Backgrounder
No. 2646
January 27, 2012
Published by The Heritage Foundation

Time to Modernize and Revitalize the Nuclear Triad

Baker Spring and Michaela Bendikova

Abstract: *The U.S. nuclear triad of heavy bombers, intercontinental-range ballistic missiles (ICBMs), and submarine-launched ballistic missiles (SLBMs) is aging. The nuclear testing moratorium, which has reached nearly two decades, and the required reductions under New START are magnifying questions about the U.S. nuclear arsenal's reliability. These growing questions will eventually undermine the credibility of the U.S. nuclear deterrent to both allies and potential enemies. Reversing this atrophy will require significant investments in modernizing the U.S. nuclear weapons arsenal.*

In today's multipolar proliferated environment, the United States needs to maintain and modernize its nuclear weapons arsenal and rejuvenate its industrial nuclear weapons complex. The United States is the only nuclear power without a substantial modernization program. Russia and China have been fielding new nuclear capabilities on a regular basis, and North Korea and Iran are emerging as regional nuclear powers with the potential to disrupt and threaten the interests of the U.S. and its allies. As the bipartisan Congressional Commission on the Strategic Posture of the United States (the Schlesinger–Perry Commission) stated:

> The triad of strategic delivery systems continues to have value. Each leg of the nuclear triad, comprised of heavy bombers, intercontinental-range ballistic missiles (ICBMs), and sub-

Talking Points

- The United States is the only nuclear power without a substantial nuclear modernization program.
- The Obama Administration's commitment to nuclear modernization did not survive the first year after New START's entry into force.
- The triad of strategic systems—bombers, intercontinental-range ballistic missiles, and submarines—is necessary to guarantee the security of the United States and its allies, and it is in dire need of a comprehensive overhaul.
- Arms control for the sake of arms control damages the U.S. strategic posture, gives potential U.S. adversaries strategic advantage, and raises doubts about U.S. commitment to nuclear protection of its allies.
- "Nuclear zero" is a fantasy divorced from realities of the current strategic environment because it requires the cooperation of all nuclear powers. China, Russia, and North Korea have no desire to give up their nuclear weapons, and Iran is highly unlikely to abandon its nuclear weapons program.

This paper, in its entirety, can be found at:
http://report.heritage.org/bg2646

Produced by the Douglas and Sarah Allison Center for Foreign Policy Studies

Published by The Heritage Foundation
214 Massachusetts Avenue, NE
Washington, DC 20002–4999
(202) 546-4400 • heritage.org

Nothing written here is to be construed as necessarily reflecting the views of The Heritage Foundation or as an attempt to aid or hinder the passage of any bill before Congress.

> marine-launched ballistic missiles (SLBMs), provides unique contributions to stability. As the overall force shrinks, their unique values become more prominent.[1]

President Barack Obama has expressed support for modernization of the U.S. nuclear arsenal, but the Administration now appears to be backing out of its commitment.

In 2010, General Kevin Chilton, commander of the U.S. Strategic Command, stated regarding the U.S. stockpile arsenal:

> I do not agree that it is more than is needed. I think the arsenal that we have is exactly what is needed today to provide the deterrent. And I say this in light of—when we talk about the non-deployed portion of the arsenal, it is sized to be able to allow us to hedge against both technical failures in the current deployed arsenal and any geopolitical concerns that might…cause us to need more weapons deployed.[2]

General Chilton's statement calls into question the rationale that the Obama Administration is now developing for further nuclear reductions and abandoning the nuclear triad. Yet as Secretary of Defense Leon Panetta has stated, the United States is headed for a future without the nuclear triad if sequestration under the Budget Control Act of 2011 proceeds.[3] The Bush Administration's 2001 Nuclear Posture Review recognized the importance of other elements of the U.S. strategic posture, namely nuclear and nonnuclear offensive strike systems, active and passive defenses, and a revitalized defense infrastructure to provide new capabilities in a timely fashion to meet emerging threats.[4] The following analysis considers only the nuclear component. The United States needs to increase investments in its nuclear weapons complex and reverse two decades of deterioration.

Continuing Utility of the Triad

The U.S. "nuclear umbrella" contributed more to the nonproliferation regime than any Cold War arms control treaty ever signed because it discouraged U.S. allies from developing or expanding their own nuclear arsenals. Even after the end of the Cold War, U.S. nuclear weapons are essential to deterring attacks on the U.S. homeland and forward-deployed troops and to assuring more than 30 countries through U.S. nuclear security guarantees. As Lieutenant General Frank Klotz, then-commander of the Air Force Global Strike Command, stated:

> [T]he Command was founded on the premise that as important as other defense priorities may be, none are more important than the responsibility for operating, maintaining, securing and supporting nuclear weapons. For if there is one unchanging, immutable truth about this awesome capability, it is that it demands constant and undivided attention.[5]

During the ratification process of the New Strategic Arms Reduction Treaty (New START), Principal

1. Congressional Commission on the Strategic Posture of the United States, "America's Strategic Posture: The Final Report of the Congressional Commission on the Strategic Posture of the United States," United States Institute of Peace, 2009, p. 100, at *http://www.usip.org/files/America%27s_Strategic_Posture_Auth_Ed.pdf* (November 12, 2011).
2. General Kevin Chilton, "The New START Treaty (Treaty Doc. 111–5): Views from the Pentagon," testimony before the Committee on Foreign Relations, U.S. Senate, July 16, 2010, at *http://foreign.senate.gov/hearings/hearing/?id=3859b691-5056-a032-5223-fe01a9e1e496* (November 21, 2011).
3. Press release, "Statement by Senators McCain and Graham on Secretary Panetta's Letter Detailing 'Devastating' Impact of Sequester," Office of Senator John McCain, November 14, 2011, at *http://mccain.senate.gov/public/index.cfm?FuseAction=PressOffice.PressReleases&ContentRecord_id=a4074315-fd3e-2e65-2330-62b95da3b0e9* (November 28, 2011).
4. Donald H. Rumsfeld, foreword of "Nuclear Posture Review Report," 2002, at *http://www.defense.gov/news/Jan2002/d20020109npr.pdf* (November 30, 2011).
5. Lieutenant General Frank G. Klotz, "Status of the Air Force Nuclear Security Roadmap," testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate, March 17, 2010, at *http://216.109.75.135/e_research/source_docs/us/congress/house_representatives/16.pdf* (January 10, 2012).

Strengths of the Nuclear Triad

Heavy Bombers

- Can ratchet their readiness levels up or down to demonstrate policy intent.
- Can be dispersed among bases to enhance survivability.
- Can be recalled en route to target to demonstrate national willingness to resolve an issue.
- Provide the widest array of yield options.
- Can carry a comparatively large number of weapons with different capabilities, both nuclear and conventional.
- Impose a significant cost burden by compelling potential adversaries to invest in advanced air defenses.

ICBMs

- Are the most responsive leg of the triad.
- Can be launched faster and reach targets faster than the other two legs of the triad.
- Deployed in hardened silos would tend to force an opponent to exhaust his own nuclear forces to disarm U.S. ICBMs, leaving the opponent vulnerable to a U.S. retaliatory strike. Without ICBMs, as few as five nuclear warheads could successfully disarm the U.S.
- Cannot be destroyed in significant numbers by a preemptive strike by small nuclear powers for the foreseeable future.
- Cost the least to operate of the three legs.

SLBMs

- Are the most survivable leg of the nuclear triad.
- Complicate opponents' calculus when contemplating an attack on the U.S.
- Deploying more ballistic missile submarines (SSBNs) at sea can signal an increase in U.S. concern and alert level.
- Surfacing SSBNs or returning them to the port can signal an easing of tensions.
- This ability to signal can increase U.S. deterrence.

Deputy Under Secretary of Defense for Policy James Miller emphasized the importance of maintaining the triad of strategic nuclear forces: "Because the United States will retain a diverse Triad of strategic forces, any Russian cheating under the Treaty [New START] would have little effect on the assured second-strike capabilities of U.S. strategic forces"[6]

However, since New START entered into force, it has become clear that the United States will need to reduce its forces substantially to comply with the treaty limits, while the Russian Federation can add many more delivery systems.[7] Moreover, as Russian experts have pointed out, Russia's new heavy ICBMs and new SLBMs can have the capability and accuracy to threaten the United States' ICBMs in a first strike.[8]

Each leg of the triad has unique features and attributes that are essential for keeping the U.S. nuclear deterrent credible to both U.S. allies and adversaries. ICBMs are the cheapest, most reliable leg of the U.S. triad and can respond faster to a threat than any other leg of the triad. Heavy bombers allow

6. James N. Milles, statement before the Committee on Armed Services, U.S. Senate, July 20, 2010, at *http://armed-services.senate.gov/statemnt/2010/07%20July/Miller%2007-20-10.pdf* (November 22, 2011).
7. U.S. Department of State, "New START Treaty Aggregate Numbers of Strategic Offensive Arms," June 1, 2011, at *http://www.state.gov/t/avc/rls/164722.htm* (November 21, 2011).
8. Mark B. Schneider, "After New START," *National Review*, July 21, 2011, at *http://www.nationalreview.com/articles/272340/after-new-start-mark-b-schneider* (November 21, 2011).

policymakers to display policy intent and can be dispersed among bases to increase survivability, and they provide a wider range of yield options. Submarines can be deployed to demonstrate intent, and are the most survivable leg of the nuclear triad.

1251 Report Commitments and the President's Disarmament Agenda

During the New START debate, the Obama Administration made a commitment to nuclear modernization under substantial pressure from some U.S. Senators. Yet President Obama's dangerous commitment to a world without nuclear weapons clashes with a commitment to modernize nuclear weapons at some point.[9] In the current tight fiscal environment, the Administration will be under pressure to forgo investments in weapons that it ultimately does not believe should exist.

The Administration's conclusion of New START, which codified unilateral U.S. nuclear weapon reductions, and its commitment to the Comprehensive Test Ban Treaty (CTBT), raise the question of whether the Administration will fulfill its promise to modernize U.S. nuclear weapons.

New START's Waning Promises. The Administration's nuclear modernization plan was outlined in the classified Section 1251 of the National Defense Authorization Act of 2010 (the 1251 Report). The Administration promised to invest more than $85 billion over the next decade to modernize the U.S. nuclear weapons complex.

However, the word "modernize" comes with significant caveats. The Obama Administration's stated policy is not to develop new nuclear warheads, give nuclear weapons new military missions, or provide them with new military capabilities.[10] Thus, the Administration's modernization plans amount to sustainment, leaving the United States with nuclear warheads that were last tested in 1992.

All U.S. warheads were designed during the Cold War when weapon yield was the primary consideration, and it was assumed the United States could test weapons if a reliability problem developed. The U.S. nuclear arsenal might not be best suited to deter nonstate actors with weapons of mass destruction or states with smaller nuclear arsenals because their yield would cause massive casualties disproportionate to the hostile aggression incurred.

"Aged" would be a better description of these systems today.[11] This raises a credibility problem. New nuclear-armed actors might not believe that a U.S. President would authorize a massive retaliation attack, the mission for which the current U.S. nuclear arsenal is best suited, in response to a comparatively smaller-scale nuclear attack.

Commitment to "Zero" Versus Modernization. More problematic is President Obama's lack of credibility in his promise to modernize the U.S. nuclear arsenal. The House and Senate Appropriations Committees, not the Administration, appropriate funds for the U.S. nuclear weapons complex. Further complicating the matter, nuclear weapons activities are considered in the Energy and Water Development Subcommittee, where they compete against local water improvements and dam projects for funding. Justifying any increase in nuclear weapon activities spending requires a significant concerted effort by the Administration, the Department of Defense, and the Department of Energy. Yet the Administration has yet to offer more than unsubstantiated promises.

While the Administration requested $7.1 billion for nuclear weapon activities in fiscal year 2011, the House Energy and Water Development Subcommittee cut $500 million from this request, and its Senate counterpart cut $440 million.[12] The Obama Administration has made little concerted effort to prevent these cuts. With the looming defense bud-

9. Barack Obama, "Remarks by President Barack Obama," speech given in Prague, April 5, 2009, at *http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/* (November 21, 2011).
10. Congressional Commission on the Strategic Posture of the United States, "America's Strategic Posture," p. xiv.
11. Bill Gertz, "General: Prioritize Nuclear Upgrades in Budget," *The Washington Times*, November 22, 2011, at *http://www.washingtontimes.com/news/2011/nov/22/general-prioritize-nuclear-upgrades-in-budget/* (November 28, 2011).
12. Mark Schneider, "Nuclear Modernization," *The Weekly Standard*, October 10, 2011, at *http://www.weeklystandard.com/articles/nuclear-modernization_594674.html* (November 10, 2011).

get cuts, funding nuclear weapons activities, modernization programs, or new systems for each of the legs of the triad will become increasingly difficult. Without these investments, the United States will move to a de facto dyad or monad, making itself vulnerable to the enemies that it will face in a multipolar nuclear proliferated environment.

Comprehensive Test Ban Treaty. In an April 2009 speech, President Obama stated that "to achieve a global ban on nuclear testing, my administration will immediately and aggressively pursue U.S. ratification of the Comprehensive Test Ban Treaty."[13] In reality, the U.S. Senate had already rejected the treaty in 1999 by a majority vote, an outcome that reflected its fundamental problems with the treaty's substance and verification provisions. Yet instead of fixing the flaws, the Obama Administration decided to return the treaty as is to the Senate for consideration. The case for the CTBT remains at least as unconvincing as it was in 1999, if not worse since there is now evidence of Russian and Chinese nuclear testing after they became signatory states of the CTBT.[14] The U.S. nuclear testing moratorium has not convinced North Korea to forgo developing its own nuclear weapons or prevented Russia from conducting very-low-yield nuclear weapons tests.[15]

Credibility Essential. While survivability is an important issue for maintaining the triad, the current environment requires the United States to have a robust nuclear and conventional capability to enable the President to respond appropriately under a wide range of circumstances. Today, the list of potential targets is broader and evolving more rapidly than ever before as new players armed with nuclear weapons continue to emerge. For example, elimination of the ICBM leg of the triad would reduce the number of U.S. nuclear weapons targets for the Chinese and the Russians from 455 to five.[16]

Credibility—whether an enemy actor believes the United States will come to the aid of its allies—is a key consideration for any opponent when deciding whether to launch an attack. Deterrence is inherently speculative, and credibility depends on many factors. In the current environment, the United States needs the capability to hold at risk both Russian (or Chinese) hardened silos and what the dictator in North Korea or the mullahs in Iran value.

However, the United States should take care not to project its own views onto its adversaries, who manifestly do not share them. Neither the North Korean dictatorship nor the Iranian leadership care about their populations, but they do care about their own survival. The United States has weapons to threaten populations of both states, but not the targeted low-yield nuclear weapons that could decapitate enemy leadership in buried bunkers. In addition, the United States needs the credibility to protect its allies. Saddam Hussein's attacks on Israel during the First Gulf War, aimed to provoke an Israeli retaliation and disrupt the coalition, are a testament to that fact that the weapons in the U.S. arsenal may not actually deter opponents.

An opponent will not be deterred unless he believes that the United States will use its capabilities to protect its own interests and those of its allies. U.S. adversaries will be more likely to attack if they believe the United States is unwilling, self-deterred, or incapable of responding on a credible basis. Weakness invites aggression. To that end, experts at The Heritage Foundation have proposed a "protect and defend" strategic posture for the U.S. that would move away from the retaliation-based strategic posture of the Cold War toward a more defensive posture that is adapted to the emerging

13. Obama, "Remarks by President Barack Obama."
14. Baker Spring, "U.S. Should Reject Ratification of the Comprehensive Test Ban Treaty," Heritage Foundation *WebMemo* No. 3272, May 26, 2011, at *http://www.heritage.org/Research/Reports/2011/05/US-Should-Reject-Ratification-of-the-Comprehensive-Test-Ban-Treaty.*
15. Congressional Commission on the Strategic Posture of the United States, "America's Strategic Posture," p. 83.
16. Mark B. Schneider, "The Nuclear Forces and Doctrine of the Russian Federation and the People's Republic of China," testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. House of Representatives, October 14, 2011, at *http://armedservices.house.gov/index.cfm/files/serve?File_id=eac8fcf5-78d5-4cf4-92cd-cf275f03f70b* (January 11, 2012).

international structure.[17] To the greatest extent possible, this defensive posture would employ offensive and defensive forces and conventional and nuclear forces to defeat any strategic attack on the U.S. and its allies, as opposed to continuing the Cold War strategy of maintaining deterrence through the threat of mutually assured destruction by a devastating counterstrike.

The United States should take care not to project its own views onto its adversaries, who manifestly do not share them. Neither the North Korean dictatorship nor the Iranian leadership care about their populations.

While some argue that the United States does not need to develop new nuclear weapons and that it would serve world security better by moving toward a minimal deterrence posture, [18] the conditions enabling a move toward the minimal deterrence posture are not present in the current international environment. In fact, there is no minimum number of weapons that the United States should have because the factors that influence the number are changing too quickly. It is better to be overinsured than underinsured.[19] Flexibility and resilience, the essential attributes of the credible U.S. force posture, are more important than reducing the number of U.S. nuclear weapons. A dyad or monad of systems, especially of aged systems, does not provide the needed flexibility or resilience. Ultimately, it might sufficiently convey U.S. willingness to resolve an issue or to intervene to protect its interests.

Yet despite the emergence of new nuclear-weapon states, the Obama Administration has made achieving a nuclear-free world a high priority. This is misguided because a nuclear-free world requires the cooperation of other countries. None of the current nuclear-weapon states share this goal or are willing to cooperate substantially in achieving it. In fact, several actors (e.g., Russia and China) are working against this vision by supplying Iran, North Korea, and other rogue nations with sensitive nuclear technologies.

The Nuclear Posture Review Implementation

Recently, President Obama instructed his Cabinet members to review implementation of the Nuclear Posture Review (NPR). A reasonable strategic approach would look at the international environment and the threat or combination of threats the United States could face in the future. Based on this threat assessment, the appropriate agencies would set the military requirements and the size of the nuclear force needed to meet those requirements.

The Obama Administration has chosen a less reasonable approach. White House arms control coordinator Gary Samore openly admits that the review's purpose is to reduce the U.S. nuclear weapons arsenal even further: "We'll need to do a strategic review of what our force requirements are, and then, based on that, the president will have options available for

17. Baker Spring, "Congressional Commission Should Recommend a 'Damage Limitation' Strategy," Heritage Foundation *Backgrounder* No. 2172, August 14, 2008, at *http://www.heritage.org/research/reports/2008/08/congressional-commission-should-recommend-damage-limitation-strategy*, and "Toward an Alternative Strategic Security Posture," Heritage Foundation *WebMemo* No. 2183, January 2, 2009, at *http://www.heritage.org/research/reports/2009/01/toward-an-alternative-strategic-security-posture*.
18. Robert S. Norris, Hans Kristensen, and Ivan Oelrich, "From Counterforce to Minimal Deterrence: A New Nuclear Policy on the Path Toward Eliminating Nuclear Weapons," April 2009, Federation of American Scientists and Natural Resources Defense Council, at *http://docs.nrdc.org/nuclear/files/nuc_10042901a.pdf* (November 30, 2011).
19. Keith B. Payne, "Assessment of the Strategic Posture of the United States: Challenges and Opportunities," testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. House of Representatives, March 2, 2011, at *http://armedservices.house.gov/index.cfm/files/serve?File_id=e0f547b4-64f6-4ea2-ab91-c64197738cb6* (November 30, 2011).

additional reductions."[20] This approach assumes further U.S. reductions before even considering other nuclear weapon states' modernization programs and their hostility toward U.S. interests.

Troubling Proliferation and Modernization Trends

While the United States is unilaterally reducing its nuclear weapon stockpile, other countries are building up their nuclear forces, modernizing their systems, and reducing the U.S. quantitative and qualitative advantage in nuclear weapons.[21] This trend is alarming, especially considering the long-standing "second to none" principle of U.S. nuclear deterrence, which stipulated that the United States will be better armed than any combination of its adversaries.

Russia. Nuclear weapons play a prominent role in the Russian military strategy. Russia has adopted a nuclear escalation strategy that permits the use of nuclear weapons in local and regional conventional wars. Moscow has invested significant resources into rejuvenating its long-range and short-range nuclear arsenal. Its modernization plans include new Bulava SLBMs, eight new Borey-class submarines, new fifth-generation missile submarines, and improved Sineva, Liner, and Arbalet SLBMs.[22] Russia may also be developing new rail-mobile ICBMs, which could cause particular problems because rail-mobile ICBMs are not specifically defined in New START and therefore might be excluded from the treaty limits.[23] In addition, Russia deploys thousands of tactical nuclear weapons and actually plans on using them on the battlefield. Its nuclear escalation strategy characterizes the first use of a nuclear weapon as a means to "de-escalate" the conflict.[24]

Russia has adopted a nuclear escalation strategy that permits the use of nuclear weapons in local and regional conventional wars.

China. The People's Republic of China has one of the most active nuclear modernization programs. Beijing is also investing significant resources into ballistic missile defense and space warfare capabilities. Richard Fisher, Senior Fellow at the International Assessment and Strategy Center, has stated that "deterring the range of nuclear and missile threat they [China and its nuclear proxies North Korea, Pakistan, and Iran] can generate will not be accomplished by an aging U.S. strategic force of fewer weapons and fewer types of weapons."[25] Complicating matters, China has an extensive network of underground tunnels totaling as much as 3,110 miles, according to Michael Turner (R–OH), Chairman of the Strategic Forces Subcommittee of the House Armed Services Committee.[26] This allows China to hide its real capability and makes it virtually impossible for the United States to target its nuclear forces regardless of how many nuclear weapons the U.S. possesses. China could exploit these tunnels to its advantage, such as in regard to Taiwan, or transfer nuclear weapons expertise to other players, as it has to Pakistan and North Korea.

20. Bill Gertz, "Nuclear-Cut Review," *The Washington Times*, September 21, 2011, at *http://www.washingtontimes.com/news/2011/sep/21/inside-the-ring-968086205/* (November 6, 2011).
21. Robert Joseph, "Second to One: America's Dangerous Loss of Nuclear Parity," *National Review*, October 17, 2011.
22. Schneider, "The Nuclear Forces and Doctrine of the Russian Federation and the People's Republic of China."
23. New START Working Group, "New START: Potemkin Village Verification," Heritage Foundation *Backgrounder* No. 2428, June 24, 2010, at *http://www.heritage.org/Research/Reports/2010/06/New-START-Potemkin-Village-Verification*.
24. Mark Schneider, "The Nuclear Forces and Doctrine of the Russian Federation," *Comparative Strategy,* Vol. 27, No. 5 (November 2008), p. 397.
25. Richard D. Fisher, "Questions Regarding China's Future Strategic Nuclear Capabilities," testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. House of Representatives, October 14, 2011, at *http://armedservices.house.gov/index.cfm/files/serve?File_id=ad364d83-49cd-42f7-a26d-0a329d28fe4d* (January 11, 2012).
26. Agence France-Presse, "US Worries over China's Underground Nuclear Network," Google News, October 14, 2011, at *http://www.google.com/hostednews/afp/article/ALeqM5iHO_kCCLQm86s29jw45FIx6EkdLQ?docId%3DCNG.19cbae00c31007ab44469985e8a939e2.6a1* (November 14, 2011).

Other Countries. *No other nuclear power has adopted a nuclear weapons policy that precludes the development of new nuclear weapons.* Nearly all other nuclear weapon states and undeclared nuclear weapon states modernize their strategic arsenals. France, the United Kingdom, India, Pakistan, and North Korea have been working on improving their nuclear weapon capabilities. Iran, a non–nuclear weapon state under the Nonproliferation Treaty (NPT), is aggressively pursuing a nuclear weapons program and is in violation of its NPT commitments.

In 2030, when the United States plans to start replacing its systems, it will have 60-year-old ICBMs, 40-year-old SLBMs, and 35-year-old to 70-year-old bombers.

Iran is accelerating its nuclear weapons program. The head of Iran's Atomic Energy Organization has reported that by the end of this year Iran will triple the amount of uranium it has enriched to a level of 20 percent.[27] According to British Foreign Secretary William Hague, Iran has "been carrying out covert ballistic missile tests and rocket launches, including testing missiles capable of delivering a nuclear payload."[28] The nose cone of the Shahab-3 ballistic missile has been redesigned to carry a nuclear warhead and an International Atomic Energy Agency (IAEA) report stated that Iran is close to producing a nuclear warhead, which could be placed on an intermediate-range ballistic missile.[29] Iran's missile tests have also implied an interest in launching an electromagnetic pulse (EMP) attack by detonating warheads in the atmosphere. Based on official U.S. estimates, Iran will become a nuclear-armed ICBM threat to the U.S. as early as 2015.[30]

U.S. Capability to Build New Systems in Danger

The United States produced its last new nuclear warhead in 1989.[31] The country has not developed a new bomber, ICBM, or ballistic missile submarine since then. In 2030, when the United States plans to start replacing its systems, it will have 60-year-old ICBMs, 40-year-old SLBMs, and 35-year-old to 70-year-old bombers. A Trident SLBM replacement is not projected until 2042.[32] The defense industrial complex has been focused on sustaining strategic delivery systems and nuclear warheads instead of developing new and better systems. This will make modernizing and developing new systems more difficult in the future. The longer the United States waits to build new systems, the worse the situation will become. "We have reached one of those critical points where investment is required to sustain the weapons and performed [*sic*] the necessary life extension on the weapons, as well as to upgrade the complex," General Kehler said recently.[33]

Warhead Modernization Is Essential

The United States has not developed a new nuclear warhead for nearly 20 years and all of the warhead designers and engineers with actual test

27. Henry F. Cooper and Robert L. Pfaltzgraff Jr., "Meeting the Iranian Threat," *National Review*, October 17, 2011, at *http://www.nationalreview.com/articles/280273/meeting-iranian-threat-henry-f-cooper* (November 29, 2011).
28. CNN, "Iran Testing Missiles That Could Carry Nuclear Weapon, UK's Hague Says," June 29, 2011, at *http://articles.cnn.com/2011-06-29/world/iran.missiles.tests_1_nuclear-program-nuclear-activities-peaceful-nuclear-technology* (November 4, 2011).
29. International Atomic Energy Agency, Board of Governors, "Implementation of the NPT Safeguards Agreement and Relevant Provisions of Security Council Resolutions in the Islamic Republic of Iran," November 8, 2011, at *http://isis-online.org/uploads/isis-reports/documents/IAEA_Iran_8Nov2011.pdf* (November 9, 2011).
30. U.S. Department of Defense, "Unclassified Report on Military Power of Iran: April 2010," April 2010, p. 11, at *http://www.armscontrolwonk.com/file_download/226/2010_04_19_Unclass_Report_on_Iran_Military.pdf* (November 14, 2011).
31. Bradley A. Thayer and Thomas M. Skypek, "The Perilous Future of U.S. Strategic Forces," *The Journal of International Security Affairs*, No. 16 (Spring 2009), at *http://www.securityaffairs.org/issues/2009/16/thayer&skypek.php* (October 26, 2011).
32. Schneider, "After New START."
33. Gertz, "General: Prioritize Nuclear Upgrades in Budget."

experience will have retired by about 2012. This will cause substantial problems as the U.S. stockpile ages. During the Cold War, the United States replaced or modernized its weapons within 10 years to 15 years.[34] Nuclear weapon testing was considered essential throughout the entire operational cycle of a weapon. However, this testing did not focus on building databases or tools to ensure the reliability of weapons if testing ceased.[35] Thus, the often cited argument that the United States has enough data to continue to confirm the reliability of its stockpile may be seriously flawed.

A Troubling Historical Precedent. Experience has shown that field handling can introduce certain flaws into the U.S. nuclear stockpile, which can be discovered only by conducting a nuclear test.[36] For example, the U.S. nuclear testing moratorium in 1958–1961 concealed serious stockpile problems, which nuclear weapon engineers and scientists discovered only after nuclear weapons testing resumed.[37] The absence of U.S. testing for only four years led to a serious deterioration in personnel skills and infrastructure. For the U.S. scientists, finding a way to resume nuclear testing was "technically agonizing, operationally painful, and economically very costly."[38] This moratorium lasted only three years. The United States is approaching its second decade without a nuclear weapons test

The Unknown Effects of Aging and Field Handling. The effects of aging on the U.S. nuclear weapons arsenal are unknown. During the Cold War, the United States developed new warhead designs and produced new warheads every few years. Because the parts and materials used in developing the original weapons may no longer be available in some cases, new parts from new materials will be used to extend the warhead's life cycle. Furthermore, weapons tested then did not include 30-year-old parts that are now being used to extend the life of warheads. These new materials and parts combined with old parts can cause unanticipated design problems that were not expected when the original weapon was assembled and can be discovered only during a nuclear weapons test. Finding problems introduced into the stockpile by field handling is also extremely difficult. In 2008, Secretary of Defense Robert Gates characterized the U.S. nuclear arsenal's long-term prognosis as "bleak."[39]

Potential Safety Issues. During the Cold War, each new nuclear warhead model incorporated next-generation safety features. Today, the United States is running the risk of complications arising from not maintaining the highest possible safety standards in its stockpile due to the prohibition on testing. New safety features may require a new weapon design if their incorporation into the weap-

34. Thomas Scheber, "Reliable Replacement Warheads: Perspectives and Issues," United States Nuclear Strategy Forum, August 2007, pp. 4–5, at *http://www.nipp.org/Publication/Downloads/Publication%20Archive%20PDF/RRW%20final%20with%20foreword%207.30.07.pdf* (November 3, 2011).
35. Kathleen C. Bailey, "The Comprehensive Test Ban Treaty: The Costs Outweigh the Benefits," Cato Institute *Policy Analysis* No. 330, January 1999, p. 9, at *http://www.cato.org/pubs/pas/pa330.pdf* (November 15, 2011).
36. *Ibid.*
37. Kathleen Bailey and Thomas Scheber, "The Comprehensive Test Ban Treaty: An Assessment of the Benefits, Costs, and Risks," National Institute for Public Policy, 2011, at *http://www.nipp.org/CTBT%203.11.11%20electronic%20version.pdf* (November 21, 2011).
38. William E. Ogle, "An Account of the Return to Nuclear Weapons Testing by the United States After the Test Moratorium 1958–1961," U.S. Department of Energy, Nevada Operations Office, October 1985, at *http://www.nv.doe.gov/library/publications/historical/NV291/Cover_Forward_Introduction.pdf* (November 21, 2011).
39. Robert Gates, "Nuclear Weapons and Deterrence in the 21st Century," speech at the Carnegie Endowment for International Peace, Washington, D.C., October 28, 2008, at *http://carnegieendowment.org/files/1028_transcrip_gates_checked.pdf* (November 14, 2011)

on raises a question about its reliability or effectiveness. The U.S. government has already decided not to implement certain safety features into warheads because they would need to be tested.[40] This is not to say that U.S. weapons are unsafe, but that the lack of nuclear testing prevents the United States from employing the most advanced safety features with its nuclear weapons.

"There is absolutely no way we can maintain a credible deterrent and reduce the number of weapons in our stockpile without either resorting to testing our stockpile or pursuing a modernization program."

The Danger of Not Testing. Every year, directors of the National Laboratories are required to certify that the U.S. nuclear stockpile remains safe, secure, and reliable. In the years ahead, this will become increasingly more difficult without nuclear testing because the annual stockpile certification is based on increasingly outdated and incomplete information. As Secretary Gates stated, "To be blunt, there is absolutely no way we can maintain a credible deterrent and reduce the number of weapons in our stockpile without either resorting to testing our stockpile or pursuing a modernization program."[41]

Potential Impact on Delivery Systems. In the past, the United States mated its nuclear warheads with its delivery system. During a ballistic missile flight, warheads are exposed to extreme pressure and temperature, especially during the reentry into the atmosphere. These factors are different for every ballistic missile and depend on the missile's weight, acceleration, reentry speed, and other factors. All of these influence nuclear warhead design. New ground and submarine-launched ballistic missiles will likely need to be designed within technological limits of existing U.S. warheads, which are more than two decades old. This will likely prevent the United States from developing the best possible systems and might even increase the overall cost of these new ballistic missiles.

Solid Rocket Motor Industrial Base. The solid rocket motor (SRM) defense industrial base plays a vital national security role in maintaining the triad. It is also essential to ensuring U.S. access to space and defending the country against a ballistic missile attack. According to the Department of Defense, it is necessary "to sustain the SRM industry because the United States will continue to rely on SRMs over the long term."[42] The United States needs to maintain the capability to procure SRM motor sets for the Trident II D-5 SLBM and Minuteman III ICBM, Evolved Expendable Launch Vehicle strap-on SRMs, and SRMs for other space launch, missile defense, and tactical missile programs.

Thus, the SRM base supports U.S. deterrence and access-to-space missions, both of which are vital to U.S. national security. The cancellation of the Kinetic Energy Interceptor, procurement limits on the Ground-Based Midcourse Defense interceptors, and the lack of clear plans to develop nuclear and nonnuclear strategic weapons (e.g., Prompt Global Strike) are harming the SRM industrial base. Investments in modernization and revitalization are needed to maintain the U.S. capability to supply its own weapon systems.

Bombers. The United States has two nuclear-capable bombers, the B-52H and the B-2. The newest B-52H left the production line in 1962, and some

40. Kathleen C. Bailey, "Comprehensive Test Ban: The Worst Arms Control Treaty Ever," National Institute for Public Policy, September 1999, at *http://www.nipp.org/National%20Institute%20Press/Archives/Publication%20Archive%20PDF/oppiece.pdf* (November 5, 2011).
41. Gates, "Nuclear Weapons and Deterrence in the 21st Century," p. 7.
42. U.S. Department of Defense, "Report to Congress on the Solid Rocket Motor Industrial Base Sustainment and Implementation Plan," redacted version, May 2011, at *http://www.acq.osd.mil/mibp/docs/Final_Redacted_SRM_Sustainment_Plan_6-6-11.pdf* (November 21, 2011).

B-2s are nearly 20 years old.[43] The Air Force plans on using them through 2044 and 2058, respectively, and does not plan on certifying the new bomber for nuclear missions until after 15 years of operational service.[44] The B-52s are equipped to carry nuclear air-launched cruise missiles (ALCM) in addition to conventional ammunition. The ALCM carried by the B-52H bomber is a critical contributing factor in making the bomber fleet effective against heavily defended targets, but their penetration capability is inadequate against advanced air defenses, and they have sustainment problems. New START heavily discounts limitations on bombers in relation to the number of warheads they can carry. Thus, abandoning the ALCM and weakening this leg of the triad would be an exercise in unilateral disarmament.[45]

Deterring Attack

To maintain and protect the U.S. ability to deter attacks on its homeland, forward-deployed troops, or allies, the United States needs to:

- **Preserve the triad.** Eliminating any leg of the triad would put the other two under unacceptable pressure and increase attrition rates and operational and maintenance costs. The three legs of the triad also hedge against technological failures in the other two legs. The United States deploys only one type of ICBM and SLBM and a technical failure would likely take a large portion of the U.S. deterrent offline for an extended period. For example, on October 24, 2011, the U.S. Air Force lost communication with a squadron of 50 nuclear-armed Minuteman ICBMs at Warren Air Force Base in Wyoming. In the past, this type of disruption was rare and limited to individual missiles. However, the broad scale of this incident made it one of the most serious and sizable ruptures in nuclear command and control in history.[46] In addition, the United States would be left vulnerable to strategic and technological surprises as other nuclear powers modernize their systems.
- **Develop new warheads in concurrence with new delivery systems.** If the directors of the National Laboratories determine that new warheads specifically mated to new delivery vehicles would bring significant material and tactical benefits to the United States, the National Laboratories should work closely with the military to develop new warheads that perfectly mate with the new delivery systems. This would hedge against technological surprises stemming from the rapidly expanding modernization programs of other countries. New warheads would also allow new delivery vehicles to be designed outside the limits of the increasingly obsolescent U.S. stockpile.
- **Resume nuclear weapons testing if necessary.** The United States should not hesitate to resume nuclear weapons testing if the directors of the National Laboratories determine the need to do so. Because of the public's negative perception of nuclear testing, any resumption of nuclear weapon testing should be accompanied by a public educational campaign to explain the importance of testing to U.S. national security.
- **Modernize all legs of the triad.** More than 30 countries around the world rely on the U.S. nuclear weapons umbrella. Therefore, it is essen-

43. Frank G. Klotz, "Strategic Forces Programs in Review of the Defense Authorization Request for Fiscal Year 2011 and the Future Years Defense Programs," testimony before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate, March 17, 2010, at *http://armed-services.senate.gov/statemnt/2010/03%20March/Klotz%2003-17-10.pdf* (November 4, 2010).
44. Baker Spring and Michaela Bendikova, "Nuclear Certification for a New Bomber," Heritage Foundation *WebMemo* No. 3408, November 7, 2011, at *http://www.heritage.org/Research/Reports/2011/11/Nuclear-Certification-for-a-New-Bomber* (November 21, 2011).
45. New START Working Group, "An Independent Assessment of New START," Heritage Foundation *Backgrounder* No. 2410, April 30, 2010, at *http://www.heritage.org/Research/Reports/2010/04/An-Independent-Assessment-of-New-START-Treaty.*
46. Matthew Foulger, "New START, Nuclear Modernization, and Command and Control," The Heritage Foundation, *The Foundry*, November 18, 2011, at *http://blog.heritage.org/2010/11/18/new-start-nuclear-modernization-and-command-and-control/*.

tial for the U.S. to maintain a credible nuclear triad. Modernization programs of other countries, especially China and Russia, could put the credibility of the U.S. deterrent in question and are rendering the U.S. vulnerable to a first-strike attack.

- **Increase investments in nuclear infrastructure.** The United States needs to provide for its nuclear weapons infrastructure. Some of the National Laboratories' buildings and equipment are decades old and require significant investments. These investments could also attract new engineers and provide the Laboratories with the means to better address the challenges of maintaining the stockpile's safety, security, and reliability.
- **Increase investments in the U.S. nuclear technology base.** The United States and its allies would benefit tremendously from the increased investments in the science and technology base underpinning the nuclear weapons complex. It is critical to build up scientific knowledge amid the challenges posed by an aging workforce and the ability of the sector to attract new engineers.
- **Certify the new bomber for nuclear missions at initial operational capability.** The Air Force should certify the new bomber for nuclear missions at the beginning of its operational life cycle. Certifying the bomber when it becomes operational would only marginally increase development costs and substantially enhance the capability of U.S. deterrence.

Conclusion

For the foreseeable future, the United States will continue to provide nuclear security guarantees to more than 30 countries around the world, and modernizing the U.S. nuclear weapons arsenal and guaranteeing the vitality of its nuclear weapons complex are critical to maintaining the credibility of the U.S. nuclear weapons arsenal. Regrettably, post–Cold War trends do not significantly advance either. As Michael Turner (R–OH) succinctly put it, "[W]hile 'Cold War' thinking is outdated and has been put behind us, replacing it with little but wishful thinking is irresponsible."[47] The United States is the only nuclear weapons country without a substantial modernization program because it has made a strategic choice to let its nuclear stockpile atrophy. Reversing these trends will require a significant investment of resources, but the longer the United States waits to take action, the worse the situation will become.

*—**Baker Spring** is F. M. Kirby Research Fellow in National Security Policy and **Michaela Bendikova** is Research Assistant for Missile Defense and Foreign Policy in the Douglas and Sarah Allison Center for Foreign Policy Studies, a division of the Kathryn and Shelby Cullom Davis Institute for International Studies, at The Heritage Foundation.*

47. Michael Turner, "Taking Exception: The Role That the U.S. Nuclear Umbrella Serves," *The Washington Post*, November 21, 2011, p. A14.