

Minuteman for the Joint Fight

The United States has been working to modernize its strategic nuclear capabilities, updating warheads through service life extension programs (SLEP) managed by the National Nuclear Security Administration (NNSA) and recapitalizing the Department of Defense's (DOD) legacy triad of delivery systems—bombers, land-based intercontinental ballistic missiles (ICBM), and submarine-launched ballistic missiles (SLBM). Schedules and budgets have been adjusted several times, and plans for the nuclear stockpile of the future now envision only five types of warheads for missiles and bombs.

As yet, the basic triad itself has been unaltered, but even that might come to be questioned, as the budget pressures on plans for maintaining and modernizing the missile and air forces are forecast to be acute. There are no official estimates of the cost of completing all the proposed maintenance and modernization work; unofficial estimates range to \$1 trillion.¹ In any event, it is plain that earlier plans called for too much to be done too quickly. In June 2014 the Navy told Congress that its program to acquire a new submarine force for launching ballistic missiles is financially “unsustainable.”² The Senate Armed Services Committee voted out and the House of Representatives passed legislation to create an unprecedented separate “National Sea-Based Deterrence Fund.”³ Unofficial analyses conclude that the US Air Force (USAF) is facing a similar difficulty and is looking for a similar “national” solution for its plans to modernize both the ICBM and bomber forces, acquire a new long-range standoff cruise missile, and make the F-35 Lightning II stealth multirole fighter capable of delivering nuclear weapons while operating in nuclear environments.⁴ The NNSA will be facing similar pressures during the 2020s as it tries to complete the SLEP for the B-61 gravity bomb, begin SLEP work on at least one other missile warhead, develop secure and reliable interoperable warheads for the submarine-launched and land-based long-range ballistic missiles, and reduce the active stockpile to five types of weapons.⁵

The DOD must also keep the currently deployed triad forces in good operating order—an objective that has required repeated special efforts over the past several years. In July 2014 the chief of naval operations warned Congress that ships currently powered by nuclear reactors, including SLBM-carrying submarines, will not be safe unless the FY2015

budget planned for the naval reactors program is increased by \$1.5 billion.⁶ A few months later, the 2014 Nuclear Enterprise Review found deficiencies in nuclear force operations and maintenance. As a result, the secretary of defense announced plans to increase funding for the nuclear forces in the defense budget by \$1.5 billion each year for at least the next five years.⁷ In addition, the DOD annually sends more than a billion dollars to the NNSA to support work on the warheads for the triad.⁸

Sometimes defense programs need to find ways to do more with less; in this case, it is a question of having more but still not enough, and there are no easy options. In matters of force development, of course, “fiscal pressures” are effectively gauges registering consensus on a program’s anticipated strategic or military importance, and there is no doubt that a safe, secure, survivable, and reliable strategic nuclear force will be essential into the future. The practical effectiveness of that force, the delivery systems, and the warheads they deliver will depend on how well the force suits the challenges of the future strategic environment.

Perhaps that environment will call for capabilities other than version 2.0 of the triad. In particular, the nuclear portfolio could be focused more tightly on two different delivery systems: airplanes and submarine-launched missiles, each of which offers unique capabilities for meeting potential challenges. For several decades the ICBM force provided great capability, but it no longer makes a unique contribution. Today, the submarine force matches or exceeds the ICBM force in lethality, survivability, and responsiveness.⁹ Moreover, the ICBMs will no longer provide a completely independent hedge against a surprise technical failure in the sea-launched missiles.¹⁰

Once removed from their nuclear mission, the ICBMs would still provide an important strategic capability if they were repurposed—a mission change similar to that made with four *Ohio*-class submarines during the early 2000s.¹¹ All Minuteman III missiles could be refitted with non-nuclear warheads, then providing a unique and valuable capability for responding to a wide range of national security challenges. Quite unlike the “conventional prompt global strike” (CPGS) concepts debated in recent years, conversion of the ICBM force would go well beyond a limited niche capability to provide a strategic strike force useful in fighting wars large and small, as well as enhancing core strategic and extended deterrence postures. The path forward seems likely to prove energizing and free of sharp dislocations to the USAF, the communities surrounding its

missile fields, and American national security policy. Taking that path can also help avoid a repeat of what Gen Maxwell Taylor found in 1959: “The determination of US strategy has become a more or less incidental by-product of the administrative process of the defense budget.”¹²

Earlier Plans Derailed

The idea of using long-range ballistic missiles as conventional ordnance became popular as the years after the Cold War gave rise to diverse threats around the world.¹³ By the end of the 1990s, US military technology was promising a near-term ability to use conventional warheads against some targets that previously had required nuclear weapons. At the turn of the century, a prominent research center called for reducing nuclear expenditures in favor of precision-strike and electronic warfare systems, effectively creating “a new strategic strike triad” of offensive capabilities that would replace the strategic nuclear triad of ICBMs, SLBMs, and bombers.¹⁴ The George W. Bush administration modified this idea for its 2001 Nuclear Posture Review (NPR), which set out to update the dominant strategic planning framework—a Cold War—legacy focused primarily on deterring the Soviet Union by means of the nuclear triad. This 2001 NPR portrayed a new strategic environment in which “multiple contingencies and new threats” might arise in several different areas with little warning. To make the US military effective in dissuading, deterring, and defeating these disparate challenges, the NPR advocated a new triad planning framework in which nuclear and nonnuclear strategic strike systems together constituted one apex, with defenses and industrial base capabilities as the other two—all linked by advanced intelligence and communications capabilities.¹⁵

In 2003 the DOD formally established the requirement for a conventional prompt global strike capability. At that time, the USAF talked about making “global strike” an important capability of the nonnuclear strategic strike component of the new triad—useful for major warfighting and engaging fleeting or emergent targets—although acknowledging that developing an affordable long-range standoff capability was proving difficult.¹⁶ President Bush assigned the operational requirement to US Strategic Command in early 2003, without establishing a single view of what it was to entail, leaving the Air Force, Navy, Army, and Defense Advanced Research Projects Agency to pursue different approaches to

ballistic and partial ballistic delivery systems, reentry systems, and warheads.¹⁷ DOD leaders reportedly hoped to achieve consensus on the mission, associated capabilities, and budgets by 2008, when various studies of organizational interfaces and procedures were to be completed.¹⁸

The al-Qaeda strikes on 11 September 2001 not only validated NPR's conclusions of 2001, the attacks and subsequent events also transmogrified US perspectives, priorities, and programs. Notwithstanding the broad strategic rationale that was advanced for global strike when the NPR began to be briefed in January 2002, it was probably inevitable that the mission for global strike would be defined by the missed opportunity in December 2001 to kill Osama bin Laden at Tora Bora.¹⁹ Regardless of whether a capability for prompt global strike would have been able to accomplish this task, the effect of the illustration was to narrow the mission, reducing the range of global strike applications. The applications were limited to those particular instances defined by special circumstances in which accurate and reliable intelligence called for an absolutely urgent strike by a system with unprecedented accuracy at intercontinental ranges and for which exact target information was available, when no other option could accomplish the mission.²⁰ Thus narrowed, the mission appears to be less relevant, which in turn devalues the strategic merit of a CPGS capability and makes it look out of proportion to the cost and risks of using it.²¹

Paramount among those risks, as seen by Congressional leaders and several commentators, are worries that Russia or China might mistakenly identify a long-range missile launch by the United States as a nuclear attack and so trigger a retaliatory nuclear attack. As a result, by 2008 Congress had demanded studies addressing the possibility of "warhead ambiguity," directed that no money be spent on launching conventional warheads by ICBMs or SLBMs, and created a single budget account for prompt global strike research.²² Congressional budget actions currently continue to deny work on all-ballistic global strike systems, instead favoring delivery systems that would start with a ballistic launch and transition to a hypersonic boost-glide delivery stage. This preference seems likely to reflect opposition to the idea of any CPGS capability, rather than an expectation that Russia or China would be less worried about a system they could not track.²³ The boost-glide systems are far less technologically mature than the ballistic delivery option, and

as of late 2014 it seemed likely another decade or more will be needed before the technology will be ready for program acquisition.

With the mission less compelling and the technology still immature for hypersonic boost-glide systems (currently the only alternatives under development), any prospect for a near-term CPGS capability has vanished.²⁴

Strategic Strike Redux

If the United States were to arm all its ICBMs only with conventional weapons, there would be much less about which to worry. The ambiguity problem would not disappear, but its seriousness could be greatly reduced, because the United States simply would not have any nuclear-armed ICBMs deployed, no matter from where they were launched or the trajectory they followed. The record of military responses to potentially escalatory incidents among the United States and Russia and China suggests that history, together with the immediate circumstances of a launch event, will affect the likelihood of its being misinterpreted and the actions that might then be taken: e.g., US-Soviet incidents at sea, a Norwegian missile launch, Russian bombers and fighter aircraft penetrating the air defense identification zone of the United States and Canada, and Chinese fighter aircraft forcing down a US intelligence airplane. As the National Academy concluded, the “significance [of the ambiguity] depends not primarily on the technical characteristics of the CPGS system but on the context, scale, and target of the attack and on the degree to which transparency and confidence-building measures have been employed.”²⁵ The 2007 Defense Science Board study also found that concerns about ambiguity were overstated.²⁶

Whatever worries might remain about warhead ambiguity might be assuaged by public declarations, private notifications, and on-site inspections. Further, a “bolt from the blue” US attack against Russia or China would be most unlikely to use only a few missiles or to launch them on indirect azimuths. Both Russia and China understand strategic intercontinental targeting quite well. Russia is credited with the technical ability to track ballistic missile launches from the United States and, thereby, is able to discriminate between those that are targeted against Russia from those aimed elsewhere.²⁷ To date, China has taken a different approach, showing no public interest in deploying systems to detect and track launches of foreign long-range missiles. Both these countries

have recently been redeploying strategic forces in ways that increase their survivability, and neither their past behaviors nor strategic cultures support the likelihood that warhead ambiguity would trigger either to launch attacks against the United States.²⁸ Russian leaders may even start developing their own conventional ICBMs.²⁹

An all-conventional ICBM force offers substantial further benefits that go far beyond reducing warhead ambiguity. They provide a significant warfighting capability.³⁰ Essentially artillery with intercontinental range, the conventional Minuteman force would provide extratheater options for conducting a strategic strike, “a military operation undertaken by the United States that is designed to alter decisively an adversary’s course of action in a relatively compact period of time,” either in isolation or as part of a broader political-military campaign.³¹ It could help US forces in regional wars gain access; clear landing zones; destroy launch sites, ports, airfields, and communication centers; penetrate sophisticated air defenses; deny sanctuaries; and kill enemy troop formations. It provides military options for responding to armed aggression when an attack is first underway. It provides additional assurance to allies and partners that the United States can provide timely assistance without being self-deterred. It can ensure dominance under the nuclear threshold, helping control escalation, because no militarily compelling defense against ICBMs is in the offing. It enriches the menu of options available for adaptive planning in crises or even in nuclear warfare.³² This repurposing of the ICBM force would provide a new means to achieve timely, needed effects on the battlefield, a means that offers economy of force without a lengthy logistics train, that can be used before an adversary has time to prepare defenses or take hostages as a crisis builds, and that, unlike close engagement or stealth options, puts no American lives at risk.

Enlarging Choices

The future conventional ICBM force could evolve to purpose-built missiles with warheads delivering a variety of effects. When hypersonic technology is sufficiently advanced, the first two stages of the Minuteman missiles could be used to launch new boost-glide payloads that could provide detailed local reconnaissance, extended communications, and persistent surveillance. Their launch and trajectories would be quite

different from entirely ballistic systems—a difference that might relieve them from risks associated with payload ambiguity. However, the hypersonic systems pose a problem of “destination” ambiguity, because the aero vehicle and payload—being maneuverable and very fast—will be difficult to track. The United States might have firsthand experience with the issue, if China’s recent work with hypersonic systems succeeds and Russia pursues similar technology.³³

Until then, the repurposed Minuteman missiles would be delivering conventional warheads on fully ballistic trajectories, for which better accuracy and new warheads would be useful.³⁴ The Navy’s earlier work on improving accuracy for the conventional Trident missile might be adaptable to the Minuteman; the National Academy review reported that experiments with the “Enhanced Effectiveness” and “Life Extension” test beds showed promising results, the former in particular suggesting that Global Positioning System–quality accuracy could be achieved for the conventional Trident.³⁵ Warheads feasible in the near term include designs for kinetic strikes, for penetrating hard surfaces, and, for above-ground soft targets, the kinetic energy projectile, which promises to deliver thousands of tungsten flechettes to clear an area of 3,000 square feet—roughly a radius of 10 yards.³⁶ Of course, the likelihood of killing the target can also be increased by launching more than one missile.

Uncertainty about the emerging strategic environment, particularly about Russian and Chinese nuclear postures, makes it prudent to retain for a while the ability to reverse course and make the Minuteman once again a nuclear weapon system, at least until the use of conventional long-range ballistic missiles becomes commonplace and future requirements for strategic nuclear weapons become more settled. Because international relations would have severely deteriorated before the United States would consider rearming the missiles with nuclear warheads and because doing so probably could not be accomplished very quickly or secretly, it is unlikely any warhead ambiguity problem would be exacerbated by keeping the Minuteman capable of launching both types of warheads. Shorter-range “dual-capable” delivery systems have been deployed elsewhere by the United States and other countries. Once converted to conventional warheads, then, the Minuteman missiles could stay in the same silos they used before the nuclear warheads were removed, until the United States determined that a rearming hedge was no longer necessary. However, plans for using the conventionally armed

missiles from their current silos will need to take into account potential hazards from the falling canopies and stages jettisoned during the first minutes of flight; perhaps silos, not nuclear-hardened, could be built for coastal launching.³⁷


Even with the nuclear warheads removed, the Minuteman force would still be counted against the total number of operationally deployed launchers and warheads allowed under the New Strategic Arms Reduction Treaty (START). Operationally deployed US nuclear warheads would thus be reduced by 400—26 percent below the allowed total of 1,550. The effect of this unilateral reduction on US nuclear deterrence deserves careful review, but any perceived risks would be mitigated somewhat by maintaining the missiles in their silos and by maintaining the ability to restore their nuclear warheads. The reduction may in fact never occur, because the New START could be modified in 2021.³⁸ If the United States has made good progress in conversion by then, US negotiators might want to exempt the Minuteman force from strategic nuclear force limits, particularly if Russia and China have made progress developing similar capabilities. If the same aggregate limits were maintained, the United States could then choose to deploy 400 nuclear warheads with additional strategic bombers or SLBMs.

The effect on US deterrence of moving from three to two strategic nuclear delivery systems is a question separate from the reduction in numbers. The advantages of the ICBMs over the SLBMs in earlier decades (promptness, accuracy, throw-weight) no longer apply. Removing the ICBM nuclear warheads would not make an enemy's defense problems easier; the diversity of attack azimuths and trajectories offered by the sea-based force actually creates a more complicated issue. Nor would an enemy attack plan be simpler. In the event of nuclear war, an enemy will still want to target the land-based missiles, even the conventional ones.³⁹

Making the Minuteman force a conventional capability would relieve some pressure on budgeting for the strategic nuclear forces. The NNSA would no longer need to develop an interoperable warhead, and the DOD nuclear budget would no longer need the level of funding required previously for operations and maintenance—especially physical and personnel security—and for modernization. The nonnuclear budgets would see increased costs, estimates for which will depend on plans for developing needed subsystems (particularly the conventional warheads), decisions about whether and how to maintain a renucleariza-

tion hedge, warhead replacement and storage, training, command and control systems, and so forth. The estimated net costs, whatever they turn out to be, must then be assessed in light of the military utility of the repurposed missiles to conventional force planning and operations and to joint force development aimed at defeating anti-access and area denial efforts by potential adversaries.

Conclusion

As the Defense Science Board reported in 2003, “Strategic strike, then, is more than just taking a shot at a target.”⁴⁰ The repurposed Minuteman missiles would be an integral part of the joint fight, woven into the ongoing development of strategy, plans, and exercises and tailored to suit particular circumstances when needed. Circumstances permitting, these missiles could execute many of the particular missions identified as appropriate in discussions of CPGS capabilities. But the repurposed Minuteman force would not be confined to residual niche assignments. Instead, the new force would contribute directly and substantially to three of the current administration’s “five key objectives” for nuclear weapons: “reducing the role of U.S. nuclear weapons in U.S. national security strategy; maintaining strategic deterrence and stability at reduced nuclear force levels; and strengthening regional deterrence and reassuring U.S. allies and partners.”⁴¹ Most important, it will provide options that a US president does not now have for managing crises and resisting aggression. 

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Notes

1. Jon B. Wolfsthal, Jeffrey Lewis, and Marc Quint, *The Trillion Dollar Nuclear Triad: US Strategic Nuclear Modernization over the Next Thirty Years* (Monterey, CA: James Martin Center for Nonproliferation Studies, January 2014), http://cns.miis.edu/opapers/pdfs/140107_trillion_dollar_nuclear_triad.pdf.

2. The planned force “requires funding at an unsustainable level, particularly between FY25 and FY34. . . . The average cost of this plan during the period in which the [Department of Navy] is procuring the [*Ohio*-class replacement SLBM-launching submarine] (~\$19.7 B/year FY2015–2034) cannot be accommodated by the Navy from existing resources—particularly

if DOD is required to be funded at the [Budget Control Act] levels.” Deputy Chief of Naval Operations, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for FY2015* (Washington, DC: Office of the Chief of Naval Operations, June 2014), 6, <http://navylive.dodlive.mil/files/2014/07/30-year-shipbuilding-plan1.pdf>.

3. National Journal, “Navy: Plan to Build New Strategic Sub Requires ‘Unsustainable’ Funding,” *Global Security Newswire*, 8 July 2014, <http://www.nti.org/gsn/article/us-navy-says-plan-build-new-strategic-sub-requires-unsustainable-funding/>.

4. See Kingston Reif, “The Air Force Can’t Hide from the Cost of Nuclear Weapons,” *Center for Arms Control and Non-Proliferation* (web site), 21 August 2014, http://armscontrolcenter.org/issues/nuclearweapons/articles/the_air_force_cant_hide_from_the_cost_of_nuclear_weapons/.

5. See Government Accountability Office, *Modernizing the Nuclear Security Infrastructure: NNSA’s Budget Estimates Do Not Fully Align with Plans*, GAO-14-45 (Washington, DC: General Accountability Office, December 2013), <http://www.gao.gov/assets/660/659610.pdf>.

6. Christopher P. Cavas, “US Navy to Congress: We Can’t Guarantee a Safe Nuclear Fleet,” *Defense News*, 9 July 2014, <http://www.defensenews.com/article/20140709/CONGRESS-WATCH/307090028/US-Navy-Congress-We-Can-t-Guarantee-Safe-Nuclear-Fleet>.

7. See Chuck Hagel, secretary of defense, “Reforms to the Nuclear Enterprise,” press conference, transcript, 14 November 2014, <http://www.defense.gov/Transcripts/Transcript.aspx?TranscriptID=5537>. Earlier problems with management of the nuclear forces, particularly by the USAF, had occasioned several reviews, including the “Air Force Blue Ribbon Review on Nuclear Weapons Policies and Procedures” (February 2008); the secretary of defense–directed “Investigation in the Shipment of Sensitive Missile Components to Taiwan” (May 2008); the “Secretary of Defense Task Force on Nuclear Weapons Management” (September 2008); a report by the Defense Science Board’s Permanent Task Force on Nuclear Weapons Surety, “Report on the Unauthorized Movement of Nuclear Weapons” (February 2008); testimony by Maj Gen C. Donald Alston to the Strategic Forces Subcommittee of the House Armed Services Committee, “Status of the Air Force Nuclear Security Roadmap” (21 January 2010); and two further reports from the Defense Science Board’s Permanent Task Force: the final “Independent Assessment of the Air Force Nuclear Enterprise” (April 2011), and the subsequent final “Air Force Nuclear Enterprise Follow-on Review” (May 2013).

8. Department of Energy, *FY2014 Congressional Budget Request: National Nuclear Security Administration*, vol. 1 (Washington, DC: DOE, April 2013), WA-5, note a, http://fire.pppl.gov/FY14_Budget_NNSA_details.pdf.

9. General Accountability Office “Unclassified Summary Statement on the GAO Triad Project,” PEMD-92-36R Triad Summary (Washington, DC: GAO, 28 September 1992), 5, <http://gao.gov/assets/90/82669.pdf>. “On balance, the sea leg emerges as the most cost-effective, taking into account [seven measures of effectiveness]. Test and operational patrol data show that the speed and reliability of day-to-day communications to submerged, deployed SSBNs [submarines equipped to launch long-range strategic missiles] were far better than widely believed, and about the equal of speed and reliability of communications to ICBM silos. Contrary to conventional wisdom, SSBNs are in essentially constant communication with National Command Authorities and, depending on the scenario, SLBMs would be almost as prompt as ICBMs in hitting enemy targets.”

10. Commonality is often seen as a means to sustain the missile industrial base and thereby reduce future costs of modernization. In 2007, for example, Senators Orrin Hatch and Bob Bennett introduced legislation with a provision directing the secretary of defense to provide “an analysis of the impact on materials, the supplier base, production facilities, and

the production workforce of extending all or part of the service life extension program for the Trident II D5 missile system to a service life extension program for the Minuteman III intercontinental ballistic missile system.” *Strategic Deterrent Sustainment Act of 2007*, S. 2039, 110th Cong., 1st sess., *Congressional Record* 153, no. 134 (11 September 2007): S11416–S11418. Four years later, Rear Adm Terry Benedict, head of the Navy’s strategic systems programs, told a Navy conference that “We currently have collaboration efforts with the Air Force . . . [which might include a] common fuse for the Minuteman’s W78 warhead and the Trident’s W88; common guidance systems R&D, common propulsion R&D; electronic systems; ordnance; and tooling.” Philip Ewing, “A Joint Navy-Air Force Ballistic Missile?” *DoD Buzz*, 21 October 2011, <http://www.dodbuzz.com/2011/10/21/a-joint-navy-air-force-ballistic-missile/>. A year later Admiral Benedict was reported as saying that the Navy and USAF would be collaborating on research and development and components that could be used by both services, such as gyroscopes and rocket-fuel constituents, and that “the future is going to be much more intertwined between these two services. Collaboration and commonality is not an option, it is a requirement.” Sydney J. Freeberg Jr., “Navy Fears Pentagon Neglects New Missile Sub; SSBN(X) Must Survive Almost 80 Years,” *Breaking Defense*, 18 October 2012, <http://breakingdefense.com/2012/10/navy-fears-pentagon-neglects-new-missile-sub-ssbn-x-must-survi/>.

11. David Nagle, “SSGN Provides Powerful Tool for Navy SEALs,” *Navy News Service*, 7 February 2003, http://www.navy.mil/submit/display.asp?story_id=5767.

12. Maxwell D. Taylor, *The Uncertain Trumpet* (New York: Harper & Brothers, 1959), 121.

13. National Defense Panel, *Transforming Defense: National Security in the 21st Century* (Washington, DC: DOD, December 1997), http://www.dod.gov/pubs/foi/administration_and_Management/other/902.pdf.

14. “A strong case can be made that the United States should take steps to create a new strategic-strike triad, relying on its precision- and electronic-strike capabilities to form two of the three legs, with a smaller residual nuclear force comprising the third leg.” Andrew F. Krepinevich Jr. and Robert C. Martinage, *The Transformation of Strategic-Strike Operations* (Washington, DC: Center for Strategic and Budgetary Alternatives, 2001), i, <http://www.csbaonline.org/wp-content/uploads/2011/03/2001.03.01-Strategic-Strike-Operations.pdf>.

15. See Amy Woolf, *The Nuclear Posture Review: Overview and Emerging Issues* (Washington, DC: Congressional Research Service, 31 January 2002), <http://fpc.state.gov/documents/organization/8039.pdf>; and Kurt Guthe, *How is the “New Triad” New?* (Washington, DC: Center for Strategic and Budgetary Alternatives, 29 July 2002), <http://www.csbaonline.org/wp-content/uploads/2011/03/2002.07.29-Nuclear-Posture-Review-The-New-Triad.pdf>.

16. *US Air Force Transformation Flight Plan* (Washington, DC: Headquarters, US Air Force, XPXC, November 2003), http://www.au.af.mil/au/awc/awcgate/af/af_trans_flightplan_nov03.pdf. For example, “The Global Strike CONOPS is designed, among other tasks, to defeat air defense systems,” C-7; and “At the start of conflict, Global Strike capabilities will “kick down the door” into denied battlespace by rapidly degrading, and then defeating, the adversary’s battle-space awareness and anti-access capabilities, clearing the way for joint persistent follow-on operations,” 44. “Potential adversaries have become increasingly hesitant to oppose the US military force-on-force and are seeking new ways to counter American strengths. Instead, they are dispersing their critical systems into sensitive areas with high collateral damage potential, in deeply buried bunkers or tunnels, and employing asymmetric offensive capabilities such as terrorist acts, network attack, or subversive media campaigns that undermine coalitions and sway international opinion. Consequently, some US targets have changed from fixed, fielded forces to a series of fleeting and emergent targets.” 43. “Reducing the cost of the

weapons while maintaining long-range has proven very difficult. . . . Developing an affordable standoff weapon that would enable large scale, persistent standoff operations against fixed and mobile targets in all weather would create a huge transformational effect in defeating future advanced air defenses. Standoff will also be a key enabler of the Joint Commander's ability to use the Global Strike CONOPS' capabilities to operate successfully in heavily defended airspace at the start of a conflict and the Global Response CONOPS' capabilities to conduct rapid response operations against terrorist-related targets." 59.

17. See the discussion in Vince Manzo, *An Examination of the Pentagon's Prompt Global Strike Program: Rationale, Implementation, and Risks* (Washington, DC: Center for Defense Information 2008), [http://www.infodefensa.com/wp-content/uploads/PGSfactsheet\[1\].pdf](http://www.infodefensa.com/wp-content/uploads/PGSfactsheet[1].pdf); and the report by the General Accountability Office, *Military Transformation: DOD Needs to Strengthen Implementation of its Global Strike Concept and Provide a Comprehensive Investment Approach for Acquiring Needed Capabilities* (Washington, DC: General Accountability Office, GAO-08-325, 30 April 2008), <http://www.gao.gov/assets/280/274988.pdf>.

18. GAO, *Military Transformation*, 10–11.

19. The bin Laden case is used to illustrate the mission for the Prompt Global Strike weapon as described in David E. Sanger and Thom Shanker, "U.S. Faces Choice on New Weapons for Fast Strikes," *New York Times*, 22 April 2010, http://www.nytimes.com/2010/04/23/world/europe/23strike.html?_r=0.

20. Critics narrowed the mission and then challenged its feasibility. For example, "The US agencies involved in counterterrorism should attempt to identify historical examples of occasions when the United States has failed to capitalize on intelligence that would have enabled it to kill or capture an important terrorist because it lacked a CPGS capability. Former senior officials could be brought in to judge whether the available intelligence would actually have been persuasive enough to prompt a president to use a CPGS weapon, had one been available." James M. Acton, *Silver Bullet? Asking the Right Questions About Conventional Prompt Global Strike* (Washington, DC: Carnegie Endowment for International Peace, 2013), 94, <http://carnegieendowment.org/files/cpgs.pdf>.

21. Some critics also stress potential complexities, delays, and costs in the CPGS "enabling" functions, noting that a target should be acquired before the weapon is launched, which can be difficult if the target is moving; that authorization and delegation procedures will be needed, together with reliable communications; and that intelligence might be mistaken. Steve Andreasen provided an early catalogue of concerns in his "Off Target? The Bush Administration's Plan to Arm Long-Range Ballistic Missiles with Conventional Warheads," *Arms Control Association* (web site), 8 July 2006, http://www.armscontrol.org/act/2006_07-08/CoverStory; and Joshua Pollack considered intelligence and delegation problems in his "Evaluating Conventional Prompt Global Strike," *Bulletin of the Atomic Scientists* 65, no. 1 (January 2009): 13–20.

22. See the excellent summary in Amy Woolf, *Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues* (Washington, DC: Congressional Research Service, 26 August 2014), <http://fpc.state.gov/documents/organization/231285.pdf>. Acton claims that the congressional actions were "ostensibly because of warhead ambiguity." Acton, *Silver Bullet?*, 2.

23. See the comparison of warhead and destination ambiguities associated with ballistic and hypervelocity delivery systems in Elaine Bunn and Vince Manzo, *Conventional Prompt Global Strike: Strategic Asset or Unusable Liability?*, *Strategic Forum* 263 (February 2011): 14–18, http://csis.org/files/media/csis/pubs/110201_manzo_sf_263.pdf.

24. News reports say that DOD-imposed funding restrictions on the proposed development of a medium-range ballistic missile to be launched from *Virginia*-class submarines, a program denied funding for FY2014 by Senate appropriators, and that “the Pentagon’s Joint Requirements Oversight Council . . . [in November 2012] determined in closed-door session that future technologies for prompt strike must do a better job of balancing affordability with desired warfighting capabilities.” Elaine M. Grossman, “Pentagon, Lawmakers Deal Blows to Navy Fast-Strike Missile Effort,” *Global Security Newswire*, 31 July 2013, <http://www.nti.org/gsn/article/pentagon-lawmakers-deal-blows-navy-fast-strike-missile-effort/>.

25. National Research Council, *U.S. Conventional Prompt Global Strike: Issues for 2008 and Beyond* (Washington, DC: National Academy of Science, 2008), 71–77, http://www.nap.edu/openbook.php?record_id=12061.

26. The 2007 Defense Science Board study noted that only peer competitors have the capability to detect and track US launches, concluding that “because of the mutual assured destruction concerns of a major nuclear exchange, peer competitors may be less likely to overreact to a single ballistic missile until they are able to reliably determine its true destination.” Defense Science Board, *Time Critical Strike from Strategic Standoff* (Washington, DC: Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics, March 2009; information gathering completed in April 2007).

27. Tatyana Rusakova, “Russia to Upgrade Missile Attack Warning System,” *Russia Beyond the Headlines*, 4 July 2014, http://rbth.com/defence/2014/07/04/russia_to_upgrade_missile_attack_warning_system_37961.html.

28. See Robert L. Butterworth, “Out of Balance: Will Conventional ICBMs Destroy Deterrence?” *Aerospace Power Journal* 15, no. 3 (Fall 2001): 74–84, <http://www.airpower.maxwell.af.mil/airchronicles/apj/apj01/fal01/butterworth.html>; Lora Saalman, *Prompt Global Strike: China and the Spear* (Honolulu, HI: Asia-Pacific Center for Security Studies, April 2014), http://www.apcss.org/wp-content/uploads/2014/04/APCSS_Saalman_PGS_China_Apr2014.pdf; and Thomas Scheber, “Conventionally-Armed ICBMs: Time for Another Look,” *Comparative Strategy* 27, no. 4 (October 2008: 336–44. On page 343, Scheber describes a senior retired Russian military officer in December 2007 dismissing “as nonsense concerns that Russian officials would misinterpret the launch of a few CPGS weapons and respond with a nuclear strike.”

29. Associated Press, “Russia Developing New Nuclear Weapons to Counter US, NATO,” *New York Post*, 10 September 2014, <http://nypost.com/2014/09/10/russia-developing-new-nuclear-weapons-to-counter-us-nato/>; and “‘Deterrence Not Arms Race’: Russia Hints It May Develop Rival to US Prompt Global Strike,” *RT News*, 11 September 2014, <http://rt.com/news/187092-russia-prompt-global-strike/>.

30. This formulation is broader than one focused on CPGS, but it has much in common with Bruce Sugden’s examples of “the long-term, expanded mission.” Bruce M. Sugden, “Speed Kills: Analyzing the Deployment of Conventional Ballistic Missiles,” *International Security* 34, no. 1 (Summer 2009): 113–46; see especially his discussion on pages 118–21. Guthe notes that conventional strike increases the flexibility of response and discusses sample applications, *How is the “New Triad” New?*, 8–10.

31. *Report of the Defense Science Board Task Force on Future Strategic Strike Forces* (Washington, DC: Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, February 2004), 2-1. Strategic strike “forces include traditional longer-range missile and air assets, missile assets at sea, in-theater air and naval assets, and in-theater special operations forces. Newer information operations capabilities could also be used as part of a strategic strike mission,” 2-2.

32. Barry Watts notes what would be forgone if effective long-range strike capabilities are not developed: “A crucial challenge likely to be unmet is neglecting to hedge against the rise of Asian powers and the spread of nuclear weapons. Other lost opportunities and unmet challenges include: reducing American reliance on nuclear weapons, denying prospective enemies sanctuaries, shaping their investments by forcing them to spend more on defending against American LRS capabilities, and closing capability gaps—preeminently the ability to prosecute emergent and time-sensitive targets deep inside defended airspace. These issues provide the strategic rationale for moving ahead promptly in LRS and are the focus of the second chapter of this report.” Barry D. Watts, *Long-Range Strike: Imperatives, Urgency, and Options* (Washington, DC: Center for Strategic and Budgetary Assessments, April 2005), ii.

33. Valerie Insinna, “US, China in Race to Develop Hypersonic Weapons,” *National Defense Magazine*, 17 August 2014, <http://www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?ID=1585>; and Kenneth Rapoza, “Like U.S., Latest Russian Bombers Testing Hypersonic Weapons,” *Forbes*, 1 September 2013, <http://www.forbes.com/sites/kenrapoza/2013/09/01/like-u-s-latest-russian-bombers-testing-hypersonic-weapons/>.

34. The accuracy required depends generally on the effect required, the warhead lethality, and the target vulnerability. The National Research Council study called for “accuracy on the order of meters” for the Conventional Trident Missile system as sketched in 2008 (*US Conventional Prompt Global Strike*, 14). The 2003 Defense Science Board Summer Study projected a need for CEPs of less than ten meters and called for developing a new conventional intermediate-range ballistic missile with a CEP of less than five meters (*Report of the Defense Science Board Task Force on Future Strategic Strike Forces*, 2–16).

35. National Research Council, *US Conventional Prompt Global Strike*, 121–23.

36. *Ibid.*, 127–131.

37. Potential damage from falling boosters has been taken sometimes as a cost of war (i.e., ground-based interceptor launches from Alaska, ICBM launches against Russia, and Pershing II launches against the Soviet Union) and sometimes as requiring special consideration for public safety (i.e., conventional ICBM launches in limited wars and missile defense launches in Europe).

38. New START entered into force in February 2011 for a term of 10 years, after which it can be extended for an additional five years if the parties agree to do so. Arms Control Association, “New START at a Glance” (factsheet, Arms Control Association, Washington, DC, August 2012), <http://www.armscontrol.org/factsheets/NewSTART>.

39. “Any system—old or new—that the United States might designate as conventional-only . . . could be armed with nuclear weapons. Other countries could never be confident that there is not a nuclear warhead on a new US system simply because the US says so.” National Research Council, *US Conventional Prompt Global Strike*, 73.

40. *Report of the Defense Science Board Task Force on Future Strategic Strike Forces*, 2–15.

41. DOD, *Nuclear Posture Review Report* (Washington, DC: DOD, April 2010), iii, <http://www.defense.gov/npr/docs/2010%20Nuclear%20Posture%20Review%20Report.pdf>.

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