

## Introduction

Some uses for which the United States has historically reserved the right to use nuclear weapons may not be a credible threat to some potential adversaries. Additionally, the U. S. may be backing into a strategic corner if the only stated response to certain situations is nuclear. Conventional alternatives to nuclear weapons may create a more flexible and credible response to a broader range of strategic problems.

The United States historically has reserved the right to use nuclear weapons for the following principal reasons:

1. Deter use of nuclear weapons against the United States (e.g. USSR or PRC vs. US/NATO)
2. Deter general conventional war between major powers (e.g., USSR vs. NATO)
3. Defend against overwhelming conventional enemy force (e.g., USSR vs. NATO)
4. Retaliate for use of biological and chemical weapons

Recently, some cases have been identified as new reasons for requiring nuclear weapons.

These specialized targets include:

5. Hardened deep underground bunkers (HDUB)
6. Satellites (sensors, and weapons)
7. C4ISR systems
8. Nuclear, Biological, and chemical development sites

The use of nuclear weapons is justified for the above targets based principally on the tremendous power they possess and the ability to quickly inflict exceptional damage over large areas. In the case of specialized targets, nuclear weapons are justified because of their unique ability to overcome various difficulties.

If, in the calculus of American national security, the above targets remain valid, and if it is true that nuclear weapons offer the only valid response to neutralizing those targets, then current strategy is also valid. If, however, some targets are not threats to national security, or if

non-nuclear answers are available and perhaps even more useful, a change to strategy is warranted to make it more credible and offer greater flexibility of response.

## Historical Perspective

Since the end of World War II, United States security policy has been to prevent the outbreak of major war by deterrence. The mainstay of strategic deterrence has been nuclear weapons, now embodied in the nuclear “triad” of manned bombers, land-based Intercontinental Ballistic Missiles (ICBM), and submarine launched ballistic missiles (SLBM). As early as 1946, the major powers recognized that nuclear weapons brought a new calculus to war, especially war on the scale of the recently concluded world war. Bernard Brodie, writing in 1946, concluded that the use of nuclear weapons was too terrible to contemplate. He believed that the only effective role for nuclear weapons was in the threat and not actual use. He reasoned that no nation would willingly submit itself to nuclear retaliation.<sup>1</sup>

Historically, the United States and Great Britain believed that the proper role of nuclear weapons was to deter major conflict, not merely to deter the use of other nuclear weapons. It is clear that early thinkers on nuclear strategy saw such weapons as deterrents to major war.<sup>2</sup> John Foster Dulles, in his influential January 1954 speech, announced that the United States would deter aggression in the world by using “...a great capacity to retaliate, instantly, by means and at places of our own choosing.”<sup>3</sup> The doctrine of “massive retaliation” was born.

The United States embarked upon a strategic program that emphasized nuclear readiness and deterrence. From 1953 until 1967, the Air Force budget outstripped the other services, averaging over 42% of the Department of Defense budget for those fifteen years. A significant

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<sup>1</sup> Bernard Brodie, *The Absolute Weapon*. New York: Harcourt, Brace and Co., 1946.

<sup>2</sup> For a British view on the understanding of the usefulness of nuclear weapons in the early 1950s, see John Slessor, “The Place of the Bomber in British Strategy,” *International Affairs* 23, no. 3 (July 1953), 302-303 in which he writes that nuclear weapons as the “Great Deterrent” and “...the counter-threat to the vast armies and tactical air forces of our potential enemy. Moreover it gives us some degree, and an increasing degree, of initiative in the cold war, instead of always dancing to the enemy’s tune.”

<sup>3</sup> John Foster Dulles, “The Evolution of Foreign Policy,” *Department of State Bulletin*, vol. 30, January 25, 1954.

amount of the Air Force budget was for development, acquisition, and operation of nuclear strategic forces. By the early 1960s, the Navy was spending a significant portion of its budget developing and deploying ballistic missile submarines (SSBN) and submarine launched ballistic missiles (SLBM).

By the end of the Eisenhower administration, American leaders realized that “one-size-fits-all” massive retaliation was not a strategic panacea. Secretary of State Christian Herter, in an April 1959 statement to the United States Senate, said, “I cannot conceive of any President engaging in all-out nuclear war unless we were in danger of all-out devastation ourselves.”<sup>4</sup> A few years later, during the Cuban Missile Crisis, the Kennedy administration concluded that the use of nuclear weapons was not a feasible option for the United States. McGeorge Bundy, President Kennedy’s Special Assistant for National Security Affairs, discussed it in a 1969 *Foreign Affairs* article:

There is an enormous gulf between what political leaders really think about nuclear weapons and what is assumed in complex calculations of relative “advantage” in simulated strategic warfare. Think Tank analysts can set levels of “acceptable” damage well up in the tens of millions of lives. They can assume that the loss of dozens of great cities is somehow a real choice for some men. In the real world of real political leaders – whether here or in the Soviet Union – a decision that would bring even one hydrogen bomb on one city of one’s own country would be recognized in advance as a catastrophic blunder; ten bombs on ten cities would be a disaster beyond history; and a hundred bombs on a hundred cities are unthinkable.”<sup>5</sup>

The French, during the same period, were not convinced that the Americans would use nuclear weapons for the defense of Europe. They developed their own nuclear arsenal primarily because of their doubt that the United States and NATO would carry through on the guarantee of

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<sup>4</sup> Alfred Grosser, *The Western Alliance: European-American Relations since 1945*, London: 1980, p. 173.

<sup>5</sup> McGeorge Bundy, “To Cap the Volcano,” *Foreign Affairs* 48, no. 1 (October 1969), pp. 9-10. See also Major General Howard M. Estes, Jr., “On Strategic Uncertainty,” *Strategic Review*, vol. 11 (Winter 1983), p. 39, where he observes, “The seductive ease with which strategic wars can be “fought” in the computer room...[has] led some

the “nuclear umbrella.”<sup>6</sup> With France out of NATO militarily, the rest of the allies developed the Flexible Response strategy. This sent a signal that the nuclear weapons, while still an option, may not actually be used. Thus, the utility of nuclear weapons as a deterrent force was brought into question. That, combined with the long-term non-use of nuclear weapons since World War II, raised serious doubt as to whether the United States (or any other state) would actually use the weapons.

The Nixon administration, primarily under the guidance of National Security Advisor and Secretary of State Henry Kissinger, developed the strategy of “assured destruction”, later amended to “Mutual Assured Destruction” or MAD. After lengthy negotiations, the Soviet Union essentially agreed to the idea that each country would hold the other hostage to total nuclear destruction. The Anti-Ballistic Missile Treaty (ABM) ensured that neither country would be able to counter a nuclear assault by the other.

President Reagan, who wanted to either eliminate nuclear weapons or develop a realistic plan that would use them, was uneasy with a plan that essentially left the United States naked to attack.<sup>7</sup> As total elimination of nuclear weapons appeared not to be feasible or practicable, he directed strategic thinkers to figure out how to use the weapons in warfighting, essentially as larger, more powerful, conventional weapons, and to develop a plan to defend the United States from nuclear attack (SDI).

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people (who should know better) to believe, or to act as if they believed, that it is possible to predict with considerable certainty the outcome of strategic nuclear war.”

<sup>6</sup> Lawrence Freedman, “The First Two Generations of Nuclear Strategists,” in Peter Paret (ed.), *Makers of Modern Strategy: from Machiavelli to the Nuclear Age*, Princeton, New Jersey: Princeton University Press, 1986, p. 770.

<sup>7</sup> To the consternation of advisors on both sides, Reagan and Gorbachev discussed the possibility of eliminating nuclear weapons altogether at the October 1986 Reykjavik conference. When asked later if it was true that he advocated such a plan, Reagan said, “Yes, I said it, and I should know, I was there.” See also Richard Ned Lebow and Janice Gross Stein, “Reagan and the Russians,” *The Atlantic Online*, (February 1994), available at <http://www2.theatlantic.com/politics/foreign/reagrus.htm>.

The strategy, as finally expounded by NATO, was in response to a perception that only by using nuclear weapons could the allies hold off large scale conventional attack by massive Soviet tank armies advancing through the Fulda Gap. War, especially in Europe, became a continuous spectrum of conflict that included conventional and nuclear options, regardless of what weapons the enemy might chose.<sup>8</sup>

Arguments have arisen recently that the only valid use for nuclear weapons is to deter the use of other nuclear weapons. The Canberra Commission (1996) and the Tokyo Forum (1999) advanced positions that nuclear weapons were irrelevant for modern security.<sup>9</sup> While there is no doubt that the threat of mutual destruction is very real and effective, it is also apparent that it is not the only reason nations go to the expense and effort to obtain nuclear weapons. The perception of weakness in the face of conventional superiority has driven American and NATO nuclear policy as well as for China, Pakistan, India, and Russia.

The United States insisted on a NATO “first-use” nuclear policy in the face of a perceived overwhelming Soviet conventional ground force on the inter-German border. China embarked upon a nuclear development program to enable it to enter the “nuclear club” and thus gain more respect from the international community, especially from the Soviet Union and the United States. India developed nuclear weapons for reasons similar to China’s, but also to check Chinese power to their north. Pakistan launched its nuclear program not only in response to India’s possession of nuclear weapons, but as a counter to Indian conventional superiority.

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<sup>8</sup> For a good summary of the development of nuclear strategic thinking, see Lawrence Freedman, “The First Two Generations of Nuclear Strategists” in Peter Paret (ed.), *Makers of Modern Strategy: from Machiavelli to the Nuclear Age*. Princeton, New Jersey: Princeton University Press, 1986, pp. 735-778.

<sup>9</sup> Rod Lyon, “A Pillar of Salt: the Future of Nuclear Arms Control,” *Australian Journal of International Affairs*, Vol. 54, no. 3, 2000, p. 300.

There is growing evidence that Russia's recent "first use" pronouncements are in response to a sense of an overmatch by NATO in Europe.<sup>10</sup>

Thus, it would appear that many nations have an understanding that nuclear weapons are to not only deter other nuclear weapons, but also are necessary to deter a potentially overwhelming conventional enemy force. In 1993, Les Aspin, then Secretary of Defense, explained how the dynamics of a nuclear "equaliser" force worked:

During the Cold War, our principal adversary had conventional forces in Europe that were numerically superior. For us, nuclear weapons were the equaliser. The threat to use them was present and was used to compensate for our smaller numbers of conventional forces. Today, nuclear weapons can still be the equaliser against superior conventional forces. But today it is the United States that has unmatched conventional military power, and it is our potential adversaries who may attain nuclear weapons... We're the ones who could wind up being the equalisee.<sup>11</sup>

It follows that if nuclear weapons are to be a mainstay of strategic deterrence there must be no question on the part of the enemy whether or not the nuclear power will actually authorize the use of the weapons. This must be true for both massive retaliation and as a counter to overwhelming conventional force. If there is significant doubt that nuclear weapons will be used, an enemy may decide to launch an attack. Deterrence will have failed, leaving the nuclear power little alternative but to either carry out the threat of massive retaliation or surrender. Given the record of non-use since the end of World War II, the role of nuclear weapons in international diplomacy has limited American ability to deal with some threats.<sup>12</sup>

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<sup>10</sup> Ibid.

<sup>11</sup> Les Aspin, 7 December 1993.

<sup>12</sup> For an Australian view on the credibility of American use of nuclear weapons and their role in future international diplomacy as well as a good discussion on the development of American nuclear strategic policy, see Joseph M. Siracusa and David G. Coleman, "Scaling the Nuclear Ladder: Deterrence from Truman to Clinton," *Australian Journal of International Affairs*, vol. 54, no. 3, 2000, pp. 277-296.

## Analysis and Conventional Alternatives

In order to deter an enemy from an undesirable course of action, or to coerce an action they might otherwise not pursue, a credible threat must be present. It is clear that nuclear weapons have offered valuable deterrence to general nuclear and major power war. It is less clear that nuclear weapons offer a credible response to anything much less than national survival. It is useful to look at the historical uses for which the United States has reserved nuclear weapons and how those used may (or may not) be valid exercises of deterrence or coercion.

In his 1996 book, *Bombing to Win*, Robert Pape made an extensive study of the role of coercion in war. He divided coercion into two categories: coercion by punishment and coercion by denial. Punishment, while not limited to attacking civilians and major population centers, operates by holding civilians and cities and risk. It can also take the form of creating huge casualties upon an enemy military force. Denial uses military means to keep an enemy from reaching its political, military, or territorial goals.<sup>13</sup>

Pape determined that there were differences in conventional and nuclear coercion. He summarized them with the following propositions:

### Conventional Coercion:

1. *Punishment strategies rarely succeed.* Inflicting enough pain to subdue the resistance of a determined adversary is normally beyond the capacity of conventional forces. Punishment strategies will work only when core values are at risk.
2. *Risk strategies will fail.* They are diluted, and therefore weaker, versions of punishment.
3. *Denial strategies work best.* They succeed if and when the coercer undermines the target state's military strategy to control the specific territory in dispute.
4. *Surrender of homeland territory is especially unlikely.* Nationalist sentiments demand resistance to foreign rule even when physical security cannot be guaranteed.

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<sup>13</sup> Robert A. Pape, *Bombing to Win: Air Power and Coercion in War*. Ithaca, New York: Cornell University Press, 1996, p. 13.



5. *Surrender terms that incorporate heavy additional punishment will not be accepted.* There is no incentive to concede when the costs of surrender outweigh those of continued resistance. Societies that expect to become victims of genocide will not surrender.
6. *Coercive success almost always takes longer than the logic of either punishment or denial alone would suggest.* Targets of coercion are usually slow to recognize the magnitudes of both increased civilian suffering and declining military prospects. Also, the domestic political costs of concessions encourage delay until the hopelessness of the situation becomes inescapably obvious. Even small hopes of success can cause coercion to fail.

#### Nuclear Coercion:

1. *Nuclear coercion requires superiority.* If the target state has an assured destruction capability, any coercer is likely to be deterred.
2. *Denial strategies are not useful in nuclear disputes.* The horrific levels of societal destruction in nuclear war are likely to so dominate decision making as to make the prospects for success or failure of military campaigns largely irrelevant.
3. *Risk strategies can be successful in nuclear disputes.* Unlike conventional threats, nuclear threats raise the prospect of so much harm that they can coerce without being fully implemented.
4. *Nuclear punishment should be effective but rare.* No target could resist. However, nuclear bombardment would not only reduce the value of the disputed territory, but would also earn the coercer a reputation for unparalleled barbarism.<sup>14</sup>

The propositions above imply that nuclear weapons are most effective when they threaten civilian populations with great harm, that is, in the coercion by punishment role. In such a role, leaders will likely be deterred from making decisions that run the risk of nuclear retaliation. On the other hand, in situations where denial is the object, conventional weapons appear to be the more effective. This becomes even more true in situations where it is unlikely that nuclear weapons will be used.

If Pape contentions are correct, that nuclear means are more effective for coercion by punishment and conventional weapons the more effective in coercion by denial, the uses for

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<sup>14</sup> Ibid., p. 20.

which the United States has reserved the right to use nuclear weapons may not be completely valid. Reviewing the list on page 1 above, the first two, 1) deter use of nuclear weapons against the United States, and 2) deter general conventional war between major powers, appear to be coercion by punishment. These are within the realm of effective use of nuclear weapons.

The remaining reasons, 3) defend against overwhelming conventional enemy force, 4) retaliate for use of biological and chemical weapons, 5) hardened deep underground bunkers, 6) satellites, 7) C4ISR systems, and 8) nuclear, biological, and chemical development sites, appear to fall into the coercion by denial category. With the possible exception of deterring use of biological and chemical weapons, (*see discussion on the biological and chemical weapon problem, below*) these categories appear to fall in the “denial” category. Effective conventional responses are available now, or are in development.

New conventional systems currently in various stages of production or research and development offer capabilities that can substitute for nuclear weapons on some missions. Air-launched cruise missiles and other precision guided munitions are currently under development by the Department of Defense. The Joint Standoff Weapon (JSOW), the Joint Direct Attack Munition (JDAM), and the Joint Air-to-Surface Standoff Weapon, a longer ranged air launched PGM are currently available or on the immediate horizon.<sup>15</sup>

Particularly promising is the Fast Reaction Standoff Weapon (FRSW). The United States Air Force is funding research and development for a mach 8 “hypersonic” air-to-ground missile

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<sup>15</sup> Andrew Krepinevich, and Stephen Kosiak, “Smarter Bombs, Fewer Nukes” *The Bulletin of Atomic Scientists*, Winter 1998/1999 (November 1998). This article has been published elsewhere under the title “The Military Revolution and the Case for Deep Cuts in Nuclear Forces.” Many of the items noted in following paragraphs were cited in this article, a very good summary of how to replace nuclear weapons with conventional munitions and other technology.

capable of responding to highly mobile, time-critical targets, and, potentially, hardened deep underground bunkers.<sup>16</sup>

Advanced research into miniaturized warheads with explosive power four to five times more powerful than available today may permit aircraft, UAVs, and missiles the ability to lift far more strike power per sortie.<sup>17</sup> With several times the strike power, General Fogleman's predictions of 1500 or more targets struck in the first hour of an attack become achievable and approach strategic levels of speed and destruction.<sup>18</sup>

The United States Air Force has been developing unmanned aerial vehicles that promise loiter time measured in days rather than just hours. In 1996, the Air Force Scientific Advisory Board reported that "UAV platform, sensor, and weapons technology have all matured sufficiently to permit low risk, rapid, and low-cost development and application of weaponized UAVs in the near-term (1996-2005)."<sup>19</sup>

Electromagnetic pulse (EMP), a known side effect of nuclear explosions, is destructive to electronic equipment and is capable of affecting systems across a large area. The ability to generate EMP from conventional sources offers a method of disrupting enemy C4I networks and systems. High-power microwave (HPM) can produce similar destructive results and may even produce effects on personnel over an extended area.<sup>20</sup> Conventionally generated EMP and HPM,

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<sup>16</sup> See Robert Wall and David Fulghum, "Combat Weakness Triggers New Research," *Aviation Week and Space Technology*, February 16, 1998, p. 25.

<sup>17</sup> Krepinevich, "Smarter Bombs, Fewer Nukes", p. 6.

<sup>18</sup> General Ronald R. Fogleman, "Getting the Air Force into the 21st Century," Speech delivered to the Air Force Association's Air Warfare Symposium (Orlando, FL: 24 February 1995). See also Krepinevich, "Smarter Bombs, Fewer Nukes," p. 3. Krepinevich argues "If, as General Fogleman seems to imply, it is possible to deploy a conventional precision strategic strike capability that can be employed with the speed and effectiveness approaching that of a nuclear strike, it may constitute an irresistible option for those military organizations that can afford to develop such forces and organizations."

<sup>19</sup> United States Air Force Scientific Advisory Board, *Report on UAV Technologies and Combat Operations*. (Washington, DC: Department of Defense, 1996).

<sup>20</sup> Board on Army Science and Technology, Commission on Engineering and Technical Systems, National Research Council, *Star 21 Technology Forecast Assessments: Strategic Technologies for the Army of the Twenty-First Century* (Washington, DC: National Academy Press, 1993), p. 503.

used as part of an electronic attack (EA), will increase ability to affect enemy C4ISR systems over broad areas without the negative aspects brought about by the use of nuclear weapons.

### **The Biological/Chemical Problem**

The United States has defined biological and chemical weapons, along with nuclear weapons, as “weapons of mass destruction” (WMD). Since the United States eliminated its biological and chemical weapons programs, the stated policy has been to imply that the use of any WMD, whether nuclear, chemical, or biological, may expect a response by nuclear attack. While it is apparent that American leaders are reluctant to think about the use of nuclear weapons, there has been no reticence to discuss their potential use.

During the Cuban Missile Crisis, President Kennedy went out of his way to avoid the use of nuclear weapons. President Reagan, despite a strategy advocating the use of nuclear weapons as a tactical warfighting tool (e.g., NATO vs. USSR), wanted to find a way to eliminate nuclear weapons. President Bush decided early on in the Gulf War that he would not authorize the use of nuclear weapons. When such plans were discussed at the Department of Defense, they were quickly discarded.<sup>21</sup>

The intentions to not use nuclear weapons did not deter President Bush and Secretary of State Baker from threatening their use, however. When Iraq was suspected of having biological and chemical weapons, public and private statements were made linking any potential use of such weapons with a veiled threat of nuclear retaliation. While Iraqi Foreign Minister Tariq Aziz stated that veiled threats of nuclear attack prevented the Iraqis from using their weapons in the

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<sup>21</sup> Colin L. Powell with Joseph E. Perisco, *My American Journey* (New York: Random House, 1995), pp. 485-486 Secretary of Defense Richard Cheney asked the Chairman, Joint Chiefs of Staff, General Colin Powell, to examine possible nuclear strike options. "To do serious damage to just one armored division dispersed in the desert would

Gulf War, it is more likely that other factors, such as the speed of the ground war and a general inability of the Iraqi command structure to function efficiently, was the actual reason.<sup>22</sup> The policy of privately not intending to use nuclear weapons, yet publicly threatening use was described by former Secretary of State James A. Baker, III, as “calculated ambiguity.”<sup>23</sup> The danger of this ambiguity is that an aggressive or risk-prone opponent may interpret such ambiguity as a lack of resolve.

With a growing sentiment that the potential for use of biological and chemical weapons is increasing, the United States must have a credible response that, while including nuclear weapons, does not require their use. Other than the first uses of chemical weapons in World War I, the only uses have been against essentially helpless victims. As long as a credible ability to respond, even conventionally, will probably deter use.<sup>24</sup>

The response to use of biological/chemical weapons use can take two forms. First, an attack on the leadership that made the decision. This has been the traditional realm of nuclear weapons. If, however, the U. S. leadership is unwilling to take that step, something equally as terrible must be available. Current conventional air strikes and cruise missile attacks are not sufficient.

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require a considerable number of small tactical nuclear weapons. I showed this analysis to Cheney and then had it destroyed.”

<sup>22</sup> Stephen I. Schwartz, “Miscalculated Ambiguity: U. S. Policy on the Use and Threat of Use of Nuclear Weapons.” *Disarmament Diplomacy*. The Brookings Institute, February 1998, p. 2.

<sup>23</sup> William Arkin, “Calculated Ambiguity: Nuclear Weapons and the Gulf War.” *Washington Quarterly*, vol. 19, no. 4, Autumn 1996, pp. 3018.

<sup>24</sup> Keith B. Payne, “Deterring the Use of Weapons of Mass Destruction: Lessons from History.” *Comparative Strategy*, vol. 14, October 1995, pp. 347-359. Despite the availability of such weapons, neither Germany nor Japan used the bio/chem weapons against the United States in World War II. In the cases where it was used (e.g., Italian use against Ethiopia in 1935, Japanese use against Chinese beginning in 1937, Egyptian use against Yemen in 1967, and Iraqi use against Kurds in the 1990s) the target was essentially helpless to respond to the attack.

Second, the response can be to attack the bio/chem weapon storage and development sites. A concern in this option is actually destroying the biological and chemical agents and avoiding spreading in an explosive cloud.

In both options above, the weapon currently available that offers both the “terrible-ness” and ability to actually destroy biological and chemical agents, is the fuel-air explosive (FAE). The fireball created by igniting a cloud of aerosol fuel will remove oxygen from the air, killing anyone in the area, create sufficient overpressure to knock down some buildings and nearby structures. Additionally, the heat is enough to sanitize biological agents and destroy or neutralize most chemical agents. The appearance and effect of a large FAE takes on a near-nuclear appearance (mushroom-like cloud) and has terrific destructive power without crossing the nuclear threshold.

The use of fuel-air-explosives has been controversial in some circles. Some hold that it is in contradiction to the Chemical Warfare Convention<sup>25</sup> and a violation of the Law of War. However, the United States has used the weapon in combat, most notably during Operation Desert Storm, and as recently as February 2001 reaffirmed it as being in the category of an incendiary device.

### **Hardened deep underground bunkers**

Hardened Deep Underground Bunkers have presented a particularly difficult case for strategic targeting. Built into underground rock formations, such bunkers have been especially difficult to destroy by conventional means. Attempting to destroy the bunker directly with a

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<sup>25</sup> The Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (Chemical Weapons Convention, or CWC), entered into force on 29 April 1997. It has been signed and ratified by 123 countries, including the United States. 48 other countries are not signatory, including Egypt, Eritrea, Iraq, Libya, North Korea, Serbia, Somalia, Sudan, and Syria.

ground penetrating, air dropped bomb has been the traditional method of attacking them. Heavy, hardened, conventional bombs have been used in the past with varying results.

The B-61-11 ground penetrating nuclear bomb, a variant of an existing nuclear gravity bomb, was developed during the 1990s to counter the difficult target. The bomb dropped from very high altitude results in a high velocity impact. Combined with a hardened case, it can penetrate several feet underground. With an underground explosion, most of the explosive power is coupled to the earth causing greater destructive power being transmitted to the buried bunker.

The British have been experimenting with hypersonic (mach 8 plus) missiles that promise an ability to penetrate the earth and impart sufficient explosive power to affect underground facilities. The missile's multiple warheads are timed very carefully to hit the earth in sequence. The first warheads remove any covering soil, which is a particularly good dampener of shock. Subsequent warheads strike the rock and penetrate with a superheated blast similar to HEAT rounds that melt their way through tank armor. A series of such warheads can penetrate well into the rock structure and impart sufficient shock to destroy or at least incapacitate the underground facility.<sup>26</sup>

Other methods are available to attack underground bunkers that do not involve explosive attack on the integrity of the facility itself. Existing methods can be used to attack the life support or communications systems. Once the underground bunkers have been located, photoanalysts and engineers will be able to identify the ventilation systems, power grid, and communications cables. Ventilation ducts, underground power or communications cables can be located by overhead means and attacked with PGMs. Additionally, electronic attack against

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<sup>26</sup> Thomas C. Linn, "U.K.-made bomb offers U.S. conventional long-range missile that destroys bunkers." *National Defense*, vol. 82, no. 535 (February 1998), pp. 16-17.

known communications networks can render the personnel inside the bunker incapable of communicating. The special warfare community has recently been cooperating with STRATCOM to determine other methods of attacking and/or neutralizing HDUBs.



## Summary and Conclusions

A credibility gap exists between the threat of nuclear weapons and current conventional capability. While there is little doubt that adversaries take American possession of nuclear weapons seriously for the deterrence of nuclear and major power war, there is room to question U. S. willingness to use them for anything short of an “enemy-at-the-gates” scenario. A case can be made that nuclear weapons are useful in deterring use of biological and chemical weapons, but there is an apparent lack of willingness on the part of U. S. leaders to actually commit to crossing the nuclear threshold. Bringing existing and “on-the-horizon” technologies into the strategic arena will add to the credibility of American resolve and allow more flexibility of response.

The belief that nuclear weapons are a credible threat becomes even more problematic in proposing them as a counter to hardened deep underground bunkers, satellites (weaponized or surveillance), or terror activity, whether state- or non-state sponsored. For the United States to maintain a credible threat to respond to the specialized targets and in response to use of WMD, non-nuclear options are required.

A bullet that never fired is just extra weight in the cartridge belt. Similarly, a bullet that an opponent does not believe will ever be fired is an ineffective tool for deterrence. For American power to be credible across the full spectrum of threats, a reasonable belief that such power will be exercised must exist. A conventional, believable force must be available.

Advances in munitions and guidance technology offer the United States strategic deterrence options beyond those provided by nuclear weapons alone. A broad range of powerful munitions, combined with the exceptionally accurate delivery methods provided by the Global Positioning System (GPS), terrain mapping radar, and laser terminal guidance, provide useful

and credible force that can provide the same or similar effects as a nuclear weapon with fewer political drawbacks. Future advances in doctrine and technology promise to increase the effectiveness of such weapons.

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