

# The New Triad

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US Air Force  
Counterproliferation Center  
Future Warfare Series  
No. 55

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The Counterproliferation Papers

Future Warfare Series No. 55

USAF Counterproliferation Center

Air University

Maxwell Air Force Base, Alabama



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December 2010

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Counterproliferation Paper No. 55

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## **Acknowledgements**

The author would like to express his gratitude to the Air Force and Air University for allowing a year of focused Strategic Study and for Dr. Barry R. Schneider for his guidance through the study of US National Security as it relates to the nuclear triad.

The author would like to express his gratitude to the Earhart Foundation for a generous grant which made possible the research and writing of this study, and to Paul Bernstein, Michael Eisenstadt, Jerrold Post, and Barry R. Schneider for their valuable comments on early drafts.

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## I. INTRODUCTION

On April 5, 2009 President Obama introduced his vision of reducing nuclear dangers and overcoming grave and growing threats by seeking the “peace and security of a world without nuclear weapons.”<sup>1</sup> Whether or not this is an obtainable goal or even in the National Security Interests of the U.S., reducing the number of nuclear weapons is a plausible endeavor. As stated in the third objective of the 2010 Nuclear Posture Review (NPR) the U.S. must continue “maintaining strategic deterrence and stability at reduced nuclear force levels.”<sup>2</sup> In fact, it is possible to substantially reduce the number of nuclear weapons well below new START numbers and still maintain national security.

Additionally, the U.S. must continue to provide assurance to allies who are covered under the U.S. nuclear deterrence umbrella. More significant reductions are possible through a mindset change regarding the traditional nuclear triad consisting of Intercontinental Ballistic Missiles (ICBMs), Submarine Launched Ballistic Missiles (SLBMs) and nuclear bombers. Specifically, this paper proposes a new version of the nuclear triad—one centered on hardened mobile ICBMs—as a means to a survivable nuclear deterrent on the road to zero.

The existing nuclear triad may presently provide an effective deterrent against Russia, and other nuclear weapon states. However, U.S. security could be compromised if we agree to much deeper cuts in strategic forces in future arms control agreements and, after having done so, Russia once again becomes an adversary—perhaps after a new crisis in Georgia, Ukraine, or one of the Baltic states. As I demonstrate in the following pages, an economical way to enhance survivability and account for such a strategic development is to revisit the Midgetman—a concept that has already been designed and tested.

This paper proceeds in five parts: first, a conceptual overview of how survivability affects the credibility of a state's nuclear deterrent; second, the strengths and weaknesses of the current nuclear triad; third, the potential impact of New START on the existing triad; fourth, the necessity of diversity within the triad post-New START; and, fifth, the role of hardened mobile launchers in the future U.S. nuclear triad.

## **II. Survivability: The Essential Component of Credible Deterrence**

In order to provide a credible nuclear deterrence the force must be survivable, which is accomplished in two ways. One method is by keeping the location of the nuclear delivery system unknown. Nuclear submarines are somewhat fragile vessels, but since the submarines are undetectable it is impossible to directly target them. Nuclear bombers on alert were set to take off to unknown locations within 15 minutes of notification making them nearly impossible to target. Another concept of survivability is to harden the facility against nuclear blast much like the ICBM force. Although the ICBM silos and launch control centers can no longer survive a direct hit, they may survive an indirect detonation. Therefore, an individual ICBM may not be survivable, but their location plays into the concept of dispersal.

The ICBM field is spread out, or dispersed across the U.S. in such a way as to ensure their survivability. The deterrent to a nuclear first strike by an adversary is to ensure a nuclear response. Spreading the ICBMs far enough apart requires a nearly impossible targeting and timing problem for any adversary. Gen Power wrote, "The primary objective of dispersal, as applied to both manned and unmanned weapon systems, is to increase the target system of a potential aggressor and thus to lower his confidence that he can hit and destroy all our strike forces simultaneously."<sup>3</sup> Therefore, vulnerable air and sea weapon systems become more

survivable upon deployment, and subsequently more dispersed. Although ICBMs have fixed sites their dispersal ensures enough missiles would survive a nuclear first strike by an adversary and provide a guaranteed nuclear response. As stated by Gen Power, the current U.S. nuclear triad presents the “unquestionable capability to counter any act of aggression with decisive results.”<sup>4</sup> Even though the POTUS desires a decrease in nuclear weapons a viable nuclear deterrent is required as long as the nuclear threat remains. Congress and the Department of Defense (DoD) commissioned several studies regarding the U.S. nuclear weapons capability.

A March 2006 Report of the Defense Science Board Task Force on Future Strategic Strike Skills number one finding stated, “The DoD has not provided specific direction regarding next-generation strategic strike systems.”<sup>5</sup> Finding number three stated, “The strategic strike area most at risk is ballistic missiles.”<sup>6</sup> The report recommended, “The Secretary of Defense should direct the Navy and the Air Force -- absent near-term systems development -- to fund advanced development (subsystem design, system prototype development, and testing) to support next-generation system development (which will also restore and maintain the skills base).”<sup>7</sup> Additionally, the final hearing before the House Armed Service Committee depicted the current U.S. Strategic Posture as similar to President Clintons who’s “policy called for the United States to lead the world in nuclear arms reductions...while at the same time maintaining a nuclear deterrent force that hedged against adverse geopolitical developments.”<sup>8</sup> As the U.S. and Russia show cooperation in reducing the number of nuclear weapons the theory supposes nuclear counter proliferation efforts improve since pressure by other states to gain nuclear weapons reduces. The hearing report also reiterated the need to maintain “sufficient quantities to perform their deterrent tasks.”<sup>9</sup> In summary, the ninth and

tenth findings of the Armed Services Committee Hearing stated the conditions for eliminating nuclear weapons are not present today, and the U.S. must maintain a viable nuclear deterrent for the near future.<sup>10</sup> What should the U.S. nuclear deterrent force look like in terms of numbers?

### **III. U.S. Nuclear Triad: Strengths and Weaknesses**

Before constructing a proposed new triad, a baseline understanding is required for each leg of the current triad. According to the Senate Armed Services Committee Hearing Report the triad should remain the same. It further reported each leg of the triad has its own value:

- “The bomber force is valuable particularly for extending deterrence in time of crises, as their deployment is visible and signals U.S. commitment. Bombers also impose a significant cost burden on potential adversaries in terms of the need to invest in advanced air defenses.
- The Intercontinental Ballistic Missile force imposes on a prospective aggressor the need to contemplate attacking only with very large number of nuclear weapons, substantially depleting its forces while ensuring a devastating response by the United States. The force is also immediately responsive in a highly controlled manner. And for the foreseeable future, there is no prospect that a significant portion of the ICBM force can be destroyed by a preemptive strike on the United States by small nuclear powers, including China.
- The Submarine Launched Ballistic Missile force is currently the most survivable, meaning that no attacker could contemplate a nuclear attack on the United States without expecting U.S. retaliation.”<sup>11</sup>

The general theme regarding U.S. nuclear policy is the need to further reduce nuclear weapons without reducing nuclear deterrence capability. Furthermore, any solution should continue to provide assurance to allies, and should “maintain equivalency” with Russia. Rather than follow the status quo regarding the value of each triad leg, a serious review of the perceived benefits is required.

The nuclear bomber force is no longer on “alert.” As a result the benefit of survivability and subsequent dispersal upon take off is no longer valid. Although nuclear bombers provide flexibility their responsiveness depends on their formal alert status. Without the alert status, nuclear bombers rely on advanced intelligence leading to changes in readiness. Otherwise, planes and crews can no longer generate with little to no warning placing their survivability in question. Nuclear bombers are currently stationed at known locations without a responsive state of readiness. The most significant argument for the nuclear bombers is their visible deployment as a demonstration of U.S. commitment. This assumes a show of force cannot be accomplished by any other leg of the triad. ICBMs and SLBMs are strategic weapon systems. An increase in readiness in either weapon system is noted by Russia. Russian intelligence system tracks changes in U.S. readiness and will be well aware of increased activity. When a nuclear submarine leaves port, strategic level adversaries are aware. When the ICBM field increases readiness, strategic level adversaries are aware. In reality, showing U.S. commitment through a visible deployment is no longer exclusive to nuclear bombers.

ICBMs present easily targeted, fixed locations. The benefit lies in their constant state of readiness and preparedness to launch within minutes of POTUS direction. Additionally, the dispersal of the ICBM fields mitigates the fixed locations. The ability to conduct an all



inclusive, simultaneous strike to every missile site is impossible with current technology. More discussion on this topic will follow in subsequent paragraphs.

Nuclear capable submarines are impossible to detect with current technology. Their extreme stealth adds to the impossibility of preempting the entirety of U.S. nuclear response capability. With these vast and varying nuclear capabilities, how can the U.S. determine where reductions in the nuclear force should occur without increasing risk to U.S. national security?

### **Impact of New START on the U.S. Triad**

New START is a blend between START I and the Moscow Treaty. Each delivery vehicle counts as one. But, each “deployed heavy bomber counts as one warhead toward this limit regardless of whether it is equipped to carry air-launched cruise missiles (ALCMs).”<sup>12</sup> This becomes interesting when taken into account that a B-52H can be armed with up to 20 ALCM-Bs.<sup>13</sup> The B-2 can carry up to 16 B61-7, B61-11, or B83 bombs.<sup>14</sup> Therefore, two bombers armed with 36 nuclear bombs count as two warheads. Why the disparity between bombers and missile systems?

Russia has significant air defenses. They are highly motivated to keep U.S. offensive capability focused on air frames because Russia has a chance of defending against an air strike, but is practically defenseless against ICBMs and SLBMs. They have been highly successful, so far, by negotiating strict rules on ICBM and SLBM rocket bodies while allowing broad interpretation for air breathing platforms such as bombers. Since this is a matter of U.S. National Security Strategy it is incomprehensible to play into a potential adversary’s strengths without exploiting their weaknesses. With that said, it is still possible to

substantially reduce operationally deployed nuclear weapons without jeopardizing national security. What are the nuclear numbers and how much reduction is reasonable?

The New START has another wrinkle that will force hard decisions on what weapon systems to maintain. The New START intends to place restriction on the number of delivery systems. The initial goal is to reduce to 800 deployed and non-deployed ICBM launchers, SLBM launchers, and nuclear capable heavy bombers and eventually reduced to 700.<sup>15</sup> According to an article in Defense News, “the United States has 450 intercontinental ballistic missiles based on land and 336 based on submarines. It also has 44 nuclear capable B-52 bombers and 16 nuclear-capable B-2 bombers. That gives the United States a total of 846 launchers. The treaty permits 800 launchers, but says only 700 can be “deployed.”<sup>16</sup> Simple math identifies 46 launchers too many and potentially 146 launchers too many. The term “deployed” lends itself to further definition during treaty negotiations. However, it is safe to say the U.S. Nuclear Triad as it exists today is unsustainable under proposed treaty restrictions. What is a logical way ahead considering the immediacy of the treaty timelines?

#### **IV. Diversity: An Essential Component to an Effective Triad**

Hans Kristensen, Director of the Nuclear Information Project for the Federation of American Scientists said, “Bombers have already been relegated to a limited role in the United States’ day-to-day nuclear posture. Warheads on missiles are the day-to-day deterrence. Bombers are really just a backup.”<sup>17</sup> The “Bomber Mafia” and the U.S. Air Force in general must overcome the emotions evoked by Kristensen’s statement, and understand the real discussion point is not the value of long range bombers, but the best means to maintain survivability, and thus credibility,.

Herein lays the crux of the entire paper. The United States bomber force provides an extremely capable and unmatched conventional capability. The current struggles for the U.S. military require extensive conventional support. Releasing additional bombers, crews, tankers and support to conventional tasks or financial reductions is a prudent decision. Taking the nuclear mission away from the 60 bombers reduces the U.S. nuclear launcher total to 786. Easily meeting the immediate restriction of 800 and making a dent in the goal to reach 700 launchers. This also allows for a substantial reduction in nuclear warheads assigned to air breathing platforms based on the treaty counting rules previously discussed. The remaining ICBM and SLBM force now forms a dyad, but the paper is entitled “The New Triad.” The concept of diversification is also important when considering a system of nuclear weapons and their launch vehicles.

Colin Grey described the virtues of a diverse U.S. strategic force through the following example:

*“To the very limited extent to which a strategic triad of forces provides redundant capabilities, an analogy with elevator safety design features is appropriate. An elevator accident could be so catastrophic for those involved that backup systems to backup systems are provided for safety. No elevator designer is permitted to ask of safety engineering, ‘how little is enough?’ Statistically improbable sequences of events do occur. The designer of strategic forces knows that the potential failure of one element of the triad needs to be insured against by the existence of complementary retaliatory forces in the other triad legs.”<sup>18</sup>*

He added,

*“A diverse force structure enhances the survivability of U.S. strategic forces. The dispersal of the U.S. strategic nuclear arsenal among ICBMs, SLBMs and aircraft poses extremely severe, and perhaps impossible, difficulties of attack timing for a first-strike planner...the ICBM force--as always--will be instantly ready to fire.”<sup>19</sup>*

In order to conduct a first-strike against a diverse, nuclear weapon system an adversary would need to ensure every delivery system was destroyed simultaneously and without warning to prevent any ability to retaliate. Currently, time, distance and U.S. missile warning make a first-strike unproductive to all who would attempt such an endeavor. Grey also wrote,

“Not only do these individual characteristics necessitate unique attacks to counter a single triad element, they also provide complementary survivability for the triad as a whole.”<sup>20</sup>

Additionally, weapon system diversification provides internal benefits. For example, if a failure or fault occurred, significant enough to cause an entire family of systems (say ICBMs) to be taken off alert, the remaining systems (Bombers and SLBMs) would provide deterrence. Therefore, if one system is down for one reason or another the other two systems would provide deterrent support. How does this position support removal of the nuclear bomber mission?

Removal of the nuclear bomber mission does not support diversity at face value. However, removing the nuclear bomber mission could provide needed resources for the previously proven need to diversify the ICBM force. If the decision is made to eliminate nuclear bombers then it stands to reason the remaining delivery systems must be even more survivable. Reduction of nuclear weapon numbers requires and ensured retaliation as long as adversarial nuclear weapons exist. As far back as the 1960s, adding a mobile facet to ICBMs was highly recommended.

The first Peacekeeper missiles were initially designed for deployment as a rail garrison on the public railroad systems across the United States. Testing was conducted and simulated deployment of a mobile rail launcher was also successfully accomplished, but the rail garrison was never operationally deployed. It turns out that despite the vast railroad system, launches could only occur at key points in the U.S. due to guidance system calibration, flight distances from launch to target, etc. Even though the rail garrison was mobile and unpredictable, the actual launch sites were predictable and therefore targetable. Much study was conducted

regarding deployment of the rail garrison that could be applied to a road mobile force of small ICBMs. In fact, the Rapid Execution And Combat Targeting (REACT) system currently employed in U.S. ICBM Minuteman III (MMIII) Launch Control Centers was originally designed for the rail garrison concept. If the rail garrison is not the answer for ICBM mobility then what is the answer?

Understanding the proposal of an additional nuclear weapon system during fiscally challenging times could seem improbable, but the following information will reveal the possible. First, the Defense Science Board and then the House Armed Services Committee both identified a top finding, and the need to develop the next generation ICBM. The future of both ICBMs and the Triad may very well be found in the recent past. As far back as 1960 Gen Power stated, "In addition to hardening and dispersal of ICBM sites, SAC is now resorting to another protective tactic--mobility--tests of which began in June 1960. Mobility is a most attractive defense tactic against missile attacks because the probability of destroying a mobile target with a long-range missile is very small."<sup>21</sup> Since the life extension program of the ICBM and SLBM force is so successful it would be prudent to pursue transitional technology rather than moving straight toward next generation missile systems.

## **V. Policy Recommendation: Hardened Mobile Launchers**

In the mid 1980s the Air Force was concerned over the growing accuracy of Russian SLBMs that could be launched off the coasts and jeopardize fixed U.S. ICBM locations. At that time the Air Force saw the need for a road mobile ICBM force that deployed a Small Intercontinental Ballistic Missile (SIBM). The Directory of U.S. Military Rockets and Missiles provided the following information: Martin Marietta was chosen to develop the

XMGM-13A Midgetman. It was a single warhead, solid fuel missile capable of flying 6,800 miles.<sup>22</sup> The first prototype successfully launched in 1991. Comparable to the MMIII in performance it provided a cheaper, light weight, smaller and therefore mobile option to the fixed ICBM sites. The Cold War ended and the program was cancelled in 1992 due to budgetary constraints. The main point to this section is to identify that a prototype has already been successfully developed and tested. It would not be necessary to start the research and development from scratch since the program already existed and could be reenergized as needed. Combined with life extension of the MMIII ICBMs and SLBMs, the Midgetman could provide a viable transitional option allowing more time to develop the next generation nuclear missile identified by Congress. A light weight and smaller ICBM also requires a mobile launch vehicle.

According to the Hill Air Force Base Museum website, the prototype for the Boeing manufactured small ICBM Hardened Mobile Launch (HML) Vehicle is on display at the Hill AFB Museum's Missile Park. The fact sheet described the HML as a mobile, radiation-hardened, vehicle designed to transport and launch the MGM-134A Small Intercontinental Ballistic Missile unofficially called the "Midgetman" missile.<sup>23</sup> If the HML was only road mobile it would fall under the same predictability via the roadways as the rail garrison fell under the railways. However the HML was described further as over 110 feet long and weighed over 239,000 pounds when fully loaded, yet it could travel on paved roads at up to 55 miles per hour. The HML could also travel off-road. It could withstand moderate nuclear effects and the trailer-mounted plow allowed the tractor to bury the launcher-trailer into the ground for additional protection from nuclear blasts.<sup>24</sup> Although the HML vehicle on display is no longer a working model, like the Midgetman, the HML prototype already went through

the research and development stage and could be revitalized by contacting Boeing Aerospace and Electronics who also cooperated with Loral Defense Systems Division.

The HML is survivable through both its' unknown location and hardening. The ability to "dig in" creating a low profile protected on its sides by the earth would cause an adversary's nuclear blast to travel over the HML allowing for a retaliatory strike capability. Rather than depending solely on the plow concept of digging in to increase survival, multiple, fixed sites could be built for quick deployment. This falls in line with the dispersal concept since an adversary would never know which sites were to be used and would have to target every site to ensure total destruction. The proposed treaty limitations on launchers would make targeting all the known locations impossible. The original concept for the HML was to utilize various bomb ranges since the land was already owned by the federal government, and would also alleviate potentially problematic land use negotiations with local land owners. This is a fine plan however, ranges are also known locations, and provide a focused area that could aid the targeting options of a determined foe. Therefore, additional basing concepts would prove helpful.

If eliminating the nuclear bomber mission does not generate enough funding to develop and field the Midgetman and HML concept then further tradeoffs with the ICBM and SLBM could be entertained. The author does not have the background to offer credible recommendations for SLBM reductions, but assumes some could be made. Qualified personnel at USSTRATCOM are better suited to determine appropriate SLBM tradeoffs. Since the MMIII has been de-MIRved (reduced to single warheads) it is reasonable to assume a one-for-one tradeoff between MMIII and the Midgetman. That is to say if additional

funding is necessary beyond the amount recovered from the nuclear bomber cuts then a MMIII could be taken out of service for each Midgetman placed in service.

Further utilizing existing resources the author recommends consideration of deploying HMLs from existing ICBM bases. Deployment from ICBM bases would keep HMLs in close proximity to Weapon Storage Areas (WSA), security, maintenance and operational crews familiar with the care and feeding of ICBMs. The expensive Missile Procedures Trainers could also be dual use to include HML ops crews if the REACT consoles originally designed for the rail mobile mission and currently utilized in the fixed launch control centers were used in the HML redesign. Missile Combat Crews could be proficient or easily transferred between MMIII, and Midgetman deployment duty. Incorporating the REACT consoles into the HMLs would also take advantage of the existing Undergraduate Missile Training conducted at Vandenberg AFB further taking advantage of a proven training and operating system. Operationally similar systems would also aid Global Strike Command and 20<sup>th</sup> Air Force with standardization of Nuclear Surety Inspections, Combat Capability Inspections and Operational Readiness Inspections. If thought through completely, MMIII and HML similarities could provide operational, maintenance and security synergies while creating the dispersal desired in separate missile systems.

In addition to unknown HML sites any of the MMIII missile sites that are vacant as a result of the offset equation mentioned previously, could be converted into “prepared” HML sites further capitalizing off the existing generator system and connection to C4 systems. Although the fixed sites are known locations, they are also dispersed. An adversary would be forced to hold the empty site as a continuous target whether or not a HML were present. Continued



deterrence of an adversary's first-strike capability must be ever present when designing nuclear weapon system deployment options.

There is no need to continually argue the value of the ICBM system. In fact the 1983 "bipartisan Scowcroft Commission on Strategic Forces provided an invaluable service by identifying the key issues related to how and why we should modernize U.S. ICBMs and by examining these issues within a comprehensive framework."<sup>25</sup> The Scowcroft Commission also identified the deployment of fixed silo ICBMs should be "complemented by subsequent development of a small mobile ICBM."<sup>26</sup> Additionally, the major recommendations of the Commission's report "were derived from a comprehensive view of policy, strategy and force requirements."<sup>27</sup> ICBMs, fixed or mobile, are the force always ready to launch within minutes of POTUS direction and form the backbone of U.S. deterrence efforts.

Without an understanding of the exact budgetary gains from relieving the bombers from the nuclear mission in terms of personnel, machines and even warhead numbers, further reductions will be required. As indicated earlier an undefined number of SLBMs should be under consideration for reduction, but another option is possible. With the concept of using ICBM bases for HML home stations the one-for-one swap between ICBMs could take the form of totally eliminating a squadron of 50 ICBMs toward the deployed launcher cuts bringing the total launcher number down to 736. Take the remaining 36 cuts from SLBMs will allow the U.S. to meet the deployed nuclear launcher goal of 700. Again, the term "deployed" requires defining, therefore, these numbers are notional. Then the one-for-one swap between HMLs and MMIIIs could start with 50. Activate a squadron of deployable HMLs and deactivate a squadron of MMIIIs. This paper recommends taking one squadron from two missile wings leaving a deficit of 100 MMIIIs in total (50 from each wing) replacing them with 25 HMLs each. This concept

would leave 100 MMIII sites that could be used as “prepared” HML sites in addition to their unknown mobile locations, and would keep the road mobile HML in an environment of nuclear missile experience as previously discussed.

## **VI. Conclusion**

In sum, the New START numbers will drive hard decisions. Reducing nuclear weapons has been directed by the POTUS. Both Congressional and DoD studies have confirmed the need to develop next generation ICBMs and SLBMs along with revitalizing the nuclear industrial base in the process. The tried and true concepts of survivability, dispersal, and diversity are like laws of physics to the nuclear strategist, and any solution should keep these concepts at the forefront. Taking nuclear bombers off alert compromised the survivable and responsive nature that made the nuclear bomber a strong and essential leg of the triad. Therefore, the unstated U.S. nuclear strategy is to operate as a dyad with the assumption of ramping up to a triad as needed. Assuming perfect intelligence regarding a potential nuclear threat is required for a nuclear bomber force to remain off alert and capable at a moment’s notice. Rather than withering away the capability of the entire triad the time has come to form a “New Triad” consisting of fixed and mobile ICBMs along with SLBMs. The compelling argument for the nuclear bomber force was three-fold: 1. they could be used as a show of force; 2. they forced adversaries to spend significant resources on fielded air defenses rather than developing defenses against missiles; 3. Bombers are recallable, which provides a hedge against misperception and miscommunication during peacetime and crisis.

Advances in communication and intelligence allow for flushing HMLs and nuclear submarines to send the same “show of force” strategic message. The proven capability of the

U.S. conventional bomber force will cause potential adversaries to continue committing vast resources to fielding air defense weapon systems. Eliminating the nuclear bomber mission and converting those bombers to conventional only status is a logical decision. Doing so provides necessary funding and other resources and increases the need for the remaining systems to be even more survivable and reliable. The Hardened Mobile Launch vehicles along with the Midgetman provide an affordable and capable transitional system to meet U.S. National Security interests and to meet the New START restrictions on nuclear weapons and delivery systems. Reducing nuclear weapons to zero may or may not be possible, but significant reductions are very possible while maintaining U.S. national security and assurance to her Allies.

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<sup>1</sup> Office of the Press Secretary. "The White House, Remarks by President Barack Obama, Prague, Czech Republic." April 5, 2009. [http://www.whitehouse.gov/the\\_press\\_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/](http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/).

<sup>2</sup> "2010 Nuclear Posture Review Report." April 2010, p. iii.

<sup>3</sup> *Ibid*, p. 3.

<sup>4</sup> *Ibid*, p. 2.

<sup>5</sup> Defense Science Board. *Report of the Defense Science Board Task Force on Future Strategic Strike Skills*. Independent Task Force Advice to the Secretary of Defense, Washington, D.C.: Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, March 2006, p. 4.

<sup>6</sup> *Ibid*, p. 5.

<sup>7</sup> *Ibid*, p. 5.

<sup>8</sup> Committee on Armed Services. *Hearing before the Committee on Armed Services United States Senate*. Congressional Commission on the Strategic Posture of the United States, United States Senate, One Hundred Eleventh Congress, First Session, Washington: U.S. Government Printing Office, May 7, 2009, p. 12.

<sup>9</sup> *Ibid*, p. 13.

<sup>10</sup> *Ibid*, p. 38.

<sup>11</sup> *Ibid*, p. 47.

<sup>12</sup> *Ibid*, p. 2-3.

<sup>13</sup> U.S. Air Force, *Long Range Strike Aircraft White Paper*, op. cit., p. 20.

<sup>14</sup> Office of the Deputy Assistant to the Secretary of Defense for Nuclear Matters, *Nuclear Matters: A Practical Guide* (Washington, D.C.: Office of the Deputy Assistant to the Secretary of Defense for Nuclear Matters, 2008), p. 37.

<sup>15</sup> "2010 Nuclear Posture Review Report." April 2010, p. 21.

<sup>16</sup> Matthews, William. "New Treaty Could Trim U.S. Bombers Nuclear Role." *Defense News*. April 1, 2010. <http://www.defensenews.com/story.php?i=4564748>.

<sup>17</sup> *Ibid*.

<sup>18</sup> Dr. Barry R. Schneider, Colin S. Gray, Keith B. Payne. *Missiles for the Nineties, ICBMs and Strategic Policy*. Westview Replica Edition, p. 8.

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<sup>19</sup> Ibid, p. 8.

<sup>20</sup> Ibid, p. 9.

<sup>21</sup> Thomas S. Power, USAF. "Strategic Air Command," p. 5.

<sup>22</sup> Parsch, Andreas. "Directory of U.S. Military Rockets and Missiles." *MGM-134*. 2002. <http://www.designation-systems.net/dusrm/m-134.html> (accessed Dec 7, 2010).

<sup>23</sup> Hill Air Force Base. "Fact Sheet." *Small ICBM Mobile Launcher*.

<http://www.hill.af.mil/library/factsheets/factsheet.asp?id=5717> (accessed December 7, 2010).

<sup>24</sup> Ibid.

<sup>25</sup> Dr. Barry R. Schneider, Colin S. Gray, Keith B. Payne. *Missiles for the Nineties, ICBMs and Strategic Policy*. Westview Replica Edition, p. 3.

<sup>26</sup> Ibid, p. 3.

<sup>27</sup> Ibid, p. 3.

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