recently deactivated all 50 of the 10-warhead Peacekeeper ICBMs; it plans to eventually deploy Peacekeeper warheads on some of the Minuteman ICBMs. The 2006 Quadrennial Defense Review (QDR) report also indicated that it planned to eliminate 50 of the Minuteman III missiles, leaving a force of 450 missiles that would carry, perhaps, 500-600 warheads. The 109th Congress stalled this plan, pending a study from the Administration. The Air Force is also modernizing the Minuteman missiles, replacing and upgrading their rocket motors, guidance systems, and other components. The Air Force had expected to begin replacing the Minuteman missiles around 2018, but has decided, instead, to continue to modernize and maintain the existing missiles.

The U.S. ballistic missile submarine fleet currently consists of 14 Trident submarines; each carries 24 Trident II (D-5) missiles. The Navy has converted 4 of the original 18 Trident submarines to carry non-nuclear cruise missiles. The remaining submarines currently carry around 2,000 warheads in total, a number that may decline by a few hundred as the United States implements the Moscow Treaty. The Navy has shifted the basing of the submarines, so that 9 are deployed in the Pacific Ocean and 5 are in the Atlantic, to better cover targets in and around Asia. It also has undertaken efforts to extend the life of the missiles so that they and the submarines can remain in the fleet past 2020.

The U.S. fleet of heavy bombers currently includes 21 B-2 bombers and 94 B-52 bombers. The B-1 bomber no longer is equipped for nuclear missions. The QDR recommended that the Air Force reduce the B-52 fleet to 56 aircraft; the 109th Congress rejected that recommendation. The Air Force has argued that this number is sufficient to meet conventional warfighting needs; there is little discussion about a continuing nuclear role for the U.S. bomber fleet.

The 110th Congress will again review the Bush Administration's plans for U.S. strategic nuclear forces, during the annual authorization and appropriations process. It may review a number of questions about the future size of that force. For example, some have questioned why the United States must retain 2,200 strategic nuclear warheads. Congress may also question the Administration's plans for reductions in the Minuteman force and B-52 fleet. This report will be updated as needed.

Contents

List of Figures

List of Tables

U.S. Strategic Nuclear Forces: Background, Developments, and Issues

Introduction

During the Cold War, the U.S. nuclear arsenal contained many types of delivery vehicles for nuclear weapons, including short-range missiles and artillery for use on the battlefield, medium-range missiles and aircraft that could strike targets beyond the theater of battle, short- and medium-range systems based on surface ships, long-range missiles based on U.S. territory and submarines, and heavy bombers that could threaten Soviet targets from their bases in the United States. The short- and medium-range systems are considered non-strategic nuclear weapons and have been referred

to as battlefield, tactical, and theater nuclear weapons.[1] The long-range missiles and heavy bombers are known as strategic nuclear delivery vehicles.

In 1990, as the Cold War was drawing to a close and the Soviet Union was entering its final year, the United States had more than 12,000 nuclear warheads deployed on 1,875 strategic nuclear delivery vehicles.[2] As of January 1, 2006, according to the counting rules in the Strategic Arms Reduction Treaty (START), the United States had reduced to 5,966 nuclear warheads on 1,225 strategic nuclear delivery vehicles.[3] Under the terms of the 2002 Strategic Offensive Reduction Treaty (known as the Moscow Treaty) between the United States and Russia, this number is to decline to no more than 2,200 operationally deployed strategic nuclear warheads by the end of 2012.

Although these numbers do not count precisely the same categories of nuclear weapons, they indicate that the number of deployed warheads on U.S. strategic nuclear forces will decline significantly in the two decades following the end of the Cold War. Yet, nuclear weapons continue to play a role in U.S. national security strategy, and the United States has no plans to either eliminate its nuclear weapons or abandon the strategy of nuclear deterrence that has served as a core concept in U.S. national security strategy for more than 50 years. The Bush Administration emphasized this point in early 2002, when presenting the results of the 2001 Nuclear Posture Review (NPR). Douglas Feith, the Undersecretary of Defense for Policy, stated that nuclear weapons "continue to be essential to our security, and that of our friends and allies."[4]

The NPR indicated that the United States would reduce its forces to 2,200 operationally deployed warheads, the number and concept codified in the Moscow Treaty, but it did not identify the specific combination of delivery vehicles or warhead loadings that the United States would maintain to reach the specified number. Subsequent Pentagon studies, including the Strategic Capabilities Assessment in 2005 and the 2006 Quadrennial Defense Review (QDR), have offered further guidance on strategic nuclear force structure. As the United States reduces its deployed forces to meet the mandates of the Moscow Treaty, it is likely also to pursue programs that will allow it to modernize and adjust its strategic forces so that they remain capable in the years that follow. A number of factors could influence

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[1] For a detailed review of U.S. nonstrategic nuclear weapons see, CRS Report RL32572, *Nonstrategic Nuclear Weapons*, by Amy F. Woolf.

[2] Natural Resources Defense Council. Table of U.S. Strategic Offensive Force Loadings. Archive of Nuclear Data. [http://www.nrdc.org/nuclear/nudb/datab1.asp] The same source indicates that the Soviet Union, in 1990, had just over 11,000 warheads on 2,332 strategic nuclear delivery vehicles.

[3] Russia, by the same accounting, had 4,399 warheads on 927 delivery vehicles. See U.S. Department of State, Bureau of Verification, Compliance and Inspection. Fact Sheet. START Aggregate Numbers of Strategic Offensive Weapons. April 1, 2006. Washington, DC. [http://www.state.gov/t/vci/rls/prsrl/64052.htm]

[4] U.S. Senate. Committee on Armed Services. Statement of the Honorable Douglas J. Feith, Undersecretary of Defense For Policy. February 14, 2002.

decisions about these programs, including budget, political, and strategic considerations, along with standard capabilities assessments.

This report reviews the ongoing programs that will affect the expected size and shape of the U.S. strategic nuclear force structure. It begins with an overview of this force structure during the Cold War, and summarizes the reductions and changes that have occurred since 1991. It then offers details about each category of delivery vehicle — land-based intercontinental ballistic missiles (ICBMs), submarine launched ballistic missiles (SLBMs) and heavy bombers — focusing on their current deployments and ongoing and planned modernization programs. The report concludes with a discussion of issues related to decisions about the future size and shape of the U.S. strategic nuclear force.

Background: The Strategic Triad

Force Structure and Size During the Cold War

Since the early 1960s the United States has maintained a "triad" of strategic nuclear delivery vehicles,[5] The United States first developed these three types of nuclear delivery vehicles, in large part, because each of the military services wanted to play a role in the U.S. nuclear arsenal. However, during the 1960s and 1970s, analysts developed a more reasoned rationale for the nuclear "triad." They argued that these different basing modes had complementary strengths and weaknesses. They would enhance deterrence and discourage a Soviet first strike because they complicated Soviet attack planning and ensured the survivability of a significant portion of the U.S. force in the event of a Soviet first strike.[6] The different characteristics might also strengthen the credibility of U.S. targeting strategy. For example, ICBMs eventually had the accuracy and prompt responsiveness needed to attack hardened targets such as Soviet command posts and ICBM silos, SLBMs had the survivability needed to complicate Soviet efforts to launch a disarming first strike and to retaliate if such an attack were attempted,[7] and heavy bombers could be dispersed quickly and launched to enhance their survivability, and they could be recalled to their bases if a crisis did not escalate into conflict.

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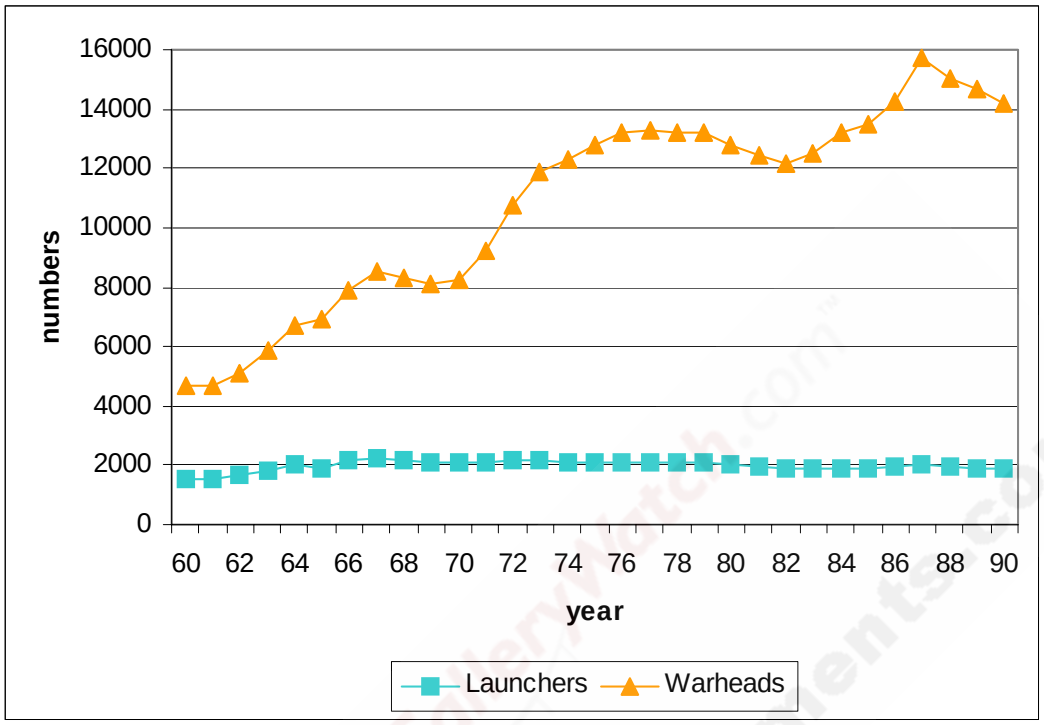
[5] When announcing the results of the Nuclear Posture Review in 2002, the Bush Administration identified a "new triad" of weapons systems and capabilities. This conceptual framework differs from the "old" triad in that it outlines how a broad set of capabilities that contribute to U.S. security, as opposed to the "old triad," which described a mix of specific weapons systems. In the "new triad," nuclear weapons and precision-guided conventional weapons combine as "offensive strike" forces. Missile defenses represent the second leg of the triad, and a "responsive infrastructure" serves the third leg. For more details see CRS Report RL31623, *U.S. Nuclear Weapons: Changes in Policy and Force Structure*, by Amy F. Woolf.

[6] U.S. Department of Defense. *Annual Report to Congress, Fiscal Year 1989*, by Frank Carlucci, Secretary of Defense. February 18, 1988. Washington, 1988. p. 54.

[7] In the early 1990s, SLBMs also acquired the accuracy needed to attack many hardened sites in the former Soviet Union.

Figure 1. U.S. Strategic Nuclear Weapons, 1960-1990



Source: Natural Resources Defense Council, Archive of Nuclear Data

According to unclassified estimates, the number of delivery vehicles (ICBMs, SLBMs, and nuclear-capable bombers) in the U.S. force structure grew steadily through the mid-1960s, with the greatest number of delivery vehicles, 2,268, deployed in 1967.[8] The number then held relatively steady through 1990, at between 1,875 and 2,200 ICBMs, SLBMs, and heavy bombers. The number of warheads carried on these delivery vehicles increased sharply through 1975, then, after a brief pause, again rose sharply in the early 1980s, peaking at around 13,600 warheads in 1987. **Figure 1** displays the increases in delivery vehicles and warheads between 1960, when the United States first began to deploy ICBMs, and 1990, the year before the United States and Soviet Union signed the Strategic Arms Reduction Treaty (START).

The sharp increase in warheads in the early 1970s reflects the deployment of ICBMs and SLBMs with multiple warheads, known as MIRVs (multiple independent reentry vehicles). In particular, the United States began to deploy the Minuteman III ICBM, with 3 warheads on each missile, in 1970, and the Poseidon SLBM, which could carry 10 warheads on each missile, in 1971.[9] The increase in warheads in the

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[8] Natural Resources Defense Council. Table of U.S. Strategic Offensive Force Loadings. Archive of Nuclear Data. [http://www.nrdc.org/nuclear/nudb/datab1.asp]

[9] GlobalSecurity.org LGM Minuteman III History and Poseidon C-3 History. [http://www.globalsecurity.org/wmd/systems/lgm-30_3-hist.htm] and [http://www.globalsecurity.org/wmd/systems/c-3.htm]

mid-1980s reflects the deployment of the Peacekeeper (MX) ICBM, which carried 10 warheads on each missile.

In 1990, before it concluded the START Treaty, the United States deployed a total of around 12,304 warheads on its ICBMs, SLBMs, and heavy bombers. The ICBM force consisted of single-warhead Minuteman II missiles, 3-warhead Minuteman III missiles, and 10-warhead Peacekeeper (MX) missiles, for a total force of 2,450 warheads on 1,000 missiles. The submarine force included Poseidon submarines with Poseidon C-3 and Trident I (C-4) missiles, and the newer Trident submarines with Trident I, and some Trident II (D-5) missiles. The total force consisted of 5,216 warheads on around 600 missiles.[10] The bomber force centered on 94 B-52H bombers and 96 B-1 bombers, along with many of the older B-52G bombers and 2 of the brand new (at the time) B-2 bombers. This force of 260 bombers could carry over 4,648 weapons.

Force Structure and Size After the Cold War

During the 1990s, the United States reduced the numbers and types of weapons in its strategic nuclear arsenal, both as a part of its modernization process and in response to the limits in the 1991 START Treaty. The United States continued to maintain a triad of strategic nuclear forces, however, with warheads deployed on ICBMs, SLBMs, and bombers. According to the Department of Defense, this mix of forces not only offered the United States a range of capabilities and flexibility in nuclear planning and complicated an adversary's attack planning, but also hedged against unexpected problems in any single delivery system. This latter issue became more of a concern in this time period, as the United States retired many of the different types of warheads and missiles that it had deployed over the years, reducing the redundancy in its force.

The 1991 START Treaty limited the United States to a maximum of 6,000 total warheads, and 4,900 warheads on ballistic missiles, deployed on up to 1,600 strategic offensive delivery vehicles. However, the Treaty did not count the actual number of warheads deployed on each type of ballistic missile or bomber. Instead, it used "counting rules" to determine how many warheads would count against the Treaty's limits. For ICBMs and SLBMs, this number usually equaled the actual number of warheads deployed on the missile. Bombers, however, used a different system. Bombers that were not equipped to carry air-launched cruise missiles (the B-1 and B-2 bombers) counted as one warhead; bombers equipped to carry air-launched cruise missiles (B-52 bombers) could carry 20 missiles, but would only count as 10 warheads against the Treaty limits. These rules have led to differing estimates of then numbers of warheads on U.S. strategic nuclear forces during the 1990s; some estimates count only those warheads that count against the Treaty while others count all the warheads that could be carried by the deployed delivery systems.

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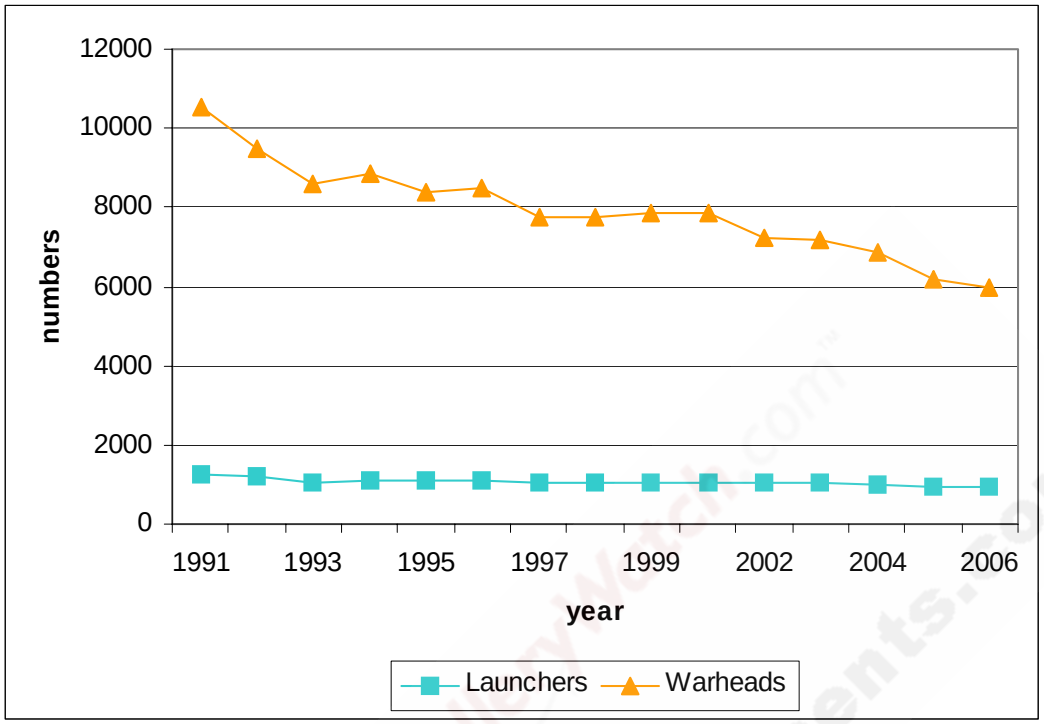
[10] The older Poseidon submarines were in the process of being retired, and the number of missiles and warheads in the submarine fleet dropped quickly in the early 1990s, to around 2,688 warheads on 336 missiles by 1993. See Natural Resources Defense Council. Table of U.S. Strategic Offensive Force Loadings. Archive of Nuclear Data. [http://www.nrdc.org/nuclear/nudb/datab1.asp]

Figure 2. U.S. Strategic Nuclear Forces Since 1991



Source: Natural Resources Defense Council, Archive of Nuclear Data

According to the data from the Natural Resources Defense Council, the United States reduced its nuclear weapons from 9,300 warheads on 1,239 delivery vehicles in 1991 to 6,196 warheads on 1,064 delivery vehicles when it completed the implementation of START in 2001. By 2006, the United States had reduced its forces to approximately 5,000 warheads on 950 delivery vehicles. These numbers appear in **Figure 2**. The number of warheads exceeds the START limit of 6,000 by a small amount because it counts more bomber weapons than would count under the Treaty limits. During the 1990s, the United States continued to add to its Trident fleet, reaching a total of 18 submarines. It retired all of its remaining Poseidon submarines and all of the single-warhead Minuteman II missiles. It continued to deploy B-2 bombers, reaching a total of 21, and removed some of the older B-52G bombers from the nuclear fleet. Consequently, in 2001, its warheads were deployed on 18 Trident submarines with 24 missiles on each submarine and 6 or 8 warheads on each missile; 500 Minuteman III ICBMs, with one or 3 warheads on each missile; 50 Peacekeeper (MX) missiles, with 10 warheads on each missile; 94 B-52H bombers, with up to 20 cruise missiles on each bomber; and 21 B-2 bombers with up to 16 bombs on each aircraft.

The United States and Russia signed a second START Treaty in early 1993. Under this Treaty, the United States would have had to reduce its strategic offensive nuclear weapons to between 3,000 and 3,500 accountable warheads. In 1994, the Department of Defense decided that, to meet this limit, it would deploy a force of 500 Minuteman III ICBMs with one warhead on each missile, 14 Trident submarines with 24 missiles on each submarine and 5 warheads on each missile, 76 B-52 bombers, and 21 B-2 bombers. The Air Force would eliminate 50 Peacekeeper ICBMs and reorient the B-1 bombers to non-nuclear missions; the Navy would retire 4 Trident

submarines (it later decided to convert these submarines to carry conventional weapons). This Treaty never entered into force and Congress prevented the Clinton Administration from reducing U.S. forces unilaterally to START II limits. Nevertheless, the Navy and Air Force continued to plan for the forces described above, and eventually implemented those changes. **Table 1** displays the forces the United States had deployed in 2001, after completing the START I reductions. It also includes those that it would have deployed under START II, in accordance the with 1994 decisions.

Table 1: U.S. Strategic Nuclear Forces Under START I and START II

	Deployed under START I (2001)		Planned for START II	
System	**Launchers**	**Accountable Warheads[(a)]**	**Launchers**	**Accountable Warheads**
Minuteman III ICBMs	500	1,200	500	500
Peacekeeper ICBMs	50	500	0	0
Trident I Missiles	168	1,008	0	0
Trident II Missiles	264	2,112	336	1,680
B-52 H Bombers (ALCM)	97	970	76	940
B-52 H Bombers (non-ALCM)	47	47	0	0
B-1 Bombers [(a)]	90	90	0	0
B-2 Bombers	20	20	21	336
Total	1,237	5,948	933	3,456

Source: U.S. Department of State, Fact Sheet; CRS Estimates

(a) Under START I, bombers that are not equipped to carry ALCMs count as one warhead, even if they can carry up 16 nuclear bombs; bombers that are equipped to carry ALCMs count as 10 warheads, even if they can carry up to 20 ALCMs.
(b) Although they still count under START I, B-1 bombers are no longer equipped for nuclear missions.

Future Force Structure and Size

The Bush Administration stated in late 2001 that the United States would reduce its strategic nuclear forces to 1,700-2,200 "operationally deployed warheads" over the next decade.[11] This goal was codified in the 2002 Moscow Treaty. According to the Administration, operationally deployed warheads are those deployed on missiles and stored near bombers on a day-to-day basis. They are the warheads that would be available immediately, or in a matter of days, to meet "immediate and

[11] President Bush announced the U.S. intention to reduce its forces on November 13, 2001, during a summit with Russia's President Vladimir Putin. The United States and Russia codified these reductions in a Treaty signed in May 2002. See CRS Report RL31448, *Nuclear Arms Control: The Strategic Offensive Reductions Treaty*, by Amy F. Woolf.

unexpected contingencies."[12] The Administration also indicated that the United States would retain a triad of ICBMs, SLBMs, and heavy bombers for the foreseeable future. It did not, however, offer a rationale for this traditional "triad," although the points raised in the past about the differing and complementary capabilities of the systems probably still pertain. Admiral James Ellis, the former Commander of the U.S. Strategic Command (STRATCOM) highlighted this when he noted in a 2005 interview, that the ICBM force provides responsiveness, the SLBM force provides survivability, and bombers provide flexibility and recall capability.[13]

The Administration did not specify how it would reduce the U.S. arsenal from around 6,000 warheads to the lower level of 2,200 operationally deployed warheads, although it did identify some force structure changes that would account for part of the reductions. Specifically, the Administration announced that, after Congress removed its restrictions,[14] the United States would eliminate the 50 Peacekeeper ICBMs, reducing by 500 the total number of operationally deployed ICBM warheads. It also announced that it would continue with plans to remove 4 Trident submarines from service, and convert those ships to carry non-nuclear guided missiles. These submarines would have counted as 476 warheads under the START Treaty's rules. These changes have reduced U.S. forces to around 5,000 warheads on 950 delivery vehicles in 2006; this reduction appears on **Figure 2**. The Bush Administration also noted that two of the Trident submarines remaining in the fleet would be in overhaul at any given time. The warheads that could be carried on those submarines would not count against the Moscow Treaty limits because they would not be "operationally deployed." This would further reduce the U.S. deployed force by 200-400 warheads.

The Bush Administration, through the 2005 Strategic Capabilities Assessment and 2006 Quadrennial Defense Review, has announced additional changes in U.S. ICBMs, SLBMs, and bomber forces. (These are discussed in more detail below.) It is not clear whether these changes would reduce the number of operationally deployed warheads enough to meet the Treaty limit of 2,200 warheads. The outcome depends on how many warheads are carried by each of the remaining Trident and Minuteman missiles and how many bomber weapons remain in the U.S. arsenal. The United States could reach the Treaty limits by reducing the number of delivery vehicles, by reducing the number of warheads carried on each delivery vehicle, or by altering the way it counts the warheads on its delivery vehicles.

Unlike START, the Moscow Treaty does not contain definitions or counting rules that help determine the number of treaty-accountable warheads. It also does not contain any monitoring provisions that would assist the nations in verifying compliance with the Treaty. Further, neither side has to declare how many warheads

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[12] U.S. Senate. Committee on Armed Services. Statement of the Honorable Douglas J. Feith, Undersecretary of Defense For Policy. February 14, 2002.

[13] Hebert, Adam. The Future Missile Force. *Air Force Magazine*. October 2005.

[14] Beginning in FY1996, and continuing through the end of the Clinton Administration, Congress had prohibited the use of any DOD funds for the elimination of strategic nuclear delivery vehicles, below START I levels, until START II entered into force. See, for example, the FY1998 Defense Authorization Act (P.L. 105-85, Sec. 1302). Congress lifted this restriction in the FY2002 Defense Authorization Act (P.L. 107-107, Sec. 1031).

are deployed on any particular type of delivery vehicle. Theoretically, each missile could carry a different number of warheads without either side having to reveal the individual loadings, or even the loadings attributed to any given portion of the force. Each simply has to declare the total number of warheads that it has designated as "operationally deployed" and that it, therefore, counts under the Treaty limits.

Table 2 identifies an illustrative force structure that the United States might deploy under the Moscow Treaty, and compares it with U.S. operational strategic nuclear forces in 2006. This structure is consistent with the statements and adjustments the Administration has made, to date, but does not postulate any further reductions in the number of delivery vehicles. The table also displays a range for the number of warheads that could be carried by each "leg" of the triad, even though, as was just noted, this estimate remains highly speculative.

Table 2: U.S. Strategic Nuclear Forces 2006 and Illustrative Strategic Nuclear Forces Under the Moscow Treaty

System	Forces in 2006		Possible forces in 2012	
	Launchers	Accountable Warheads	Launchers	Accountable Warheads[(b)]
Minuteman III ICBMs	500	1,200	450[(a)]	500-600
Trident II Missiles	336	2,688	264[(b)]	1,056-1,152
B-52H Bombers	95	950	56[(c)]	300-500
B-2 Bombers	21	336	21	200-350
Total	952	5,174	933	2,200

Source: U.S. Department of State, Fact Sheet; CRS Estimates

(a) Congress rejected the proposed reduction in Minuteman III missiles, pending a report from the Administration. The number of operationally deployed warheads, however, need not change, even if the Minuteman III force declines by 50 missiles.

(b) The launcher total for Trident submarines counts only 12 vessels, excluding the 2 submarines in overhaul.

(b) These estimates are highly speculative.

(c) Congress rejected the Air Force plan for the B-52 fleet, and, in the FY2007 Defense Authorization Act, mandated that the Air Force retain 75 B-52 bombers through 2018; however, the number of weapons that would count under the Moscow Treaty is not affected by the number of deployed bombers.

Strategic Nuclear Delivery Vehicles: Ongoing Plans and Programs

Intercontinental Ballistic Missiles (ICBMs)

Peacekeeper (MX). In the late 1980s, the United States deployed 50 Peacekeeper ICBMs, each with 10 warheads, at F.E. Warren Air Force Base in Wyoming. The 1993 START II Treaty would have banned multiple warhead ICBMs, so the United States would have had to eliminate these missiles while implementing the Treaty. Therefore, the Pentagon began planning for their elimination, and the Air Force added funds to its budget for this purpose in 1994. However, beginning in

FY1998, Congress prohibited the Clinton Administration from spending any money on the deactivation or retirement of these missiles until START II entered into force. The Bush Administration requested $14 million in FY2002 to begin the missiles' retirement; Congress lifted the restriction and authorized the funding. The Air Force began to deactivate the missiles in October 2002, and completed the process, having removed all the missiles from their silos, in September 2005. The MK21 reentry vehicles and W87 warheads from these missiles have been placed in storage. As is noted below, the Air Force plans to redeploy some of these warheads and reentry vehicles on Minuteman III missiles, under the Safety Enhanced Reentry Vehicle (SERV) program.

Under the terms of START, the United States would have had to eliminate the Peacekeeper missile silos to remove the warheads on the missiles from accountability under the Treaty limits. However, the Air Force has chosen to retain the silos. Therefore, the 500 warheads that were deployed on the Peacekeeper missiles still count under START, even though the missiles are no longer operational. The United States will not, however, count these warheads under the limits in the Moscow Treaty.

Minuteman III. The U.S. ICBM force currently contains 500 Minuteman III ICBMs. These missile are located at three Air Force bases — 150 missiles are housed at F.E. Warren AFB in Wyoming, 200 at Malmstrom AFB in Montana, and 150 at Minot AFB in North Dakota.

Missile Plans. In the 2006 Quadrennial Defense Review (QDR), the Pentagon indicated that it planned to "reduce the number of deployed Minuteman III ballistic missiles from 500 to 450, beginning in Fiscal Year 2007."[15] The QDR did not indicate which base was likely to lose a squadron of missiles, although, in testimony before the Senate Armed Services Committee, General James E. Cartwright, the Commander of U.S. Strategic Command (STRATCOM), indicated that the missiles would likely come from Malmstrom because that would leave each base with an equal number of 150 ICBMs.[16] Many observers expect the Air Force to retire the missiles in Malmstrom's 564th Missile Squadron, which is known as the "odd squad."[17] This designation reflects that these missiles were built and installed by General Electric, while all other Minuteman missiles were built by Boeing, and that these missiles use a different communications and launch control system than all the other Minuteman missiles.

In testimony before the Senate Armed Services Committee, General Cartwright stated that the Air Force had decided to retire these missiles so that they could serve as test assets for the remaining force. He noted that the Air Force had to "keep a

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[15] U.S. Department of Defense. Report of the 2006 Quadrennial Defense Review. Washington, February 2006. p. 50.

[16] U.S. Senate, Committee on Armed Services, Hearing on Global Strike Plans and Programs. Testimony of James E. Cartwright, Commander U.S. Strategic Command. March 29, 2006.

[17] Johnson, Peter. Growth Worries Base Boosters. *Great Falls Tribune*. January 19, 2006.

robust test program all the way through the life of the program." [18] With the current available assets, the test program would begin to run short around 2017 or 2018. This time line, however, raises questions about why the Air Force has pressed to begin retiring the missiles 10 years earlier, in FY2007. Some have speculated that the elimination of the 50 missiles is intended to reduce the long term operations and maintenance costs for the fleet, particularly since the 564th Squadron uses different ground control technologies and training systems than the remainder of the fleet. This option is not likely, however, to produce budgetary savings in the near-term as the added cost of deactivating the missiles could exceed the reductions in operations and maintenance expenses.[19] In addition, to use these missiles as test assets, the Air Force would have to include them in the modernization programs described below, which would further limit the budgetary savings. Retiring these missiles might also allow the Air Force to reduce the number of officers needed to operate the Minuteman fleet and to transfer these officers to different positions, although, again, the numbers are likely to be small. Nevertheless, by retiring these missiles, both STRATCOM and the Air Force can participate in the ongoing effort to transform the Pentagon in response to post-Cold War threats. These missiles may still have a role to play in U.S. national security strategy, but they may not be needed in the numbers that were required when the United States faced the Soviet threat.

Congress has questioned the Administration's rationale for the retirement of 50 Minuteman missiles. In the FY2007 Defense Authorization Act (H.R. 5122, Sec. 139), Congress stated that DOD could not spend any money to begin the withdrawal of these missiles from the active force until the Secretary of Defense submitted a report that addressed a number of issues, including (1) a detailed justification for the proposal to reduce the force from 500 to 450 missiles; (2) a detailed analysis of the strategic ramifications of continuing to equip a portion of the force with multiple independent warheads rather than single warheads; (3) an assessment of the test assets and spares required to maintain a force of 500 missiles and a force of 450 missiles through 2030; (4) an assessment of whether halting upgrades to the missiles withdrawn from the deployed force would compromise their ability to serve as test assets; and (5) a description of the plan for extending the life of the Minuteman III missile force beyond FY2030.

Warhead Plans. Each Minuteman III was initially deployed with 3 warheads, for a total of 1,500 warheads across the force. In 2001, to meet the START limit of 6,000 warheads, the United States removed 2 warheads from each of the 150 Minuteman missiles at F.E. Warren AFB,[20] reducing the Minuteman III force to 1,200 total warheads. In the process, the Air Force also removed and destroyed the

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[18] U.S. Senate, Committee on Armed Services, Hearing on Global Strike Plans and Programs. Testimony of James E. Cartwright, Commander U.S. Strategic Command. March 29, 2006.

[19] Private communication.

[20] U.S. Space Command. F.E. Warren Air Force Base. 90th Space Wing. [http://www.warren.af.mil/organizations/90sw.shtml] See also, Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

"bulkhead," the platform on the reentry vehicle, so that, in accordance with START rules, these missiles can no longer carry 3 warheads.

Under START II, the United States would have had to download all the Minuteman III missiles to one warhead each. Although the Bush Administration initially endorsed the plan to download all Minuteman ICBMs, this plan has apparently changed. In an interview with *Air Force Magazine* in October 2003, General Robert Smolen indicated that the Air Force would maintain the ability to deploy these 500 missiles with up to 800 warheads.[21] Although some analysts interpreted this statement to mean that the Minuteman ICBMs would carry 800 warheads on a day-to-day basis, it seems more likely that this was a reference to the Air Force intent to maintain the ability to reload warheads, and reconstitute the force, if circumstances changed.[22] The NPR had indicated that the United States would maintain the flexibility to do this. However, in recent testimony before the Senate Armed Services Committee, General Cartwright also indicated that some Minuteman missiles might carry more than one warhead. Specifically, when discussing the reduction from 500 to 450 missiles, he said, "this is not a reduction in the number of warheads deployed. They will just merely be re-distributed on the missiles."[23] In addition, as is noted below, the Navy may remove nearly 100 nuclear warheads from its Trident missiles if it deploys some of these missiles with conventional warheads. These warheads could be distributed to other Trident missiles, or the Air Force might add an equivalent number of warheads to its Minuteman missiles. Consequently, it seems possible that, as the United States adjusts its forces in the coming years, it could reduce its Minuteman force to 450 missiles, deploy 500-600 warheads on those missiles, and retain the ability to deploy up to 800 warheads on Minuteman missiles under certain circumstances.

Several factors are likely to affect the decision on the final number of warheads carried on Minuteman missiles. First, as was noted above, 150 Minuteman missiles have been "downloaded" to a single warhead under START rules, and, therefore can no longer carry additional warheads. That leaves, at most, 300 missiles that could carry 2 or 3 warheads. Second, the Air Force is planning to deploy some Minuteman missiles with the MK21 reentry vehicles removed from Peacekeeper ICBMs under the SERV program. Each of the modified missiles will only carry a single warhead. The Air Force has indicated that it will deploy the W-87 warhead on just a portion of the Minuteman force, but it has not indicated how many missiles will be included,[24] so it is not clear how many will be limited to the single-warhead configuration. As a result, only a portion of the Minuteman fleet will still be able to carry more than one warhead. Finally, the United States has committed to retain no

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[21] Hebert, Adam. The Future Missile Force. *Air Force Magazine*. October 2005.

[22] See, for example, Jeffrey Lewis. STRATCOM Hearts MIRV. ArmsControlWonk.com, January 30, 2006. [http://www.armscontrolwonk.com/960/stratcom-hearts-mirv]

[23] See, U.S. Senate, Committee on Armed Services, Hearing on Global Strike Plans and Programs. Testimony of James E. Cartwright, Commander U.S. Strategic Command. March 29, 2006.

[24] Sirak, Michael. Minuteman Fleet has Life Beyond 2020, Says Senior Air Force Space Official. Defense Daily. June 14, 2006.

more than 2,200 operationally deployed warheads on its strategic forces. Increases in the number of Minuteman warheads, above the 500 expected on the downloaded force, would necessitate reductions in either bomber weapons or Trident warheads.

Minuteman Modernization Programs. The Air Force is currently pursuing several programs to improve the accuracy and reliability of the Minuteman fleet and to extend the missiles' service lives. According to some estimates, this effort could eventually cost $6-7 billion.[25] This section describes several of the key programs in this effort.

Propulsion Replacement Program (PRP). The program began in 1998 and seeks to replace the propellant, the solid rocket fuel, in the Minuteman motors to extend the life of the rocket motors. A consortium led by Northrup Grumman is pouring the new fuel into the first and second stages and remanufacturing the third stages of the missiles. According to the Air Force, 250 missiles have already been upgraded with motors that carry the new fuel, and 42 have been equipped with the redesigned stage 3 motor. The Air Force expects to complete the PRP program by 2013.[26] In the FY2007 Defense Authorization Act (P.L. 109-364) and the FY2007 Defense Appropriations Act (P.L. 109-289), the 109th Congress indicated that it would not support efforts to end this program early.

Guidance Replacement Program (GRP). The Guidance Replacement Program will extend the service life of the Minuteman missiles' guidance set, and will improve the maintainability and reliability of guidance sets. It is replacing aging parts with more modern and reliable technologies, while maintaining the accuracy of the missiles.[27] Flight testing for the new system began in 1998, and, at the time, it exceeded its operational requirements. Production began in 2000, and the Air Force purchased 652 of the new guidance units. Press reports indicate that the system had some problems with accuracy during its testing program.[28] The Air Force eventually identified and corrected the problems in 2002 and 2003. According to the Air Force, 387 Minuteman III missiles have been upgraded with the new guidance packages.[29] The process may be completed by 2010.[30]

Rapid Execution and Combat Targeting (REACT) Service Life Extension Program. The REACT targeting system was first installed in Minuteman launch control centers in the mid-1990s. This technology allowed for a

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[25] Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

[26] Sirak, Michael. Minuteman Fleet has Life Beyond 2020, Says Senior Air Force Space Official. Defense Daily. June 14, 2006.

[27] LGM Minuteman III Modernization. Globalsecurity.org [http://www.globalsecurity.org/wmd/systems/lgm-30_3-mod.htm]

[28] Donnelly, John M. Air Force Defends Spending Half A Billion on Iffy ICBMs. *Defense Week*. September 10, 2001. p. 1.

[29] Sirak, Michael. Minuteman Fleet has Life Beyond 2020, Says Senior Air Force Space Official. Defense Daily. June 14, 2006.

[30] Hebert, Adam. The Future Missile Force. *Air Force Magazine*. October 2005.

significant reduction in the amount of time it would take to re-target the missiles, automated routine functions to reduce the workload for the crews, and replaced obsolete equipment.[31] In 2006, the Air Force began to deploy a modernized version of this system to extend its service life and to update the command and control capability of the launch control centers. This program will allow for more rapid retargeting of ICBMs, a capability identified in the Nuclear Posture Review as essential to the future nuclear force The Air Force expected to complete this effort in late 2006.

Safety Enhanced Reentry Vehicle (SERV). As was noted above, under the SERV program, the Air Force plans to deploy MK21/W-87 reentry vehicles removed from Peacekeeper ICBMs on the Minuteman missiles, replacing the older MK12/W62 and MK12A/W78 reentry vehicles. To do this, the Air Force must modify the software, change the mounting on the missile, and change the support equipment. According to Air Force Space Command, the SERV program conducted three flight tests in 2005, and cancelled a fourth test because the first three were so successful.[32] The Air Force expects to begin deploying the new reentry vehicles on the Minuteman missiles later in 2006, and to complete the process by 2011.

Future Programs. The Air Force began to explore its options for a new missile to replace the Minuteman III in 2002, with the intent to begin deploying a new missile in 2018. It reportedly produced a "mission needs statement" at that time, and then began an Analysis of Alternatives (AOA) in 2004.[33] In June 2006, Lt. General Frank Klotz indicated that, after completing the AOA, Space Command had decided to recommend "an evolutionary approach to the replacement of the Minuteman III capability,"[34] which would continue to modernize the components of the existing missiles rather than begin from scratch to develop and produce new missiles. He indicated that this recommendation had not yet been approved, and was still working its way through the Pentagon. However, he indicated that Space Command supported this approach because it would be less costly than designing a new system "from scratch."

This approach could ensure the long-term future of the ICBM fleet. A more expensive "new" program could face cost-cutting pressures in both the Pentagon and Congress. In addition, budget limits could lead to pressures to reduce the number of missiles, leading to a further contraction of the ICBM fleet. On the other hand, some might argue that a new ICBM program would demonstrate a stronger long-term commitment by the Air Force to its ICBM fleet. It might appear easier to withdraw funding and support from the ICBM fleet if the Air Force decides to modernize,

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[31] LGM Minuteman III Modernization. Globalsecurity.org [http://www.globalsecurity.org/wmd/systems/lgm-30_3-mod.htm]

[32] Lt. Gen. Frank G. Klotz, Vice Commander, Air Force Space Command. Transcript of Speech to the National Defense University Breakfast. June 13, 2006.

[33] Selinger, Mark. Minuteman Replacement Study Expected to Begin Soon. Aerospace Daily and Defense Report. June 25, 2004.

[34] Lt. Gen. Frank G. Klotz, Vice Commander, Air Force Space Command. Transcript of Speech to the National Defense University Breakfast. June 13, 2006.

maintain, and extend the existing missiles, rather than to pursue new, and possibly more capable, technologies.

Submarine Launched Ballistic Missiles

The U.S. fleet of ballistic missile submarines consists of 14 Trident submarines, each equipped to carry 24 Trident missiles. The fleet currently carries a total of around 2,000 warheads.

By the early 1990s, the United States had completed the deployment of 18 Trident ballistic missile submarines (SSBNs). Each of these submarines was equipped to carry 24 Trident missiles, and each missile could carry up to 8 warheads (either W-76 warheads or the larger W-88 warheads on the Trident II missile). The Navy initially deployed 8 of these submarines at Bangor, Washington, and all 8 were equipped with the older Trident I missile. It then deployed 10 submarines, all equipped with the Trident II missile, at Kings Bay, Georgia. During the 1994 Nuclear Posture Review, the Clinton Administration decided that the United States would reduce the size of its Trident fleet to 14 submarines, and that four of the older submarines would be "backfit" to carry the Trident II missile.

The Bush Administration's 2001 Nuclear Posture Review endorsed the plan to "backfit" 4 of the Trident submarines so that all would carry Trident II missiles. It also indicated that, instead of retiring the remaining 4 submarines, the Navy would convert them to carry conventional weapons, and designated them "guided missile" submarines (SSGNs). Consequently, the U.S. ballistic missile submarine (SSBN) force currently consists of 14 Trident submarines, with 7 based at Bangor, Washington, 5 based at Kings Bay, Georgia, and 2 in overhaul as they are equipped to carry Trident II missiles. This section describes many of the plans and programs that are changing this force.

The SSGN Program. The Navy is in the process of converting 4 Trident submarines (the USS Ohio, USS Michigan, USS Florida, and USS Georgia) to carry conventional cruise missiles and other conventional weapons. Reports indicate that the conversion process will take approximately $1 billion and two years for each of the 4 submarines. When completed, the SSGNs will be able to carry 154 Tomahawk cruise missiles, along with up to 100 special forces troops and their mini-submarines.[35]

The first two submarines scheduled for this conversion were removed from the nuclear fleet in early 2003. They were slated to receive their engineering overhaul, then to begin the conversion process in 2004.[36] The first to complete the process, the

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[35] Connolly, Allison. For Four Subs, Its Good-bye Ballistic Missiles, Hello SEALs. Norfolk Virginia Pilot. December 18, 2004.

[36] Ohio Class SSGN Tactical Trident. GlobalSecurity.org [http://www.globalsecurity.org/military/systems/ship/ssgn-726.htm]

USS Ohio returned to service as an SSGN in January 2006.[37] All four submarines are scheduled to complete the process by 2008 or 2009.

The Backfit Program. As was noted above, both the 1994 and 2001 Nuclear Posture Reviews confirmed that the Navy would "backfit" four Trident submarines so that they could carry the newer Trident II (D-5) missile. This process would not only allow the Navy to replace the aging C-4 missiles, it would also equip the fleet with a missile that has improved accuracy and a larger payload. With its greater range, it would allow the submarines to operate in a larger area and cover a greater range of targets. These characteristics were valued when the system was designed and the United States sought to enhance its ability to deter the Soviet Union. The Bush Administration believes that the range, payload, and flexibility of the Trident submarines and D-5 missiles remain relevant in an era when the United States may seek to deter or defeat a wider range of adversaries.

Four of the eight Trident submarines based in Bangor, Washington (USS Alaska, USS Nevada, USS Henry M. Jackson and USS Alabama) are a part of the backfit program. The Alaska and Nevada both began the process in 2001; the Alaska completed its backfit and rejoined the fleet in March 2002 and the Nevada did the same in August 2002. During the process, the submarines underwent a pre-planned engineered refueling overhaul, which accomplishes a number of maintenance objectives, including refueling of the reactor; repairing and upgrading some equipment, replacing obsolete equipments, repairing or upgrading the ballistic missile systems, and other minor alterations.[38] The submarines also are fit with the Trident II missiles and the operating systems that are unique to these missiles. According to the Navy, both of these efforts came in ahead of schedule and under budget. The Henry M. Jackson and Alabama are scheduled to compete their engineering overhaul and backfit in FY2006 and to reenter the fleet in FY2007.

The last of the Trident I (C-4) missiles was removed from the fleet in October 2004, when the USS Alabama off-loaded its missiles and began the overhaul and backfit process. All the Trident submarines currently in the U.S. fleet now carry the Trident II missile.[39]

Basing Changes. When the Navy first decided, in the mid-1990s, to maintain a Trident fleet with 14 submarines, it planned to "balance" the fleet by deploying 7 Trident submarines at each of the two Trident bases. The Navy would have transferred 3 submarines from Kings Bay to Bangor, after 4 of the submarines from Bangor were removed from the ballistic missile fleet, for a balance of 7 submarines at each base. However, these plans changed after the Bush Administration's Nuclear Posture Review. The Navy has transferred 5 submarines to Bangor, "balancing" the fleet by basing 9 submarines at Bangor and 5 submarines

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[37] First Trident Submarine Converted. Associated Press. January 10, 2006.

[38] SSBN-726 Ohio-Class FBM Submarines, GlobalSecurity.org, [http://www.globalsecurity.org/wmd/systems/ssbn-726-recent.htm]

[39] Morris, Jefferson. Older Trident Missiles to be Phased out by Fall, Admiral Says. Aerospace Daily and Defense Report. June 17, 2005.

at Kings Bay. Because two submarines would be in overhaul at any given time, this basing plan means that 7 submarines would be operational at Bangor and 5 would be operational at Kings Bay.

According to unclassified reports, the Navy began moving Trident submarines from Kings Bay to Bangor in 2002, and transferred the fifth submarine in September 2005.[40] This change in basing pattern apparently reflects changes in the international security environment, with fewer targets within range of submarines operating in the Atlantic, and a greater number of targets within range of submarines operating in the Pacific. In particular, the shift allows the United States to improve its coverage of targets in China and North Korea.[41] Further, as the United States modifies its nuclear targeting objectives, and, particularly, if it deploys conventional warheads on Trident submarines, it could alter the patrol routes for the submarines operating in both oceans, so that a greater number of emerging targets would be within range of the submarines in a short amount of time.

Warhead Issues. The Trident I (C-4) and Trident II (D-5) missiles can be equipped to carry up to 8 warheads each. Under the terms of the START Treaty, the United States can remove warheads from Trident missiles, and reduce the number listed in the data base, a process known as downloading, to comply with the Treaty's limit of 6,000 warheads. The United States took advantage of this provision as it reduced its forces under START, reducing to 6 warheads per missile on the 8 Trident submarines based at Bangor, Washington.[42]

The Navy may also have begun to reduce the number of warheads on the other Trident submarines, as this will be necessary to allow the United States to reduce its forces to the 2,200 deployed warheads permitted under the Moscow Treaty. The United States does not have to reach this limit until 2012, but, according to some reports, would rather reduce its forces gradually than adjust them suddenly in the last few years before the Treaty's deadline.[43] As it reduces to the level in the Moscow Treaty, however, the United States will not have to indicate how many warheads are deployed on each missile; it will simply have to declare a total number of operationally deployed warheads on all of its strategic nuclear delivery vehicles. To meet the limit however, it is likely to deploy an average of 4 warheads on each Trident II missile.

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[40] Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

[41] Ibid.

[42] Even though 4 of these submarines are being converted to SSGNs, they still count under the START Treaty because they still have SLBM launch tubes. Each of those tubes count as 6 warheads. See U.S. Department of State. Bureau of Verification, Compliance, and Implementation. START Aggregate Number of Strategic Offensive Arms. April 1, 2006. [http://www.state.gov/t/vci/rls/prsrl/64052.htm]

[43] Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

Modernization Plans and Programs. The Navy initially planned to keep Trident submarines in service for 30 years, but has now extended that time period to 42 years. This extension reflects the judgement that ballistic missiles submarines would have operated with less demanding missions than attack submarines, and could, therefore, be expected to have a much longer operating life than the expected 30 year life of attack submarines. Therefore, since 1998, the Navy has assumed that each Trident submarine would have an expected operating lifetime of at least 42 years, with two 20-year operating cycles separated by a two-year refueling overhaul.[44] The Navy has also pursued a number of programs to ensure that it has enough missiles to support this extended life for the submarines.

Trident Missile Production. The Navy has purchased 408 Trident II (D-5) missiles. After finalizing the plan to deploy all 14 Trident submarines with D-5 missiles, the Navy extended Trident production through 2013, and now expects to purchase 561 Trident missiles.[45] The Navy expects to maintain a fleet of 12 operational Trident submarines, with 24 missiles on each submarine, but it would need more than the 288 missiles that would fill these submarines. Around 50 of the missiles would be available for use by Great Britain in its Trident submarines. The remainder would support the missile's test program throughout the life of the Trident system. The Navy has requested $220 million towards the purchase of Trident missiles in FY2007, but does not expect to purchase additional missiles until FY2008.

Trident Missile Life Extension. The Navy has also begun a life extension program for the Trident II missiles, so that they will remain capable and reliable throughout the 45-year life of the Trident submarines. The Navy has requested nearly $700 million to support this program in FY2007. According to the Navy, this funding will sustain efforts to redesign the guidance system and missile electronics to extend the life of the missiles.[46]

W76 Warhead Life Extension. The overwhelming majority of Trident missiles are deployed with the MK4/W76 warhead, which, according to unclassified estimates, has a yield of 100 kilotons.[47] It is nearing the end of its service life and is currently undergoing a life extension program that is designed to enhance its capabilities. Several questions have come up during the life extension program. For example, some weapons experts have questioned whether the warhead's design is reliable enough to ensure that the warheads will explode at its intended yield.[48] In

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[44] SSBN Ohio-Class FBM Submarines. GlobalSecurity.org, [http://www.globalsecurity.org/wmd/systems/ssbn-726-recent.htm]

[45] Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

[46] U.S. Department of Defense. Department of the Navy. Fiscal Year 2007Budget Estimate Submission. Justification of Estimates. February 2006. p. 13.

[47] Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

[48] Fleck, John. Flaws Seen in Sub-Launched Nuclear Warhead. Albuquerque Journal. July

(continued...)

addition, in June 2006, an inspector general's report from the Department of Energy questioned the management practices at the National Nuclear Security Administration (NNSA), which is responsible for the life extension program, arguing that management problems had led to delays and created cost overruns in the program. This has raised questions about whether NNSA will be able to meet the September 2007 delivery date for the warhead.[49]

Conventional Trident Modification. In the report of the 2006 Quadrennial Defense Review, the Pentagon called for the deployment of conventional warheads on a portion of its Trident SLBMs.[50] According to DOD's plan, the Navy would deploy

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[48] (...continued)
8, 2004.

[49] Costa, Keith J. IG: Project Weaknesses put W-76 Warhead Refurbishment Plan at Risk. InsideDefense.Com June 8, 2006.

[50] For details, see, CRS Report RL33067, *Conventional Warheads on Long-Range Ballistic*
(continued...)

two Trident missiles on each submarine with conventional warheads and deploy 4 warheads deployed on each of these missiles, for a total force of 96 conventional warheads. This would provide the United States with the capability to launch conventional warheads against targets around the world in less than an hour, a capability that does not now exist unless U.S. forces are forward-based in the region where the targets might be. This is a part of STRATCOM's plan for the Prompt Global Strike mission. The Navy requested $127 million for FY2007 to begin this program, but Congress did not authorize or appropriate the funding in the FY2007 Defense Authorization or Defense Appropriations bills, instead questioning the need for and intentions of the program, while raising concerns about the possibility that other nations might misinterpret the launch of a conventional Trident missile.

Future Programs. The Navy has initiated studies into options for a replacement for the Trident — one would be a new, dedicated ballistic missile submarine and another would be a variant of the Virginia class attack submarine. It would have to begin work on a new submarine by 2016 so that it could begin to enter the fleet as the Tridents begin to retire.[51]

Bombers

B-1 Bomber. The Air Force began to deploy the B-1 bomber in the mid-1980s and eventually deployed a fleet of 96 aircraft. After several crashes, the Air Force was left with 92 bombers in 2001. It has sought to retire 30 of the aircraft, leaving a force of 62 bombers, but has met resistance from Congress. The B-1 served exclusively as a nuclear delivery vehicle through 1991, carrying short-range attack missiles and gravity bombs. Because these bombers were not equipped to carry nuclear-armed air-launched cruise missiles, each counts as a single delivery vehicle and a single warhead under START. In 1993, the Air Force began to convert the B-1 bombers to carry conventional weapons. This process was completed in 1997 and the B-1 bomber is no longer equipped to carry nuclear weapons, although it still counts against the START limits. Neither the bomber nor its weapons will count against the limits in the Moscow Treaty. The bomber has contributed to U.S. conventional operations in Afghanistan and Iraq.

B-2 Bomber. The Air Force has 21 B-2 bombers, based at Whiteman AFB in Missouri. The B-2 bomber can carry both B-61 and B-83 nuclear bombs, but is not equipped to carry cruise missiles. It can also carry conventional weapons, and has participated in U.S. military campaigns from Bosnia to Iraq. It is designed as a "low observable" aircraft, and was intended to improve the U.S. ability to penetrate Soviet air defenses.

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[50] (...continued)
Missiles: Background and Issues for Congress, by Amy F. Woolf.

[51] Hebert, Adam. Pentagon Already at Work on Nuclear Systems Needed after 2020. Inside the Pentagon. March 21, 2002. pp. 6-9.

Weapons. According to unclassified estimates, the United States has around 550 B-61 and B-83 bombs.[52] The B61-11, a modification developed in the 1990s, has a hardened, modified case so that it can penetrate some hardened targets, although probably not those encased in steel and concrete. The B-83 bomb is a high yield weapon, that is also designed to destroy hardened targets, such as ICBM silos.

B-52 Bomber. The Air Force currently maintains 94 B-52H aircraft at two bases, Barksdale, Louisiana and Minot, North Dakota. The B-52 bomber, which first entered service in 1961, is equipped to carry nuclear or conventional air-launched cruise missiles and nuclear-armed advanced cruise missiles. The B-52 bombers can also deliver a wide range of conventional arms.

The Air Force has proposed cutting the B-52 fleet on many occasions in the last decade. For example, when the United States identified the force structure that it would deploy under the START Treaty, it indicated that it would only seek to retain 76 B-52 bombers. Congress, however, rejected the Clinton Administration's proposal, and the United States has retained the full fleet of 94 aircraft.

The 2006 Quadrennial Defense Review called for a significant change to the B-52 fleet, reducing it from 94 to 56 aircraft. The budget request for FY2007 indicated that the Air Force planned to retire 18 bombers in FY2007 and 20 in FY2008. At the same time, the QDR called for continuing improvements to the B-1, B-2, and B-52 bombers' conventional capabilities using the funds that were saved by the retirement of the 38 aircraft. The Air Force has argued that it can reduce the number of deployed bombers, without reducing the overall capabilities of the bomber fleet, because these new weapons have "raised the efficiency" of the bomber platform. At hearings before the Senate Armed Services Committee, General James E. Cartwright, the Commander of STRATCOM, noted that "the next generation weapons that we're fielding, these air-launched cruise missiles, the joint direct attack munitions, et cetera, are much more efficient than they were in the past."[53] General Cartwright also indicated that, in spite of the reduced size of the fleet, the Air Force would continue to deploy B-52 bombers at two bases.

Congress rejected the Pentagon's proposals for at least part of the B-52 fleet. The House, in its version of the FY2007 Defense Authorization Bill, prohibited the Air Force from retiring any of the B-52 aircraft, and mandated that it maintain at least 44 "combat coded" aircraft until the Air Force began to replace the B-52 with a new bomber of equal or greater capability. It stated, as a part of its rationale for this rejection, that it appeared the reduction was based on the reduced need for nuclear-capable bombers and did not take into consideration a growing need for long-range conventional strike capabilities.[54] The Senate agreed to permit the Air Force to retire

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[52] Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

[53] U.S. Senate, Committee on Armed Services, Hearing on Global Strike Plans and Programs. Testimony of James E. Cartwright, Commander U.S. Strategic Command. March 29, 2006.

[54] U.S. Congress. House. Committee on Armed Services. National Defense Authorization (continued...)

18 B-52 aircraft, but stated that it expected no further reduction in the size of the force, noting that a further reductions might "prevent our ability to strike the required conventional target set during times of war."[55] The Conference Committee (H.R. 5122, Sec. 131) combined these two provisions, allowing the retirement of no more than 18 aircraft, and mandating that the Air Force retain at least 44 "combat coded" aircraft. These restrictions are to remain in place until 2018, or until a new long-range strike aircraft "with equal or greater capability than the B-52H model aircraft" attained initial operational capability, if that occurred first. Congress also stated that no funds could be spent to retire any B-52 aircraft until the Secretary of the Air Force submitted a report to Congress that described the Air Force plan for the modernization of the B-52, B-1, and B-2 bomber fleets; how many bombers would be assigned two nuclear and conventional missions if the United States had to execute "two overlapping `swift defeat' campaigns;" a justification of the cost and projected savings of any reductions to the B-52H bomber aircraft fleet; the life expectancy of each bomber aircraft to remain in the bomber force structure and the capabilities of the bomber force structure that would be replaced by a new bomber aircraft.

The growing interest in long-range strike capabilities, and the continuing addition of precision conventional weapons to these aircraft, demonstrates that the Pentagon and STRATCOM view the U.S. bomber fleet as essential to U.S. conventional weapons capabilities. Further, the need for long-range strike capabilities, rather than an interest in maintaining the nuclear role for bombers, appears to be driving decisions about the size and structure of the bomber fleet. There are some indications that, during the discussions on the QDR, some in the Pentagon argued that the all the B-52 bombers should be removed from the nuclear mission. Both the House and the Senate, in their response to the Administration's request, also focused on the ability of the Air Force to meet its conventional weapons needs with a smaller bomber fleet.

Weapons. The B-52 bomber is equipped to carry both the Air-Launched cruise missile (ALCM) and Advanced Cruise Missile (ACM). The ACM reportedly has a modified design with a lower radar cross-section, making it more "stealthy" than the ALCM. According to Air Force figures, the United States currently has 1,142 ALCMs and 460 ACMs.[56] Although these weapons represent a majority of the weapons that U.S. bombers could carry on nuclear missions, the Department of Defense is reportedly pursuing a study of the future role of these missiles in the U.S. force mix. With the growing interest in conventional strike capabilities, there may be a declining interest in maintaining the force of nuclear-armed cruise missiles.

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[54] (...continued)
Act for Fiscal Year 2007. House Report. 109-452. May 5, 2006. p. 103.

[55] U.S. Congress Senate. National Defense Authorization Act for Fiscal Year 2007. S.Rept. 109-254. May 9, 2006. p. 94.

[56] The Air Force also has 289 ALCMs that have been converted to carry conventional warheads (CALCMs). See Michael Sirak. DOD Studies Future Role of Nuclear-Armed Cruise Missiles. Defense Daily, March 30, 2006.

Both the ALCM and ACM are currently undergoing life-extension programs so that they can remain in service through 2030.[57] Both cruise missiles also carry the W-80 warhead, which was scheduled to for a life-extension program. However, the Department of Defense has recently indicated that it no longer plans to support the W-80 refurbishment program, raising further questions about the future role of nuclear-armed cruise missiles in the U.S. arsenal.[58]

Under the START II Treaty, the United States would have had to count the total number of nuclear weapons the B-2 and B-52 bombers were equipped to carry under its allocation of permitted warheads. These warheads would have counted even if the bombers were equipped to perform conventional missions, unless the bombers were altered so that they could no longer carry nuclear weapons. Under the Moscow Treaty, however, the United States will only count as "operationally deployed" those nuclear weapons stored at bomber bases, excluding a small number of spare warheads. It does not intend to alter any bombers so that they cannot carry nuclear weapons. Consequently, the number of bomber weapons could decrease in the future, even without changes to the numbers of deployed bombers, as the United States retires weapons or removes them from storage areas at Minot, Barksdale, and Whiteman Air Force Bases.

Future Bomber Plans. The Air Force has begun to plan for the development of a new strategic bomber, with its possible introduction into the fleet in around 2018. According to Air Force Secretary Michael Wynne, the service is seeking a bomber with not only stealth capabilities and long range, but also one with "persistence," one that can "stay airborne and on call for very long periods." [59] The start of the study on a new bomber, known as an Analysis of Alternatives (AOA) has been delayed in recent months by a dispute over whether the study should stand alone or be merged with another AOA on prompt global strike (PGS). While a future bomber could be a part of the PGS mission, other systems, such as hypersonic technologies and missiles, would also be a part of the effort to strike anywhere around the world at long range. General Cartwright of STRATCOM has reportedly supported a plan to merge the two efforts, so that the considerations of capabilities for a new bomber would be measured along side other systems, both to balance the force and avoid redundancy across the force.[60] On the other hand, the Air Force Chief of Staff, General T. Michael Moseley, reportedly preferred to keep the two studies separate. He has argued that a bomber with long-range strike capabilities must have "persistent, survivable, and penetrating capabilities" while a platform with

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[57] Robert S. Norris and Hans M. Kristensen. U.S. Nuclear Forces, 2006. Bulletin of the Atomic Scientists. January/February 2006.

[58] According to S.Rept. 109-274, Energy and Water Appropriations Bill 2007, the Nuclear Weapons Council and Department of Defense no longer support the W80 Life Extension activities. As a result, both the House (H.R. 5427) and Senate Appropriations Bills eliminate funding for this effort.

[59] Christie, Rebecca. Air Force To Step Up New Bomber Search in Next Budget. *Wall Street Journal*. June 29, 2006.

[60] Grossman, Elaine M. Cartwright Wants to See Strike Studies Await "Discovery" Process. InsideDefense.Com. April 6, 2006.

PGS capabilities could be "standoff weapon that is very, very fast."[61] This position reportedly prevailed, with the Air Force deciding, in May 2006, to keep the two studies separate.[62]

This dispute reveals wide-ranging differences, within the Air Force and Pentagon, about the goals for and capabilities that should be sought in a new bomber program. The dispute focuses, however, on conventional capabilities; it seems to be almost a foregone conclusion that nuclear capabilities, or the need for a bomber leg of the nuclear triad, will not drive the discussion or analysis.

Issues for Congress

This report focuses on the numbers and types of weapons in the U.S. strategic nuclear force structure. It does not address the broader question of why the United States chooses to deploy these numbers and types of weapons, or more generally, the role that U.S. nuclear weapons play in U.S. national security strategy. This question is addressed in other CRS reports.[63] However, as Congress reviews the Bush Administration's plans for U.S. nuclear forces, and assesses how the United States might alter its force structure, it could address broader questions about the relationship between these forces and the role of nuclear weapons.

Force Size

The Bush Administration has argued that, because the United States and Russia are no longer enemies, the United States will not size or structure its nuclear forces simply to deter the "Russian threat." Instead, nuclear weapons will play a broader role in U.S. national security strategy. Specifically, the United States will maintain nuclear weapons to *assure* allies and friends of the U.S. commitment to their security, to *dissuade* potential adversaries from challenging the United States with nuclear weapons or other "asymmetrical threats," to *deter* adversaries by promising an unacceptable amount of damage in response to an adversary's attack, and to *defeat* enemies by holding at risk those targets that could not be destroyed with other types of weapons.[64] Further, says DOD, the United States will develop and maintain the capabilities it needs to counter the capabilities of a wider range of adversaries under

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[61] Bennet, John T. Internal Squabbles Holding Up Bomber Study, USAF Official Says. InsideDefense.com. April 21, 2006.

[62] Matishak, Martin. Long-Range, Prompt Global Strike Studies Will Remain Separate. InsideDefense.com. June 16, 2006.

[63] See, for example, CRS Report RL31623, U.S. Nuclear Weapons: Changes in Policy and Force Structure, by Amy F. Woolf.

[64] U.S. Department of Defense. Special Briefing on the Nuclear Posture Review. News Transcript. January 9, 2002. These are the same four defense policy goals outlined in the Quadrennial Defense Review for the whole of the U.S. military. See U.S. Department of Defense. Quadrennial Defense Review Report. September 30, 2001. p. 11.

a wider range of circumstances. It has designated these circumstances as immediate contingencies, potential contingencies, and unexpected contingencies.[65]

The 2001 Nuclear Posture review determined that the United States would need to maintain between 1,700 and 2,200 operationally deployed nuclear warheads to achieve the goals outlined above. The Bush Administration also indicated that the United States would maintain in storage many of the warheads removed from deployed forces, and would maintain the capability to restore some of these warheads to the deployed forces to meet unexpected contingencies. This option could increase the size of the U.S. deployed force to more than 3,000 warheads. The Administration has indicated that all four of the objectives noted above contribute to the decision on U.S. force size, in contrast with the past when deterrence and defeat of Russia dominated force size decisions.[66]

Some analysts have questioned why the United States must maintain such a large force of nuclear weapons if it is not planning to use its forces against a "Russian threat." They have questioned whether the United States would attack with such a large number of weapons if its own national survival were not at risk, and they note that only Russia currently has the capability to threaten U.S. national survival. They assert that the United States could likely meet any other potential contingency with a far smaller force of nuclear weapons. Therefore, some have asked why, in the absence of a threat from Russia, must the United States maintain a force of 2,200 nuclear warheads.

The Bush Administration disputes this view, noting that the United States has other potential adversaries, and, even if these nations do not possess thousands of nuclear warheads, some may expand their nuclear forces or chemical and biological capabilities in the future. And, it has asserted that the need to assure allies and dissuade potential adversaries could require a force of significant size, regardless of the number of potential targets a nation might possess.

Force Structure

When the Bush Administration announced the results of the Nuclear Posture Review, it indicated that the United States would retain a triad of ICBMs, SLBMs, and heavy bombers for the foreseeable future. But it did not offer a rationale for the

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[65] U.S. Department of Defense. Annual Report to the President and Congress. Donald H. Rumsfeld, Secretary of Defense. Washington, 2002. p. 88.

[66] In testimony before the Senate Armed Services Committee, Secretary of Defense Rumsfeld said, "The U.S. nuclear arsenal remains an important part of our deterrence strategy and it helps to dissuade the emergence of potential or would- be peer competitors by underscoring the futility of trying to sprint towards parity with us or, indeed, superiority. I would add that it also assures our friends and allies that indeed our capability is sufficient; and in some instances, nations that have the ability to develop nuclear weapons, because they're our friends and allies, recognize they have no need to do so." See U.S. Senate. Committee on Armed Services. Hearing on The Strategic Offensive Reductions Treaty. July 25, 2002.

retention of this traditional "triad." The absence of a rationale makes it difficult to predict possible future trends for any of the three legs of the triad.

As was noted above, most discussions about the bomber force focus on how many bombers, and what types of bomber weapons, the United States needs to bolster its conventional long-range strike capability. There is little, if any, discussion about the role that bombers may play in either nuclear deterrence, or, if deterrence fails, in the launch of U.S. nuclear weapons. It is not surprising that some in the Air Force and Pentagon have questioned the continuing need for nuclear-capable bombers.

It is similarly hard to predict the future size of the ICBM force in the absence of any statements about the unique, or complementary, role that ICBMs may play in the U.S. nuclear deterrent posture in the future. In the past, analysts have argued that single-warhead ICBMs bolster crisis stability, and discourage efforts by an adversary to launch a disarming first strike, because the cost of the strike, as measured by the number of attacking warheads, would exceed the benefits, as measured by the number of warheads destroyed. This, when combined with the high accuracy and prompt responsiveness of ICBM warheads, argued for a substantial fleet of 500 or more ICBM launchers. But one does not hear similar arguments in current discussions. If the goal is simply to retain 500 (or fewer) warheads based on land, then a force of 150-200 Minuteman missiles could be sufficient.

The Trident fleet seems less vulnerable to the absence of a rationale for a triad of strategic delivery vehicles. It is currently carries more than half of the U.S. deployed nuclear warheads, and this percentage will likely hold steady, or even increase, as the United States continues to reduce its forces to the levels mandated by the Moscow Treaty. With its ability to remain invulnerable to detection and attack, and with the increasing accuracy and reliability of its missiles and warheads, the Trident fleet will continue to represent the "backbone" of the U.S. nuclear force. Further, in the absence of arguments about the need for complementary capabilities and redundancy, it is possible to imagine that, in the future, the Trident fleet could represent almost the totality of the U.S. nuclear force.

There have not been any public statements from the Bush Administration, in general, or STRATCOM, in particular, in support of a nuclear force so dominated by the sea-based leg of the triad. However, the downward pressures on both the bomber and ICBM legs are both evident in the report of the 2006 Quadrennial Defense Review. Therefore, it is possible to ask whether these changes in the bomber fleet and ICBM force represent the last of the changes that the Bush Administration is likely to make, or the first changes in a larger effort to resize and restructure the U.S. nuclear force. If similar efforts to reduce the nuclear role of heavy bombers and the reduce the number of deployed ICBMs are evident in the FY2008 budget request, the 110th Congress may again address these issues during the annual authorization and appropriations debates.

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