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PROTECTING US SECURITY BY MINIMIZING THE ROLE OF NUCLEAR WEAPONS: A NEW US NUCLEAR POLICY

Nuclear weapons are the most potent destructive force known to humanity. Yet, even though the United States enjoys a dominant geopolitical position in the world, underpinned by a conventional military superiority greater than any ever known before, US nuclear policies and doctrines remain encumbered by Cold War beliefs in the potential utility of these weapons of mass destruction. These false hopes that nuclear weapons can play a range of political and military roles in US security policy cause the United States to mistakenly pursue a nuclear strategy that is costly -- not only in material terms, but also in geopolitical terms. In the worst case scenarios, the strategy could be catastrophic in terms of human lives and the nation's future. The overarching goal of US nuclear policy and strategy should be to seek to minimize the roles played by these weapons, both in our own policies and in the policies of all other nations.

The United States enjoys conventional military superiority over every other nation in the world. As a result, in all situations in which military instruments are relevant means of defending American interests, conventional armed forces are the preferred means of protecting those interests. For the United States, nuclear weapons' only role is to deter nuclear attacks on the US and its allies. They provide no military or political advantage for the United States against any other threat. In addition, any use of nuclear weapons, no matter how limited, would end the longstanding taboo on their use and make devastating nuclear wars more likely. Consequently, US political and military strategy, diplomacy, military doctrine, and military force structure should all aim to minimize the importance accorded to nuclear weapons by the US and all other nations.

US Conventional Military Dominance

The key attribute of the US military posture is the conventional military dominance it currently enjoys and will likely be able to maintain for the next several decades, assuming that US citizens are willing to invest sufficient resources to preserve the nation's current advantages. Although military instruments are inherently limited in the strategic and policy goals they can achieve alone, conventional military superiority provides the US with the ability to defend itself, its allies, and its global interests whenever military means are relevant.

The US enjoys conventional superiority because of the scale and longevity of its investments in relevant technologies, the size of its forces, and the qualities and training of the people in its

armed forces. The United States leads the world in military technologies. Sensors on satellites and manned and unmanned aircraft, paired with redundant global command, control and communications networks, provide unprecedented and unparalleled situational awareness to US political and military leaders. Precision-guided munitions launched from air, sea, and land platforms offer the potential for US armed forces to eliminate targets with a degree of speed and accuracy that was unimagined only a few decades ago. Furthermore, the United States maintains unmatched capabilities to project military power around the world, including large and small aircraft carriers, sea- and air-launched cruise missiles, penetrating strike aircraft and bombers, a large fleet of cargo and tanker aircraft, and mobile theater missile defenses. The US can move large numbers of Marines and/or Army forces rapidly to distant regions. And, finally, the United States has unique capabilities to deploy significant numbers of technologically advanced Special Operations Forces almost anywhere in the world on short notice.

The US can capitalize on these advanced military technologies because of its investment in people and its unique military culture. As one of the first nations to abandon conscription, the US all-volunteer force provides greater selectivity and longer tenures than conscripted forces, resulting in the high caliber of individuals serving in the military. The qualities of these individuals are further enhanced by the significant and unmatched investments in training made by the United States. No other nation provides as frequent opportunities for its fighting men and women to conduct training operations on their equipment or in simulators, both in small units and in larger exercises. Finally, an American culture of individual initiative, combined with high-quality, well-trained personnel, produces the ability for US armed forces to conduct complex, decentralized military operations more effectively than any other state.

Besides the quality edge in both people and equipment, the United States also has a massive quantitative advantage in most types of military capabilities. The US has long been the greatest spender on armed forces. The US maintains more people in active service than any country other than China, and much of China's military consists of domestically focused conscript forces. The US maintains larger numbers of warships, bombers, and advanced tactical fighters than any other nation, and its forces of armored and wheeled ground vehicles are at least comparable in size to other nations. Moreover, each of these pieces of equipment also is qualitatively superior to any other counterpart.

US conventional dominance is not guaranteed and depends on a continued high level of investment, efficient use of resources, and the continuing willingness of US citizens to sacrifice personal resources to provide sufficient national resources. But the previous high levels of investments do mean the United States has conventional military superiority today in almost every respect. And assuming continuing high levels of investment, US conventional superiority is likely to endure for at least several decades. Relative US economic dominance is declining as other nations develop, but the US will remain a very wealthy nation with vast resources for

decades to come. The US has untapped capacity to expend significantly greater resources on defense, as it has demonstrated repeatedly during past wars and crises. US technological superiority can be maintained by continuing to invest in relevant research and development -- the nation has a vibrant private technological sector that can be drawn upon to support that R&D. Moreover, the large, well-educated US population offers a pool for military service that no other nation can duplicate in the near-term.

US conventional dominance is not uncontested. Russia and China are actively seeking to erode US military advantages, but remain unlikely to pose anything more than limited regional challenges to American conventional superiority, if that, for many years. Chinese investment in equipment modernization is paying off, but its modern military forces remain small and qualitatively inferior to those of the US. China does not today have the ability to contest the United States successfully, even in specific areas near US allies off China's coasts. Still, given its 20 years of investments in building a more modern military and continuing economic growth, China could plausibly threaten the United States' ability to conduct specific military actions in regions near China's coasts within the next several decades. If realized, such threats could jeopardize America's ability to fulfill its commitments to defend certain allies. But the realization of these threats is far from assured.

Few assert Russia will be able to contest US (and NATO) conventional military dominance within reasonable time horizons. Even if successful, Russian military reform efforts will likely take decades to produce a modern, professional force, as the Russian military largely remains an ill-trained conscript force reliant on older equipment. Those pessimistic about relative NATO/Russian conventional capabilities point out that the Russians have quantitative advantages in ground forces at several points along NATO's borders. Such calculations ignore the alliance's ability to move forces around during the crisis that would precede any conflict, as well as the inherent flexibility and mobility of NATO's superior air power. These scenarios also assume the United States and its allies will not act in the near future to overcome these dangers -- a position given lie by current efforts underway to strengthen NATO's on-the-ground capabilities in Northern Europe.

The Limited Role of Nuclear Weapons

Nuclear weapons remain indispensable in order to deter other nations from contemplating nuclear attacks on the US and its allies. Conventional forces are an inadequate deterrent for adversaries with significant nuclear forces, as they could not impose a comparable scale of destruction. Deterrence of nuclear attacks will always be a risky proposition, particularly during crises or wars, as it assumes informed and rational decision-makers, effective communications, and a host of other enabling conditions. Still, the fact that the US and Soviet Union generally behaved cautiously during the Cold War, when they each faced existential threats from the other's nuclear weapons, suggests nuclear threats do have deterrent value. At the same time, the

facts that non-nuclear states have been willing to attack and wage conventional war on nuclear powers, and that nuclear weapons have never been used since 1945, demonstrate the limited utility of these weapons in the real world, as opposed to the world of nuclear theoreticians.

Other than deterring nuclear attacks, nuclear weapons offer no advantage over conventional forces to the United States. The US can *defeat* any conventional attack on itself or its allies using conventional means. Even if a competitor challenged US conventional dominance in a particular situation and gained a temporary advantage, the US would be able to prevail conventionally over time by repositioning forces and, if necessary, drawing on its substantial demographic and economic resources. Because of this essentially absolute conventional defense capability, nuclear weapons add no further military advantage. Unlike every other major power, the United States does not have to rely on nuclear threats to defend itself from conventional attacks -- a tactic of weak states. In addition, for defending against unconventional attacks, such as the 9/11 attack, or the recent covert low-level military operations conducted by Russia in Ukraine, nuclear weapons are irrelevant.

Deterrence seeks to prevent adversaries from initiating attacks in the first place, instead of directly stopping them with military force, and clearly is preferable to *defense*. The United States' ability to defend itself and its allies successfully, combined with the capability to retaliate conventionally anywhere in the world, serves as a powerful deterrent against any conventional attack. Since US conventional capabilities are near absolute, nuclear weapons add no value to conventional threats. Moreover, since the US has used conventional forces repeatedly, but has not used nuclear weapons throughout the nuclear age, the deterrent threat of a conventional response is more credible than a threat of responding to conventional attack with a nuclear strike.

In the unlikely event that American security guarantees were disbelieved by an adversary and deterrence failed, it would be the result of a perception of insufficient American will, not insufficient American military capability. Threats to respond to conventional aggression with nuclear weapons would not enhance the credibility of American deterrence. If the United States were seen as unwilling to commit conventional forces to defend an ally, there is no reason to believe that threats to risk a nuclear war on an ally's behalf would be seen as more credible. Conversely, an adversary may believe it necessary to counter US conventional superiority with the threat or actual use of tactical nuclear weapons. US policy should make clear that crossing the nuclear threshold by any means -- with any type of warhead or weapon system, strategic or tactical -- would bring into play the possibility of a response from the United States' strategic nuclear arsenal.

Assurance is diplomacy, combined with the symbolic use of force, to persuade allies that US commitments to their security are sincere, credible, and that the nation is capable of fulfilling them. Allies, particularly officials charged with security in allied nation, always will harbor some

doubts about whether the United States would risk American lives to defend their sovereignty. Such doubts will wax and wane over time depending on the quality of relations between the US and its ally, perceptions of US strength and leadership, and events around the world—over most of which the US will have only limited influence.

Maintaining allies' confidence in US commitments requires frequent consultations, political reassurances, high-level meetings, and cooperation in military planning. US conventional forces also provide a global, visible, flexible, and credible means of reassuring allies -- particularly when they are deployed on the ally's territory or conduct temporary deployments to exercise jointly with allied forces. Though nuclear guarantees are an important component of US security commitments, allies doubt them more than they doubt US conventional commitments because of the greater risk they pose to the US homeland. If an adversary in fact attacked a US ally with conventional forces, the adversary would have already discounted the US commitment to defend the ally. And if US credibility had already been discounted, the potentially graver consequences of a nuclear response would make nuclear guarantees even less credible in the eyes of the adversary. Consequently, the US should make clear repeatedly that it will fulfill all of its treaty obligations and would respond conventionally to conventional attacks against allies, and with nuclear weapons in the event of nuclear attacks. The long history of US security commitments, and the sacrifices in blood and money which the American people have repeatedly made in defense of these commitments, provide ample evidence that US security guarantees are credible.

In recent years, some have argued that the United States should not restrict the purposes of its nuclear arsenal to deterring nuclear attacks, and instead threaten their use in response to a wider range of threats, such as attacks with chemical or biological weapons, cyber attacks that cause physical damage to important infrastructures, or efforts by states to provide terrorist organizations with nuclear weapons that would be used on US or allied territory through unconventional means (e.g., smuggled in a container).

Apart from questions about the efficacy of such threats, deterring them by threatening massive retaliation with conventional forces remains far preferable than broadening the stated role of nuclear weapons. Elevating the importance of nuclear weapons by widening their roles establishes precedents and perceptions of nuclear utility that can only encourage their emulation by others and result in vertical and horizontal proliferation. In contrast, the United States has the ability to respond to any of these threats with devastating conventional forces, thus achieving all the military utility without any of the political drawbacks.

By making clear that the US believes nuclear weapons can serve only to deter nuclear attacks, the US also would be helping to weaken perceptions of the importance of these weapons and to strengthen perceptions of the dangers they pose, thereby facilitating efforts to limit/reverse proliferation and reduce nuclear arsenals. In contrast, if the United States would make clear it relies on nuclear weapons for a larger set of roles, it legitimates these weapons, falsely draws attention to their potential uses, and thereby encourages nuclear proliferation. US threats to

respond to conventional attacks with nuclear weapons exaggerates the utility of nuclear weapons and could reinforce other states' inclination to acquire nuclear arsenals. If the US threatened with nuclear weapons despite its conventional superiority, other states with weaker conventional forces would have even more incentive to follow suit. The repetition of explicit threats to make the first use of nuclear weapons in a conflict could render such threats more credible and gradually weaken the taboo against the use of nuclear weapons.

Minimizing the Roles of Nuclear Weapons -- in US Policies and Those of Other Nations

Given this analysis of the single-purpose served by nuclear weapons in protecting the security of the United States and its allies, the US should orchestrate its diplomacy, nuclear declaratory policies, and force posture in order to minimize perceptions of the utility of nuclear weapons in world affairs. Among other things, such a policy would include: a) as political circumstances make possible, pursuing various types of negotiated arrangements that could lead eventually to a verifiable international regime that eliminated nuclear weapons from all nations; b) adopting declaratory policies that make clear the US belief in the narrow utility of nuclear weapons; and c) focusing its force structure solely on maintaining a secure, second-strike capability.

The primary objective of US policy on nuclear weapons should be the establishment of a verifiable international regime eliminating nuclear weapons globally. Since nuclear weapons only provide strategic value as a deterrent against nuclear use, while the potential effects of even a limited nuclear exchange could be devastating, US and global security would be enhanced substantially by the elimination of nuclear weapons from all nations. A functioning nuclear disarmament regime would better protect US interests than deterrence, as deterrence is inherently a risky and uncertain phenomenon. As long as nuclear weapons exist, their use is a possibility. Only by causing them to cease to exist can this possibility be ruled out.

Moreover, modern surveillance and reconnaissance capabilities and the long experience with US-Russian and multilateral arms control treaties demonstrate that verifiable regimes are possible. The risk of cheating under such a regime could be curtailed by creation of an international body charged with monitoring treaty compliance, backed by the power to impose punitive sanctions and the possibility of collective military action by the Treaty's signatories against nations that cheat or seek to break out of the agreement.

Of course, nuclear weapons will only be eliminated when underlying political conflicts among nations that have nuclear arsenals are resolved. Most important would be the achievement of understandings among Russia, the US, and the nations of Europe about Russia's role on the continent, and the political and economic integration of Russia into European affairs. A similar process concerning China's role in East Asia and its continuing economic and political integration into world affairs is also essential. As these broad international issues are worked out, however, processes that no doubt will take years, it would be possible to take steps towards

the establishment of a verifiable elimination regime. Such steps would include reducing the size of nuclear weapon stockpiles, beginning with those of the US and Russia, erecting tighter controls and more extensive monitoring procedures on civilian nuclear facilities and fuel cycles, developing and testing verification methods, particularly those pertaining to verifying limits on warheads (limits in existing treaties pertain mainly to weapon launchers), broadening and strengthening existing nuclear weapon free zones, strengthening the Non-proliferation Treaty, and developing common international understandings about the humanitarian consequences of nuclear use and the means through which nuclear disarmament might be achieved.

The US should refrain from the permanent forward-basing of nuclear weapons, which impose additional costs and risks and increase political tensions, without providing capabilities beyond those offered by US-based strategic forces. Instead, the US should assure allies of its nuclear deterrence guarantees by:

- maintaining (or establishing where they do not yet exist) standing consultative mechanisms with nations to whose defense we are committed to discuss threats to their security and plan on how to counter them jointly, including the nuclear component of such plans;

- frequently demonstrating the global reach of US nuclear capabilities through exercises, temporary deployments of bombers, and port visits by strategic submarines; and

- frequently demonstrating US conventional capabilities by temporary deployments of ground, air, and naval forces to allied nations for joint exercises.

By taking these concrete and practical steps, US nuclear policy and diplomacy can set a course for a truly secure future.

The second prong of US nuclear policy should rule out the use of nuclear weapons except as a response to others' use of nuclear weapons. US nuclear policy and doctrine should seek to strengthen the taboo against nuclear use by creating starkly clear boundaries that would raise the thresholds for nuclear use.

US declaratory policies should emphasize both the grave humanitarian consequences of nuclear use and the military disutility of nuclear weapons.

US nuclear policy and doctrine should state clearly that the US would not use nuclear weapons unless a nuclear weapon had already been used against the United States or one of its allies. Whatever marginal tactical or operational advantage the United States might gain from envisioning broader roles for nuclear weapons would not offset the greater negative consequence: Encouraging other states to look favorably on acquiring nuclear weapons and weakening the nuclear taboo.

At the same time, the United States must make clear beyond a shadow of a doubt that any nuclear attack on the United States or an ally under the United States' nuclear deterrence umbrella would be met with a nuclear counter-attack of equal or greater severity. A nuclear attack should be defined as any attack that incorporates a nuclear explosion, including an EMP attack, an attack with low-yield weapons, or an attack with weapons launched by short-range systems, no matter how few in number or limited in yield.

The US should reserve the option to respond to a tactical nuclear strike against in-theater conventional forces with the use of strategic nuclear weapons against tactical military targets, such as command and control nodes, large troop formations, or military bases. US policy should make clear that any step onto the nuclear escalation ladder could bring all of the capabilities of US strategic nuclear forces into play. Doctrine aside, in fact, the US might choose to respond to a very small, battlefield use of nuclear weapons with conventional forces. Such a response would further belittle the military utility of nuclear weapons. But such a decision would be a tactical choice that could only be made in the circumstances at the time. Although a logical possibility, such a battlefield option should not be stated explicitly as part of US doctrine in order to avoid weakening the perception that any nuclear use would prompt a US nuclear response, and thereby weaken deterrence of limited nuclear strikes.

Forces

Finally, reflecting the narrow role conceived for nuclear weapons, the US nuclear force structure should be focused solely on maintaining a secure second-strike capability. This focus would be reflected in the size, composition, and attributes of its nuclear forces, and their interactions with other non-nuclear, but strategic, capabilities.

In the 2020-2030 timeframe, the US should reduce its arsenal to roughly 1,000 deployed nuclear warheads, as counted under the rules of the New Start agreement, or to the size of the largest nuclear arsenal in the world, whichever is smaller. An arsenal of 1,000 deployed warheads would represent an approximately one-third reduction from current number of deployed warheads, as counted by the rules of New Start. A force of this size would be capable of inflicting massive devastation on any nation, thus constituting a more-than-minimal deterrent, leaving no doubt of the United States' ability to retaliate against a nuclear attack and continuing to provide extended deterrence for its allies. Although smaller, I believe the United States should maintain a strategic nuclear triad of ICBMs, submarines, and bombers. Illustratively, a 1,000-warhead force could consist of 300 ICBMS with single warheads, 10 ballistic missile submarines carrying missiles with 640 warheads, and 60 long-range bombers.

Additionally, the US should maintain a reserve of 1,000 non-deployed warheads to hedge against the degradation of operational warheads and the possibility of a nuclear crisis. While the United States should not reduce its forces below 1,000 deployed and 1,000 reserve warheads unilaterally, it should seek whenever possible to make further reductions through arms control treaties, with the ultimate goal of the global elimination of nuclear weapons.

Importance of the Strategic Triad

The US should seek to maintain the nuclear triad for as long as possible, even if agreements cause deployed forces to be reduced below 1,000 warheads, as each component provides unique attributes to the overall US nuclear deterrent.

ICBMs provide reliability, as they are based on tried-and-true technology and, unlike bombers that can be shot down, are extremely difficult to intercept. The wide geographical dispersion of ICBM silos and the fact that they are each equipped with one warhead also means that destroying one launcher in the event of a nuclear exchange would require at least one warhead. (In fact, as no missile can be expected to perform perfectly at all times, multiple warheads would probably be targeted against each silo.) This calculus strengthens the deterrence dynamic by casting into doubt an enemy's ability to preemptively destroy the US ICBM force without utilizing a large portion of its own forces. For decades to come, the US ICBM component could be composed of existing Minuteman III missiles, their components updated as needed with service-life extension programs or replacement parts, as this is the lowest-cost option. Reduction of the force from the START mandated 400 to 300 would also provide replacement parts and test missiles during this period.

Bombers offer flexibility. Unlike ICBMs and SLBMs that cannot be recalled once launched, bombers can be launched towards their target in a nuclear crisis and maintained near, but outside enemy air defenses, while political leaders sought to end the crisis without a nuclear strike. The bombers could be recalled should there prove to be a diplomatic solution or if the initial crisis was based on error, such as an erroneous interpretation of radar data. B-2s will remain the mainstay of the bomber fleet. If advances in Russian or Chinese air defenses raise doubts about the B-2s ability to penetrate to its targets, it should be equipped with a new, nuclear-capable cruise missile. B-52s, while aging, offer volume in the delivery of nuclear weapons. A new nuclear-capable cruise missile will be necessary to ensure the B-52s' continuing effectiveness. Development of the LRS-B next-generation bomber also should be a high priority, both for conventional and nuclear roles.

Submarines offer survivability when at sea. Whereas airfields and missile silos are stationary and easy to locate and target, US deployed submarines are extremely difficult to track reliably. This enhances the nuclear deterrent by reducing the enemy's confidence in its ability to avoid a

retaliatory strike. A force of ten *Ohio*-class and *Ohio*-replacement submarines, two below currently planned levels, should be sufficient. Reducing the purchase of *Ohio*-replacement submarines, which are very expensive platforms, also would ease long-term pressures on the Navy's shipbuilding budget.

Proponents of current *Ohio*-replacement building plans argue that a fleet of 12 submarines is the minimum necessary to meet (classified) nuclear coverage requirements. These requirements should be revised downwards, however, as the value of ballistic missile submarines lies more in their ability to survive a nuclear first strike than in their ability to retaliate immediately. So long as the submarines remain survivable, it is unnecessary to maintain a nuclear submarine fleet that is capable of holding all nuclear-armed adversaries at risk at any given time; some transit delay before a retaliatory strike would be acceptable.

Tactical Nuclear Weapons

The US should not modernize its tactical nuclear weapons, permitting them to be phased out at the end of their current lifetimes in the mid-2020s. The role currently presumed to be played by these weapons can be played by US strategic nuclear forces. Tactical nuclear forces offer no operational or strategic advantage as compared to either strategic nuclear forces or conventional forces, while generating significant costs for modernization and maintenance, and for the training and certification of flight crews and aircraft. Implementing this recommendation means cancelling plans to extend the lifetimes of tactical versions of the B-61 bomb and cancelling the planned development of a nuclear delivery capability for the F-35 -- a savings of perhaps $8 billion over the next ten years.

Other Strategic Technologies

While the US should continue to invest in other technologies with potential strategic implications, such as cyber warfare, electronic warfare, and conventional global strike, these technologies do not supplant the need to maintain a nuclear deterrent as long as other states maintain nuclear arsenals.

The US should continue investing in conventional global strike systems, including research into hypersonic weapons, as they promise enhanced tactical options for conventional responses to attacks, crises, or provocations. As missile defense systems are likely to remain limited in their ability to defeat an attack by any sizeable ballistic missile arsenal, there is no need to develop nuclear-capable hypersonic weapons.

The United States should ardently pursue missile defense technologies at both the theater and national levels. As technology permits, the US should deploy theater missile defenses in or near

allied nations that can protect against, or at least limit the damage from, attacks by small nuclear forces. The US should continue to develop incremental improvements to existing theater missile defense systems, such as the THAAD and SM-3 systems. Investment also should be continued in potentially breakthrough missile defense technologies, such as laser technology, that conceivably could reverse the existing cost imbalance between offensive and defensive capabilities.

The US also should pursue a robust research and development program for national missile defense, but stop short of fielding additional continental-based systems until new technologies prove to be effective. The United States should freeze the Ground-Based Missile Defense program and redirect funding to R&D efforts. The US should not field additional or replacement interceptors at existing West Coast sites, and certainly not develop a new site on the East Coast, until developmental versions of the interceptors achieve consistent success under real-world conditions, including the ability to distinguish incoming warheads from debris or chaff or decoys.

The US should maintain a stockpile maintenance program to ensure that US nuclear weapons are safe, effective and reliable, and a nuclear infrastructure of sufficient capability to repair or, if necessary, replace warheads and delivery systems as required. Although the aging of existing warheads may at some point require the fabrication of new warheads, any new warheads should be designed following an extremely conservative approach that provides higher margins of error without adding new capabilities to existing designs.

A conservative design approach not only would send a strong message about the disutility of these weapons but also provides a high degree of confidence in warheads' reliability without resuming nuclear testing. Since nuclear weapons should be used only as a strategic deterrent with an extremely high threshold for use, any new or overhauled warheads should be relatively high-yield warheads, like those now deployed on Trident and Minuteman missiles. Bomber weapons might be designed with variable yields so that they could be used in response to the use of tactical weapons on battlefields without excessive collateral damage. Other design features that might present hope of making nuclear weapons more "useable," such as extremely low yields, electromagnetic pulse, or neutron bomb designs, should not be incorporated as they would present the appearance that the US shares others' claim that limited nuclear wars could be fought without catastrophic consequences.

The US should maintain effective warning and command and control systems, including space-based systems that are protected against disruption by cyber or electronic warfare or by physical interception. This goal can be furthered by investing in hardening, redundancy, and defensive measures, as well as by developing lower cost space launch capabilities, provided by several launcher manufacturers, to make possible the rapid replacement of disabled satellites.

The US should invest research and development funds in methods to protect command and control systems, especially satellite systems, from physical attack, as demonstrated by China's shoot-down of one of its own satellites, and electronic disruption, as might result from the use of an EMP weapon. Hardening, however, cannot be expected to prevent any and all disruptions, and hardened systems should be developed and fielded with a high sensitivity to cost-effectiveness.

Redundancy applies not only within warning and C2 systems but also across systems. The US should ensure that any given system, such as communications or GPS satellites, are redundant enough (i.e. numerous enough) that the system as a whole can still function even if a significant fraction of those satellites were destroyed or otherwise incapacitated. At the same time, command and control and targeting capabilities must be layered across different systems to ensure that nuclear second strike capabilities could not be severely degraded or eliminated by the failure of any one given system. For example, satellite communications should be layered with ground-based radio and telephone communications and, potentially, even physical courier systems, all supported by appropriate command and control protocols, while ensuring that all nuclear systems continue to incorporate secondary inertial navigation systems.

Finally, the US should invest R&D funds in the creation of active defensive capabilities for satellites critical to nuclear command and control, while shifting the emphasis of cyber warfare programs towards developing more robust defenses against cyber attacks. Defensive measures for key satellites might include the ability to maneuver, deploy decoys, and potentially even employ limited missile defenses. These missile defenses would only be designed to be capable of intercepting missiles targeted at the satellite and might include hit-to-kill and, in a more distant timeframe, laser-based systems.

Conclusion

Nuclear weapons do not achieve US policy objectives, dominant conventional forces do. The US interest lies in seeking to minimize the importance accorded to nuclear weapons by narrowing the roles they are perceived to play. US doctrine, policy, forces, and diplomacy should all be configured to support this interest. The posture described in this paper achieves just that, in contrast to postures that imagine uses of nuclear weapons that have never actually been demonstrated. After seventy years of indulging fantasies of what nuclear weapons can do, it is high time to acknowledge that they do very little and adapt US nuclear policy, strategy, and forces to those facts.