

This article was downloaded by: [68.167.117.74]

On: 27 September 2013, At: 10:24

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



The Nonproliferation Review

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/rnpr20>

ESCAPE FROM NUCLEAR DETERRENCE

Dallas Boyd & James Scouras

Published online: 27 Jun 2013.

To cite this article: Dallas Boyd & James Scouras (2013) ESCAPE FROM NUCLEAR DETERRENCE, The Nonproliferation Review, 20:2, 339-360, DOI: [10.1080/10736700.2013.799822](https://doi.org/10.1080/10736700.2013.799822)

To link to this article: <http://dx.doi.org/10.1080/10736700.2013.799822>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

ARTICLE

ESCAPE FROM NUCLEAR DETERRENCE

Lessons for Global Zero from the Strategic Defense Initiative

Dallas Boyd and **James Scouras**

Since the post-World War II genesis of nuclear deterrence, two presidential initiatives have been presented to deliver humanity from the threat of its failure. The first was the Strategic Defense Initiative (SDI), a constellation of space- and ground-based systems that President Ronald Reagan envisioned would render nuclear weapons "impotent and obsolete." The second is President Barack Obama's roadmap to "a world without nuclear weapons," commonly referred to as "Global Zero." While these proposals appear to have little in common, deeper investigation reveals a number of provocative similarities in motivation and presentation. Moreover, both generated fierce debate, often with ideological overtones, about their strategic desirability and technical feasibility. We use these parallels, as well as prominent dissimilarities, to draw lessons from the SDI experience that can be applied to the debate over Global Zero.

KEYWORDS: Ballistic missile defense; nuclear deterrence; nuclear disarmament; nuclear weapons; Global Zero; Strategic Defense Initiative; United States; Soviet Union; Russia; China

No sooner had the atomic bombings of Hiroshima and Nagasaki occurred than military strategists began to grapple with the ominous direction in world affairs that these events heralded. Since then, a succession of concepts has been explored to manage and reduce the nuclear threat. These efforts range from preventing the acquisition of nuclear weapons to destroying them before launch to mitigating their effects. However, the most enduring approach involved a psychological construct whose effectiveness derived from the very terror these weapons instilled. Nuclear deterrence is the condition that exists when the anticipated magnitude of a state's retaliation outweighs any benefit that might accrue from attacking it. Although not without serious mishaps and close calls, the nuclear deterrence paradigm is widely credited with averting war between the major powers since its formulation early in the Cold War. Yet, the fallibility of human decision making and the horrific consequences of failure ensured that nuclear deterrence would enjoy no more than grudging acceptance until a suitable alternative could be conceived.

Since the genesis of nuclear deterrence, two US presidents have offered grand proposals to deliver humanity from the threat of its failure. While earlier concepts had offered only to control the threat, these presidential initiatives aspired to escape from the cage of nuclear deterrence altogether. The first was the Strategic Defense Initiative (SDI), a

constellation of space- and ground-based systems that—as envisioned by President Ronald Reagan—would render nuclear weapons “impotent and obsolete.” In his March 1983 speech announcing the program, Reagan suggested that research conducted under SDI “could pave the way for arms control measures to eliminate the weapons themselves.”¹ He believed that if SDI could make the nation physically invulnerable to ballistic missiles and the United States shared this technology with other countries, including the Soviet Union, the groundwork would be laid for a stable, nuclear-free world.²

The second proposal is President Barack Obama’s roadmap to “a world without nuclear weapons,” commonly referred to as Global Zero.³ For the purposes of this article, this term refers only to the pursuit of nuclear disarmament, the first of four policy objectives enumerated in Obama’s 2009 speech in Prague. (The other articulated goals were strengthening the Treaty on the Non-Proliferation of Nuclear Weapons [NPT], building a new framework for civil nuclear cooperation, and securing fissile materials.) President Obama’s vision was not simply today’s world minus nuclear weapons, but rather a transformed world in which nuclear weapons have lost their relevance and have been abolished. In support of eventual nuclear disarmament, Obama identified specific initial steps: reducing the role of nuclear weapons in US national security strategy, negotiating a new strategic arms reduction treaty with Russia, pursuing ratification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT), and seeking a treaty to cut off production of fissile material for nuclear weapons. He additionally proposed seeking further cuts in nuclear arms in a process that would involve all nuclear weapon states. While Obama’s roadmap did not extend beyond these steps, the ultimate goal of eliminating nuclear weapons is identical to Reagan’s.⁴

Both Reagan and Obama invoked freedom from fear in proposing their grand visions. When Reagan announced SDI, he asked, “What if free people could live secure in the knowledge that their security did not rest upon the threat of instant US retaliation . . . ?”⁵ More than twenty-five years later, Obama called on the world to “stand together for the right of people everywhere to live free from fear in the 21st century.”⁶ However, their ultimate goals and rhetorical similarities are not the only resemblances between the proposals; closer examination reveals a number of subtler, provocative parallels.

First, SDI and Global Zero sprang from the personal convictions of the chief executive, though both built on intellectual efforts that began decades earlier.⁷ However, both programs departed substantially from what history suggested that science or politics could achieve. SDI required one to believe that a nuclear attack could be defeated with hitherto unimagined technologies. “Star Wars,” the derisive nickname that critics quickly affixed to the program, reflected this seemingly fanciful ambition. Similarly, Global Zero rests on overcoming skepticism that the nuclear powers can relinquish their most powerful weapons and enhance their security in the process. Thus, embracing either concept required a suspension of disbelief. The most significant similarity, however, is the most ironic: both proposals stemmed from concerns over the reliability of nuclear deterrence, yet each represents a solution of uncertain dependability.

Notwithstanding these parallels, several dissimilarities distinguish the concepts. SDI was envisioned as an automated system-of-systems, while Global Zero is a collection of political initiatives. There was no technological precedent for anything resembling Reagan’s

vision of a “shield that could protect us from nuclear missiles just as a roof protects a family from rain.”⁸ Nuclear disarmament, by contrast, has at least one rough historical analogue—the 1987 Intermediate-Range Nuclear Forces Treaty, which eliminated an entire class of US and Soviet ballistic and cruise missiles.⁹ While SDI’s main obstacles were technological, the greatest challenges facing Global Zero are political. If SDI *could* have been achieved, it could have been built unilaterally, while Global Zero requires international cooperation. Finally, Reagan’s announcement came at a time when nuclear war loomed heavily in the American consciousness. Global Zero lacks the ready-made constituency of an anxious public.

Cataloguing these similarities and dissimilarities represents more than an academic exercise. A deeper understanding of the debate surrounding the previous effort to replace nuclear deterrence offers lessons that are useful for the current one. From its first announcement, SDI was characterized by its advocates’ failure to keep policy goals tethered to technical realities. Moreover, inadequate consideration was given to potential Soviet countermeasures, allies’ perspectives, the effect of uncertainties created by imperfect defenses, and instabilities that might arise in the end-state. Later, SDI became a political litmus test in which one’s position on the program depended less on its scientific and strategic merits than on one’s political persuasion. Each of these pitfalls has relevance to Global Zero, whose fate may hinge on many of the same factors.

Further lessons can be unearthed from a study of the SDI debate as it evolved into a three-decade feud over missile defense. Less than two years after SDI was announced, Reagan’s original goal of supplanting nuclear deterrence was discarded for a wholly antithetical objective—*strengthening* deterrence by creating uncertainty about the effectiveness of a first strike.¹⁰ Since then, the vision has morphed still further, from a nationwide shield against a massive attack to a defense against limited strikes by pariah states. Meanwhile, several important but ancillary benefits to national security have resulted, most notably the development of improved theater missile defenses.

Global Zero may evolve similarly, and its advocates would do well to appreciate that the movement can deliver benefits even if the drive for abolition falls short. A US-led disarmament campaign may have value as a tone-setting mechanism, de-emphasizing nuclear weapons in global security policies. This may have the effect of encouraging greater interstate dialogue on nuclear weapons and fostering more stable alert postures, as well as discouraging proliferation more broadly. If these are its ultimate results, remarkable achievements will have been made even without the elimination of nuclear weapons. Thus, Global Zero may come to be seen not as the final chapter in the history of nuclear weapons but as an effort resembling SDI—a seductive but potentially destabilizing vision that evolved into a useful tool for coping with the nuclear threat.

This article proceeds as follows. First, we review the major paradigms that have been explored to contend with the threat of nuclear war, highlighting the qualities that made them unacceptable as substitutes for nuclear deterrence. Next, we identify the similarities between SDI and Global Zero, drawing lessons from the SDI experience and discussing their applicability to the debate over nuclear disarmament. We also examine dissimilarities between the proposals with a view toward their implications. Finally, we consider uncertainties surrounding the movement to abolish nuclear weapons. While this article is agnostic on the wisdom of that effort, it proceeds from the premise that the disarmament

debate would profit from a more complete understanding of the previous attempt to escape from deterrence.

Overarching Paradigms for Contending with Nuclear Weapons

Immediately following the atomic bombings of Hiroshima and Nagasaki, strategists began to contemplate the radical effects the new weapon would have on international security. Bernard Brodie supplied the first significant analysis of nuclear arms in his 1946 book, *The Absolute Weapon*. He quickly grasped that the bomb promised no mere increase in the destructiveness of war but rather a fundamental repurposing of military power. "Thus far the chief purpose of our military establishment has been to win wars," Brodie wrote. "From now on its chief purpose must be to avert them."¹¹ Around this kernel of insight grew the concept of nuclear deterrence, which would become the defining security construct of the Cold War. Averting nuclear war, it was soon understood, demanded an unassailable second-strike capability to punish any attacker. After a period of attempting to maintain nuclear superiority, as the Soviet arsenal grew, US policymakers settled on "Assured Destruction," which Defense Secretary Robert McNamara defined as the "ability to inflict unacceptable damage . . . during the course of a strategic nuclear exchange, even after absorbing a surprise first strike."¹²

With respect to the Soviet Union, "unacceptable damage" was measured, somewhat arbitrarily, as the destruction of one-quarter of its population and two-thirds of its industry.¹³ However, the US stockpile far outpaced the needs of this requirement even before it was articulated, as did that of the Soviet Union. At their peaks, the two states' arsenals contained more than 31,000 and 45,000 warheads, respectively.¹⁴ The expense associated with these weapons was immense; one assessment places the cost of the US nuclear weapons program between 1940 and 1996 at \$5.5 trillion (in 1996 dollars).¹⁵ Added to this ledger was a high cost to human virtue, for nuclear deterrence rests on the grim paradox of protecting one's citizens by threatening to annihilate those of one's enemy. Yet the quality that makes deterrence untenable is neither its cost nor its moral repugnance. Rather, it is the prospect that deterrence will one day fail that most commends an alternative.

A persistent fear during the Cold War was that crises would spin out of control, leading to a nuclear exchange that neither side desired. Especially worrisome were disruptions to "first strike stability." This condition centered not on the decision to initiate a nuclear war and suffer the consequences, but on whether, if war seemed probable, to strike first or wait, where waiting entailed the risk of a first strike by the other side. In this circumstance, attacking first might be seen as the least bad of two bad options, and the brutal logic of nuclear deterrence would not apply. Other dangers included the possibility that nuclear weapons might be launched accidentally, based on erroneous information, or on the orders of a rogue commander. Arguably the most glaring deficiency of deterrence, however, was its dependence on the rationality of national leaders who controlled nuclear weapons. As Winston Churchill observed, deterrence "does not cover the case of lunatics or dictators in the mood of Hitler when he found himself in his final dug-out."¹⁶

Consequently, in the following decades, strategists would explore a variety of conceptual and technological alternatives to nuclear deterrence.

Civil and Air Defenses

That rationality might be insufficient to avert nuclear war prompted the study of various means to mitigate its destructiveness. One concept explored early in the Cold War was "civil defense," which involved shelters and other facilities to protect the population from blast and radioactive fallout. In 1957, the Gaither Committee considered a plan to spend more than \$30 billion (in then-year dollars) on a comprehensive civil defense building program.¹⁷ While the panel rejected blast shelters, it called for a nationwide fallout shelter program, which the government created by designating existing buildings as shelters.¹⁸ Some construction also occurred at the private level, but only sporadically, perhaps due to the perception that surviving a nuclear war was scarcely less horrible than perishing in one.¹⁹ During the Eisenhower administration, the United States also fielded an extensive air defense network that included nuclear surface-to-air missiles and aircraft armed with nuclear rockets.²⁰ However, policy makers ultimately determined that these defenses were inadequate to defend against Soviet bombers, which would soon be eclipsed by the far more menacing intercontinental ballistic missile (ICBM).

Preemption

Striking first, or preemption, was not strictly a tactic of the missile age, but the speed and accuracy of ballistic missiles made them uniquely threatening as disarming weapons. Early nuclear deterrence theory had rested on the logic that a nation would not attack an enemy's cities if its own would be destroyed in turn. But if an adversary's nuclear forces were targeted rather than its population centers, retaliation, in theory, might be avoided altogether. Of course, this option is only feasible if opposing nuclear forces can be located and completely destroyed. The most prohibitive risk in attacking a nuclear-armed foe is that one or more weapons would survive. On several occasions during the Cold War, concern over this outcome tempered the consideration of preemptive attacks.

During the Berlin Crisis of 1961, President John F. Kennedy briefly considered executing a nuclear first-strike plan against the Soviet Union that the Pentagon and White House had formulated earlier that year.²¹ Satellite photographs had revealed that the Soviets possessed only eight ICBMs, making a disarming attack plausible. However, he was ultimately dissuaded, in part by the concern that Soviet retaliatory forces could not be definitively neutralized.²² A year later, Kennedy again contemplated a first strike, this time a conventional attack against Soviet missile bases in Cuba, only to be sobered by the same fear. As Fred Kaplan recounts, "even in those halcyon days of 'strategic superiority,' the most determined American officials . . . did not even contemplate taking the awesome risk of executing the strategy in practice."²³ After these crises, neither superpower could ever again seriously entertain a disarming attack against the other. Yet, the fear of a first strike persisted on both sides even after the end of the Cold War.

Preventive Counterproliferation

In 1946, then-Major General Leslie Groves, the manager of the Manhattan Project, argued that if the United States were "ruthlessly realistic," it would not allow any non-ally to possess nuclear weapons. "If such a country started to make atomic weapons," he wrote, "we would destroy its capacity to make them..."²⁴ Although Groves' musing did not become US policy, attacks on the facilities of nuclear aspirants have frequently been considered and occasionally carried out. Both the United States and the Soviet Union contemplated destroying China's nuclear facilities when its weapon program was in its infancy.²⁵ Before China's 1964 nuclear test, the United States repeatedly importuned Soviet leaders for a joint attack, only to be rebuffed.²⁶ Several years later during the 1969 Sino-Soviet conflict, the Soviet Union likewise considered a preemptive attack against China. Additionally, several non-nuclear states, including South Korea and Taiwan, contemplated attacks on their rivals before they achieved a nuclear capability.²⁷ More recently, targeting enemy nuclear programs has been a consistent feature of Israel's security policy. In 1981, the Israelis destroyed Iraq's Osirak light water reactor; they carried out a similar attack on Syria's Al-Kibar facility in 2007.

The high-water mark of preventive counterproliferation was arguably the 2003 US invasion of Iraq, the case for which invoked the specter of an Iraqi nuclear attack. However, the Iraq War became so costly and politically toxic that a similar action would seem to require the most extraordinary circumstances to justify. Iran's suspected bomb program would seem the most logical candidate for an attack, but this outcome is far from certain. Iran appears to have recognized the need to disperse and harden its nuclear facilities, casting doubt on the effectiveness of US and Israeli air strikes. Consequently, preventive counterproliferation holds little promise as a consistent security policy.

Missile Defense

Proponents of missile defenses have long been wary of relying on the forbearance of one's adversaries and have therefore sought a more tangible defense posture than deterrence by threat of punishment. Interest in this capability dates to the 1940s, when German V-2 rocket attacks foreshadowed a paradigm shift in the conduct of war. Both the United States and the Soviet Union initiated anti-ballistic missile (ABM) research before the decade was out.²⁸ Early US systems featured nuclear-tipped interceptors and were designed for the defense of major cities and ICBM fields. However, these systems were costly and offered limited protection, and few experts believed them capable of truly continental defense. Their principal shortcomings, then as now, were their complexity and vulnerability to adversary adaptation. An attacker could choose from a menu of options to ensure the penetration of warheads, including the use of decoys and overwhelming defenses with reentry vehicles. Soviet leaders were confident that they could saturate SDI at less cost than the United States could augment it, a conclusion that allowed the Soviet Union's General Secretary, Mikhail Gorbachev, to resist pressure to launch a Soviet version of the system.²⁹

The greatest strategic deficiency of missile defenses, however, is their potentially destabilizing effect. Defenses are seen by many as inherently dangerous because their potential to “mop up” retaliatory warheads is thought to make a prospective first strike appear less costly to the attacker, undermining first-strike stability. As Soviet spokesman Gennady Gerasimov noted of SDI, “anti-missile defense can do almost nothing for a country subjected to a nuclear surprise attack; it most suits an attacking country trying to reduce the strength of a retaliatory strike.”³⁰ Even President Reagan acknowledged this concern in his 1983 SDI speech, conceding that missile defenses “raise certain problems and ambiguities.” He noted that, “If paired with offensive systems, they can be viewed as fostering an aggressive policy, and no one wants that.”³¹ The defender’s logical response would be to increase its offensive arsenal or take other destabilizing countermeasures, such as preemption or launching on tactical warning of attack.

A less ominous view of missile defense, and the one that animated Reagan’s pursuit of SDI, was that the system would have the opposite effect, enabling contractions of nuclear arsenals to the point of their ultimate elimination. According to this vision, defenses would serve as an insurance policy against covert rearming after ballistic missiles had been eliminated. The comfort of this hedge would encourage the two sides to undertake reciprocal steps toward that goal, building up defenses while drawing down offensive forces until “mutual assured destruction” had been replaced with “assured survival.”³² Thus, hardly antithetical to disarmament, missile defense would serve as the very mechanism to achieve this outcome. However, this argument gained little traction beyond SDI’s core advocates, and fears over the offensive character of missile defenses persist today.

Arms Control and Nonproliferation

Recognition of the dangers presented by missile defenses led the United States and Soviet Union to adopt the 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems, which codified mutual vulnerability between them.³³ This treaty was the product of the Strategic Arms Limitation Talks (SALT), bilateral discussions that came to epitomize the process of “arms control.” This umbrella term covered efforts to regulate the size and composition of the superpower arsenals, as well as agreements on the permissible testing of nuclear weapons. Later SALT discussions laid the foundation for the Strategic Arms Reduction Treaty and the Strategic Offensive Reductions Treaty, which substantially reduced the number of US and Soviet/Russian warheads. This process continues today as the United States and Russia move toward the limits of the New Strategic Arms Reduction Treaty (New START), which will lower US and Russian strategic warhead loadings to 11 and 13 percent of their Cold War peaks, respectively.³⁴ However, this trend is probably more revealing of the superfluous number of weapons the two countries retain than any enthusiasm for cutting them *per se*. Having already plucked the low-hanging fruit, the cuts mandated under New START may have reached the limits of painless warhead reductions.

Efforts to slow the spread of nuclear weapons were undertaken concurrently with bilateral arms control negotiations. The NPT, considered the cornerstone of the nonproliferation regime, is credited with limiting (to four or five) the number of new

nuclear powers since its entry-into-force. However, the clandestine weapon programs of signatories Iraq, Libya, North Korea, Syria, and Iran have underscored the limitations of international safeguards against proliferation. Additionally, many nonproliferation experts argue that impatience with the pace of nuclear disarmament is eroding the credibility of the NPT.³⁵ Despite the commitment of its signatories to “pursue negotiations in good faith” relating to disarmament, only the United States and the United Kingdom have evinced any willingness to do so.³⁶

Disarmament

After an abortive attempt to cage the nuclear genie following the atomic bombings of Japan, the most visible efforts to abolish nuclear weapons have involved grassroots campaigns. In the 1950s and 1960s, hundreds of thousands of anti-nuclear protesters took part in protest marches between the British nuclear research base at Aldermaston and London, and later, in the 1980s, in the “nuclear freeze” demonstrations in the United States and Europe. However, the most substantive progress toward abolition, such as it was, occurred in negotiations at the highest levels of government. In early 1986, in what has become known as the “January Proposal,” Gorbachev proposed complete nuclear disarmament by 2000.³⁷ At the Reykjavik summit later that year, President Reagan stunned the Soviets by suggesting that nuclear weapons be eliminated entirely, only to have the talks break down over SDI.³⁸

Disarmament achieved a leap in respectability with its endorsement by former Secretaries of State George Shultz and Henry Kissinger, former Secretary of Defense William Perry, and former Senator Sam Nunn in 2007.³⁹ President Obama’s Prague speech two years later advanced its legitimacy still further. Yet the arguments that led abolition to be dismissed in earlier generations remain unanswered. Perhaps the most compelling of these is the memory of the world before nuclear weapons existed. Opponents of disarmament are quick to note that the decades since Nagasaki have coincided perfectly with the longest period of uninterrupted peace between the major powers in history.⁴⁰ So long as nuclear weapons are perceived as serving a salutary function, the states that possess them will guard the capability jealously. As Carnegie scholars George Perkovich and James M. Acton argue, before disarming, these nations must be convinced that abolition does not “make the world safe” for a resumption of major power war.⁴¹

In sum, none of the alternatives thus far conceived have sufficed as replacements for nuclear deterrence. Civil and air defenses offered too little protection; preemption was too freighted with risk; preventive counterproliferation could address the nuclear threat only at the margin; a missile defense shield could be easily defeated; arms control and nonproliferation merely managed the arms race and slowed the spread of nuclear weapons; and disarmament was unacceptable to the nuclear powers. With no conceivable alternative to nuclear deterrence, it was understandable that Robert McNamara would predict that the future would be “overshadowed with the permanent possibility of thermonuclear holocaust.”⁴²

SDI and Global Zero amounted to wholesale rejections of this prophecy. In his SDI speech, Reagan challenged nuclear deterrence on a visceral level, asking “Wouldn’t it be

better to save lives than to avenge them?" In Prague, Obama cited a "moral responsibility" to eliminate nuclear weapons. Beyond these parallel moral framings, several similarities between the initiatives are described below, which are useful in conceptualizing SDI and Global Zero as different approaches to the same problem. From this perspective, we identify lessons from the SDI era, and from later incarnations of missile defense, and demonstrate their relevance to the debate over Global Zero.

Similarities Between SDI and Global Zero

The ambition to replace nuclear deterrence is merely the most basic of the many similarities between the initiatives. Others are less apparent but nonetheless provide useful points of comparison. For example, both were elite-driven rather than responsive to the popular will, and their nuances were inaccessible to most Americans. Both were domestically and internationally polarizing. Their destabilizing potential unsettled US allies and antagonists alike, the former apprehensive over the loss of extended deterrence and the latter over the development of a US strategic advantage.

Each of the proposals also engendered suspicions that hidden motives lay behind their pursuit. Sinister interpretations of SDI circled the program from the start, with many centering on its potential as an offensive instrument. The KGB, the Soviet spy agency, speculated that SDI was a "large-scale disinformation operation" designed to extract concessions in arms negotiations.⁴³ Gorbachev privately remarked that SDI's true purpose was to "exhaust" the Soviet Union by forcing responses that it could ill afford.⁴⁴ Critics have been less apt to impute ulterior motives to Global Zero, although several have been proposed. One interpretation is that a US-led disarmament campaign is intended to remove challenges to US conventional superiority. Some Chinese commentators have suggested that the United States's de-emphasis on nuclear weapons is a "trap" to lure China into a conventional arms race, enervating its economic development.⁴⁵ A more charitable view is that Global Zero is simply a vehicle to advance the president's arms control priorities.

Another similarity is that both Reagan and Obama acknowledged the need to maintain nuclear deterrence vigorously even as they endeavored to replace it. Reagan pledged that the United States would "remain constant in preserving the nuclear deterrent" as SDI was pursued, just as Obama has affirmed that the nation will "maintain a safe, secure, and effective arsenal" as long as nuclear weapons exist. Supporters of the proposals also conceded that the path to achieving their end-state was imperfectly understood. Nevertheless, they tended to discount instabilities that might arise during the transition. In the case of SDI, the most alarming of these was the possibility that the Soviets would strike first before the system was complete.⁴⁶ Less worrisome, yet inevitable, were the quantitative increases and qualitative improvements the Soviets would make to their nuclear arsenal to ensure its ability to penetrate US defenses.⁴⁷

Nuclear disarmament may produce instabilities of a different sort. The risk of nuclear war does not necessarily decrease as the number of weapons is reduced to very low levels, and many experts believe that the transition from small arsenals to zero may be the most

perilous stage. The “low numbers problem” is shorthand for the belief that such arsenals are intrinsically destabilizing because during a severe crisis they may invite a disarming first strike. According to this logic, a modestly armed nation would face pressure to launch its weapons before they are targeted.⁴⁸ Finally, critics of disarmament warn that the United States’s non-nuclear allies may pursue their own strategic weapons if US extended deterrence is attenuated or withdrawn. Though none of these outcomes is inevitable, it should be apparent that Global Zero, like SDI, would exchange nuclear deterrence for another paradigm of uncertain stability.

The *apparent* robustness of nuclear deterrence over the decades presents a high threshold for any alternative that seeks to replace it. Embracing an alternative therefore requires highly favorable assessments of its effectiveness. The debate over SDI’s expected performance offers a cautionary tale as policy makers evaluate the technologies needed to effect nuclear disarmament. From its first announcement, SDI’s performance estimates were systematically inflated, a practice that spread from administration officials to defense contractors and finally to the political class. Among the administration’s supporters, it became a matter of political orthodoxy to believe that SDI would work, and that even if it did not, would still improve US security. Conversely, to be a loyal member of the opposition was to believe that SDI would *not* work, and that even if it did, it would be destabilizing. The politicization of missile defense continues to the present day, hindering objective appraisals of its desirability.

SDI advocates eventually conceded that the system would never be 100 percent effective, but many officials continued to make extravagant claims about its potential.⁴⁹ In 1985, Dr. James Lonson, then the SDI office’s director of science and technology, estimated that the system would have an 85 percent chance of intercepting *all but one* Soviet warhead out of 1,400 launched.⁵⁰ Echoes of this overconfidence can be heard in assessments of the current Ground-based Midcourse Defense (GMD) system, the latest incarnation of national missile defense technology. In 2003, for example, then-Under Secretary of Defense Edward Aldridge told a Senate panel that the system’s effectiveness against a North Korean missile would be “in the 90 percent range,” much to the incredulity of senators who understood the uncertainty surrounding its performance.⁵¹ More brazenly, Lieutenant General Henry A. Obering III, the former director of the Missile Defense Agency, boasted in 2008 that “not only can we hit a bullet with a bullet, we can hit a spot on the bullet with a bullet.”⁵² Yet in only eight of the fifteen tests of the system since 1999 has the interceptor hit its target, and even “successful” tests have been criticized for their lack of realism.⁵³ Support for the system, despite its mixed testing record, has led critics to describe confidence in missile defense as approaching “theology.”⁵⁴

The consequences of unwarranted faith in the system remain grave even as its function has evolved from protecting the nation from a massive first strike to defeating a small attack from modestly armed nuclear states. Consider a scenario in which US leaders attack a regional nuclear power, or intervene against the vital interests of such a state, believing the United States to be safe from retaliation. If nuclear weapons are then launched against the United States and the defenses fail, the system (or, rather, the *belief*

in its efficacy) will have precipitated a catastrophe that would not otherwise have occurred.⁵⁵

Equally grave dangers may result from overconfidence in the technologies associated with Global Zero. While these technologies were not enumerated in Prague and are much less central to Obama's vision than scientific advances were to Reagan's, they are nonetheless understood to be indispensable to a nuclear disarmament regime. These technologies, chiefly tools of verification, require the ability to certify the dismantlement of warheads, the cessation of fissile material production, and the elimination of nuclear weapons fabrication capabilities. The first is required to dispose of existing weapons; the last two would prevent the reconstitution of arsenals once they are eliminated. All of these tasks are beyond existing technologies.⁵⁶ For example, various technical hurdles must be overcome before warhead dismantlement can be verified. Methods must be developed to confirm that a device presented for dismantlement is actually a nuclear warhead and not a clever facsimile. Technicians must verify that the warhead has indeed been dismantled in such a way that it cannot be reconstructed.⁵⁷ Yet another challenge is to develop "information barriers" to take measurements of fissile material without revealing classified weapon design information. Finally, protocols must be established to manage the access of foreign inspectors to sensitive warhead dismantlement facilities. Two international efforts—the Trilateral Initiative and the UK-Norway Initiative—have explored technologies and methodologies to fulfill these requirements. While they provide some basis for optimism, broad confidence in warhead dismantlement technology has not been achieved.

Technical advances are also needed to ensure that shuttered fissile material production facilities are not reactivated.⁵⁸ Additionally, inspectors must be able to verify that clandestine uranium enrichment and plutonium reprocessing facilities do not exist, a task that may be complicated by new technologies.⁵⁹ For example, a recent proliferation concern involves the use of lasers for isotope separation, which could allow uranium to be enriched with few detectable signatures.⁶⁰ Vastly more effective remote monitoring techniques may therefore be needed to detect such facilities. Finally, past production of fissile material must be accounted for in a process known as "nuclear archeology" to ensure that hidden quantities are not held in reserve. This requirement has been called "one of the thorniest problems that lie ahead in the road to nuclear disarmament."⁶¹

Yet, an even more nettlesome problem—and one that technology holds little promise of resolving—is the inherent artificiality of any attempt to distinguish between purely weapons-related fissile material production and the manufacture of high-grade nuclear fuels for other purposes. The latter category includes a host of legitimate applications ranging from civil nuclear energy to naval propulsion, many of which rely on highly enriched uranium. Because the technology to produce this fuel is indistinguishable from that used to produce fissile material for nuclear weapons, ostensibly peaceful production of nuclear material holds the potential for military diversions. Indeed, it is the very transferability of fissile material that underpins the concept of "latent deterrence," which holds that erstwhile nuclear weapon states can rely on their nuclear infrastructure to deter enemies without possessing actual weapons.⁶² This reality underscores the incompleteness of President Obama's pledge to "seek a new treaty that verifiably ends the

production of fissile materials *intended for use in state nuclear weapons.*"⁶³ (Emphasis added.)

No less important than the technologies to detect covert fissile material production and diversions from civilian facilities are enforcement *policies* to respond to these acts, which are similarly immature. Because disarmament is a reversible process, detailed plans must be drafted to respond to nuclear rearmament as well as to prevent the emergence of new nuclear powers. For example, Brad Roberts, formerly deputy assistant secretary of defense for nuclear and missile defense policy, describes the problem of the "nuclear-armed renegade," a state that secretly develops nuclear weapons and then "openly brandishes its bombs and . . . sets out on some bold ambition of coercion or aggression."⁶⁴ Opinion is sharply divided on the adequacy of conventional forces as a deterrent in this circumstance.

A final similarity between SDI and Global Zero concerns threat shifting, a phenomenon that occurs in direct relation to the effectiveness of any defense. Opponents of SDI noted that even if ballistic missiles could be reliably intercepted, the Soviets would simply turn to other delivery vehicles such as cruise missiles, depressed-trajectory missiles, or even cargo freighters.⁶⁵ Similarly, a successful nuclear disarmament campaign may renew interest in other weapons, perhaps advanced biological agents, as a strategic hedge. Although not without operational challenges, these weapons are cheaper than nuclear weapons and easy to produce in clandestine facilities, which may cause one catastrophic threat to be exchanged for another.

Dissimilarities

Notwithstanding these similarities, SDI and Global Zero differ in obvious and fundamental ways. The former focused on a unilateral technological approach: shooting down ballistic missiles in space. The latter emphasizes a cooperative policy approach: negotiated, verifiable, international reductions in nuclear arsenals. Yet as we probe beyond the obvious, we find more subtle dissimilarities between SDI and Global Zero that are no less illuminating than the similarities. For example, once it was announced, SDI enjoyed broad public support in the United States.⁶⁶ The muscularity of Reagan's approach to the Soviets was then popular, and SDI's ambitiousness recalled President Kennedy's challenge to reach the Moon, an achievement to which the technical difficulty of missile defense has often, if erroneously, been compared. In contrast, domestic opinion on Global Zero has not yet coalesced but will certainly figure in its implementation. A key determinant will be whether nuclear disarmament is perceived as a security-enhancing or security-diminishing undertaking. Though SDI engendered many reservations, the concern that it would weaken the United States relative to its enemies was not among them. Global Zero, by contrast, requires the United States to relinquish its most potent weapons. While other nuclear weapon states would have to do likewise in a verifiable way, mustering support for this proposition may nonetheless be difficult given many Americans' anxiety over the nation's perceived decline.

A key factor in the mobilization of support for SDI was the influence of corporate interests. SDI involved a mammoth national expense, and many corporations had strong financial incentives to cheer its development. The resulting bias in technological assessments was evident in the findings of the Fletcher Commission, a group of technical advisors empanelled soon after SDI's announcement to assess its feasibility. Describing the results of their study, then-Under Secretary of Defense Richard DeLauer boasted that it represented the wisdom of "over 50 of our nation's top scientists and engineers."⁶⁷ DeLauer neglected to disclose that more than a third of the commission's members were employees or board members of major US defense contractors.⁶⁸ The findings of the Fletcher Commission were predictably favorable. In addition to support from this quarter, Members of Congress vested in the success of these corporations were reliable votes in favor of the program.

The influence of financial interests on the SDI debate extended to the policy analysis community as well. The Strategic Defense Initiative Organization and its successors preferentially funded contractors and consultants who could be counted on to produce studies favorable to the program. By virtue of their sheer volume, the resulting studies had a strong impact on the popular perception of SDI. These analyses were difficult to counter by the less numerous and less generously funded studies by think tanks, nonprofits, and academics that were critical of the system.⁶⁹

In contrast to SDI, the lack of financial incentives to advance nuclear disarmament has meant that most advocacy for Global Zero has occurred within the nonprofit community. The meager budgets of these institutions present a significant challenge in rallying support for the initiative. Additionally, because nuclear abolition could lead to substantial revenue losses for the corporations that manage the nuclear weapons infrastructure, supporters of disarmament may face well-funded groups in opposition to their vision. While there may be some profit in the technologies related to disarmament, corporate interests will likely favor the maintenance of the status quo. Finally, lawmakers whose states host US nuclear weapons and related facilities have parochial reasons to resist deep reductions.

Perhaps the only advantage Global Zero enjoys with respect to advocacy is the *absence* of organized opposition among the nation's scientists and academics. In this regard, the contrast with SDI is sharp. As SDI gathered steam, its sponsors had to contend with a hostile chorus from university campuses and research centers. In a significant show of moral force, thousands of faculty members signed pledges to refuse SDI funding.⁷⁰ The closest analogue that Global Zero may face is the collective opposition of many current and former military leaders, although the disarmament camp also counts numerous former generals and admirals in its ranks. Indeed, several retired four-star flag officers, including two former commanders of US Strategic Command, have endorsed nuclear abolition.⁷¹

Beyond the domestic reception of SDI and Global Zero, another noteworthy distinction is their differing dependence on international cooperation. While missile defense can be pursued unilaterally, global nuclear disarmament inherently requires the participation of the other nuclear weapon states.⁷² The Obama administration's 2010 Nuclear Posture Review notes, with considerable understatement, that "Russia's nuclear

force will remain a significant factor" in the speed with which the US arsenal shrinks.⁷³ Because of the interlocking nature of the world's nuclear deterrence dyads, Russian non-cooperation alone would forever consign Global Zero to the academic realm. China will maintain its deterrent as long as Russia and the United States do, India as long as China does, and Pakistan as long as India does.⁷⁴ Yet the necessity of global cooperation reveals another important distinction between SDI and Global Zero: the latter may improve the international security climate even if it is unsuccessful.

Reagan's pursuit of SDI severely strained relations between the United States and the Soviet Union, which had already deteriorated after the period of *détente* in the 1970s. At the 1986 Reykjavik summit, Gorbachev testily remarked that it was not the system's capability that alarmed the Soviets but rather its ominous symbolism. Proceeding with SDI, he said, would "signify a shift of the arms race into a new environment, the raising of it to a new stage...destabilizing the strategic situation in the world."⁷⁵ In this context, Gorbachev's attempts to ease tensions between the superpowers occurred at cross-purposes with Kremlin hardliners, who favored a more aggressive response to SDI.⁷⁶ Had a less reform-minded Soviet leader been at the helm, Reagan's gambit might have greatly destabilized US-Soviet relations.

Global Zero is more likely to improve the global security environment than to poison it. In addition to a new arms control treaty with Russia, which has already been achieved, Obama's roadmap listed several waypoints en route to nuclear disarmament: reducing the role of nuclear weapons in US national security strategy, ratifying the CTBT, and pursuing a fissile material cutoff treaty. Other outgrowths of Global Zero may include removing nuclear weapons from continuous high-alert status, stigmatizing the issuance of nuclear threats, and fostering greater cooperation in the protection of fissile material. In addition to their intrinsic value, these efforts would yield considerable international goodwill. At the very least, they would signal US fidelity to its commitment to pursue disarmament, which, the arms control community constantly intones, is necessary to maintain global support for the nonproliferation regime.

Uncertainties

A final set of considerations involves neither parallels nor distinctions between the paradigms but rather future unknowns. As President Obama has acknowledged, his vision may not be achieved in his lifetime; in fact, the debate over nuclear disarmament may extend far into this century or beyond. In this regard, it could resemble the seemingly interminable row over missile defense, which has occupied a central place in the US security dialogue for over four decades. It remains to be seen whether the pursuit of Global Zero will exhibit the more counterproductive features of the push for SDI and its offspring.

One open question concerns the intellectual caliber of the disarmament debate. SDI advocates faced a steep hurdle in making the case for the system's feasibility and strategic merit, and many engaged in practices that did not uphold the finest traditions of public discourse. In particular, SDI officials were notorious for their use of deceptive practices in

testing and promoting the system as well as for purging dissenters. In 1987, a respected weapon scientist at Lawrence Livermore National Laboratory accused Edward Teller, then one of Reagan's science advisors and a staunch missile defense advocate, and Lowell Wood, the head of the lab's X-ray laser program, of providing senior officials with "overly optimistic" and "technically incorrect" information concerning the X-ray laser. The scientist, Roy Woodruff, resigned his post over the incident and filed a grievance with the University of California claiming to have suffered retaliation for publicizing the deception; the university concurred with his complaint.⁷⁷

In another episode that year, Pentagon officials excised key findings from a Defense Science Board (DSB) review of SDI before its delivery to the Defense Acquisition Board, which was considering the leap from research to phased deployment. These findings included the judgment that "there is presently no way of confidently assessing" the program's cost or effectiveness. The DSB review had recommended that initial deployment be postponed for one to two years while "gaps in system design and key technologies" could be filled.⁷⁸ However, without the benefit of these cautionary recommendations, the SDI deployment plan was approved. The full scope of these practices would not become known until the following decade. In 1994, government auditors revealed that, ten years earlier, Pentagon officials had manipulated the test of a key missile interceptor to improve its chance of success. This test occurred shortly before a crucial congressional vote to fund SDI, funding which was subsequently approved.⁷⁹ Later test failures were also inaccurately described as successes, a practice that apparently continues to this day.⁸⁰

Whether advocates of Global Zero will embrace similar tactics is unknown, though it is perhaps cause for optimism that so far they have not. Contention is sure to surround assessments of disarmament verification technology, and supporters of nuclear abolition will face a crucial ethical test in this regard. However, a more compelling argument against such tactics concerns efficacy rather than ethics. The misleading practices of SDI advocates produced considerable distrust among skeptics of the proposal, making them reflexively suspicious of missile defense in any form. Association with the original vision and its supporters later tainted more practical applications of the technology, such as theater missile defenses. A similar phenomenon may occur with the more modest sub-elements of the Global Zero agenda. In light of Russia's and China's potential resistance to nuclear abolition, these lesser objectives may be the ultimate fruits of the initiative rather than stepping stones on the path to disarmament. The Obama administration therefore has a strong incentive not to jeopardize them. Yet by coupling them to the vision of disarmament, this outcome may be a foregone conclusion.

Another open question concerns the efficacy of grouping the controversial goal of nuclear disarmament with other elements presented in Prague that enjoy broader support. The Obama administration may have packaged these goals together to assign a purpose greater than the sum of its parts. If deliberate, this approach would mirror that of SDI, whose former directors, Lieutenant General James Abrahamson and Ambassador Henry Cooper, claim merely unified existing missile defense efforts under a single administrative banner. Most of the funding for its technologies, they argued, had been committed long before Reagan's speech.⁸¹ However, in the case of Global Zero, by lashing uncontroversial policies

such as fissile material protection to a contentious objective, the subordinate elements may be placed in jeopardy. Indeed, opponents of the New START agreement explicitly linked its ratification to Global Zero. Before the Senate vote, a group of Reagan-era officials urged the rejection of the treaty “and the larger disarmament agenda which its ratification would endorse.”⁸² Thus, modest nuclear reductions, which might have been uncontroversial in their own right, became more contentious within the broader context of Global Zero. The acrimony of the New START debate raises the question of whether the president and his supporters will choose to moderate their objective.

As yet, there is no indication that Global Zero will command anything approaching the political devotion that SDI enjoyed. However, the history of missile defense cautions against attaching such ideological and emotional significance to a policy pursuit. Since Reagan’s speech, missile defense has acquired a political symbolism that transcends its utility as a weapon. During this time, the justification for the system has undergone a radical metamorphosis.⁸³ Even before the dissolution of the Soviet Union, the vision of a shield against a massive Soviet attack slowly gave way to less ambitious designs. By the 1990s, the system was oriented toward a limited attack, though some advocates quietly suggest that it may one day evolve to defend against a Chinese attack.⁸⁴ These shifting rationales suggest that its advocates desire the capability for its own sake, identifying adversaries on a rolling basis.

There is a danger in doggedly pursuing a utopian vision at the expense of more readily achievable goals. Reagan’s refusal to give up SDI at Reykjavik may have scuttled the most concrete opportunity in history to abolish nuclear weapons. This decision was remarkable for its logical incoherence—sacrificing a tangible opportunity to advance toward the goal of a nuclear-free world to preserve a system meant to be a vehicle for achieving this very outcome. In the following decade, the intense interest in missile defense commanded attention that might have been focused on more immediate threats, such as the rise of al Qaeda. This single-minded zeal continues today with the deployment of missile defenses in Europe, an effort once described as fielding “a system that does not yet work, against a threat from Iran that does not yet exist.”⁸⁵

If supporters of Global Zero exhibit a similar myopia, they may squander political and intellectual capital better spent on more pressing dangers. For example, a year after his Prague address, Obama himself characterized nuclear terrorism, rather than nuclear war, as “the single biggest threat to US security” in the short-, medium-, and long-term.⁸⁶ Despite this assessment, Global Zero ranks the lockdown of poorly guarded fissile material as a subordinate priority to the abolition of state-controlled nuclear weapons, the most closely guarded national assets on Earth. Under this curious prioritization, the relatively straightforward task of securing the ingredients for a terrorist bomb is deferred for the more daunting goal of state-level disarmament.

Conclusion

For more than six decades, strategists have grappled with the question that tormented Churchill as he contemplated the hydrogen bomb: “What ought we to do? Which way

shall we turn to save our lives and the future of the world?"⁸⁷ The answer to this question still eludes us. Yet, our failed search for a single, fully satisfactory alternative to nuclear deterrence has inspired a crucial insight: that perhaps no such panacea exists. In this realization lie the seeds of a more pragmatic approach.

Rather than a single, comprehensive solution, the most promising approach may involve a synthesis of several paradigms described above, which together form a systems approach to managing the nuclear threat. As former Senator Sam Nunn has argued, "... [N]ational security is not enhanced by pursuing arms control treaties at all costs; or by seeking deep reductions at all costs; or by deploying national missile defense at all costs. Each approach is a means to advance our safety, but none can make us secure on its own. The threats are interrelated; our approach must be interrelated."⁸⁸ A systems approach recognizes that while some missile defenses may contribute to national security, there comes a point at which additional defenses become harmful; while some reductions in nuclear arsenals may be stabilizing, deep cuts may be destabilizing; while diminishing the role of nuclear weapons may be beneficial, eliminating their function entirely may invite disaster. Drawing on the full spectrum of options and striking the proper balance is not easy but holds far more promise than pursuing any single concept to its limit.

Such a strategy is also likely to be the only means of producing an enduring consensus. That President Reagan found a place for arms control in his vision and President Obama has continued to pursue missile defenses suggest that such an enduring consensus can be realized. However, if a synthesis approach is to be achieved, the individual pieces cannot have become so controversial as to make them radioactive to members of the opposing camp. Theater defenses, for example, have only recently begun to draw support from traditional opponents of missile defense, a legacy of the polarizing debate over SDI and its successors. Ensuring that the debate over nuclear disarmament is civil and intellectually honest is a necessary precondition for skeptics to entertain deeper reductions as part of a comprehensive approach. This will require above all a strong measure of pragmatism over ideology among supporters of Global Zero. If its central vision emerges as a political symbol comparable to SDI, bipartisan support for further warhead reductions may be severely compromised.

Whether the nuclear peace that has lasted since Nagasaki is more properly attributed to brilliant strategy or dumb luck (or a mix of the two), we cannot rely indefinitely on the continued success of nuclear deterrence. Thus, the search for an alternative is properly motivated. Yet the chief consequence of bouncing from paradigm to paradigm has been, paradoxically, to undermine deterrence while simultaneously entrenching it as the only feasible construct to contend with nuclear weapons. This in turn increases the risk and lengthens the period in which humanity must live with the prospect of its failure.

ACKNOWLEDGEMENTS

For constructive reviews of earlier drafts of this paper, we thank Rakesh Bahadur, Andrew Bennett, Michael Boland, Jennifer Borchard, Stephanie Culberson, Matthew Doster, Martin

Hellman, Rhianna Kreger, Stephen Lukasik, Sharon Pritz, Stephen Schwartz, George Ullrich, and two anonymous reviewers. The views expressed in this paper represent those of the authors; they should not be construed as the views of the organizations with which the authors are affiliated.

NOTES

1. Ronald Reagan, "Address to the Nation on Defense and National Security," March 23, 1983, <www.reagan.utexas.edu/archives/speeches/1983/32383d.htm> .
2. See Paul Lettow, *Ronald Reagan and His Quest to Abolish Nuclear Weapons* (New York: Random House, 2005), and Richard Rhodes, *Arsenals of Folly: The Making of the Nuclear Arms Race* (New York: Alfred E. Knopf, 2007), pp. 176–77.
3. Barack Obama, "Remarks by President Barack Obama," Prague, April 5, 2009, <www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered/>. This term is not to be confused with the nonprofit organization of the same name, which espouses an identical goal but is not formally affiliated with the Obama administration.
4. Perhaps because SDI advocates later argued that the system was intended to *strengthen* deterrence, Reagan's original motive in building the system is often overlooked. By all accounts a genuine abolitionist, Reagan's vision was to make nuclear weapons so ineffective that they would ultimately be eliminated completely. See David Cortright and Raimo Väyrynen, *Towards Nuclear Zero*, Adelphi Paper 410, Routledge: 2010.
5. Reagan, "Address to the Nation on Defense and National Security."
6. Obama, "Remarks by President Barack Obama."
7. On missile defenses, see Sanford Lakoff and Herbert F. York, *A Shield in Space? Technology, Politics, and the Strategic Defense Initiative* (Berkeley and Los Angeles: University of California Press, 1989), p. 3. On nuclear disarmament, see Lawrence S. Wittner, *The Struggle Against the Bomb: A History of the World Nuclear Disarmament Movement*. 3 vols. (Stanford, California: Stanford University Press, 1993–2003).
8. See Rhodes, *Arsenals of Folly*, p. 175.
9. Nonnuclear analogies can be found in the 1972 Biological Weapons Convention and the 1993 Chemical Weapons Convention, which have made substantial progress in eliminating such weapons worldwide.
10. In 1985, physicist Richard Garwin noted this evolution in SDI's purpose, distinguishing between its original goal—"replacing deterrence by the President's dream of an impenetrable shield"—and "the real SDI," which offered "only the hope of strengthening deterrence by threat of retaliation." (Emphasis in original.) See Richard L. Garwin, "Star Wars and Geneva," speech delivered to the Foreign Press Association, September 9, 1985, <www.fas.org/rlg/850909-sdi.htm> .
11. Bernard Brodie, ed., *The Absolute Weapon: Atomic Power and World Order* (New York: Harcourt Brace, 1946), p. 76.
12. Robert S. McNamara, "The Dynamics of Nuclear Strategy," speech before the editors and publishers of United Press International, San Francisco, California, September 18, 1967.
13. Memorandum from Robert McNamara to President Lyndon Johnson, "Recommended FY 1966–1970 Programs for Strategic Offensive Forces, Continental Air and Missile Defense Forces, and Civil Defense," December 3, 1964. See also Jerome B. Wiesner, "Russian and American Capabilities," *Atlantic Monthly*, July 1982, <www.theatlantic.com/magazine/archive/1982/07/russian-and-american-capabilities/306408/> .
14. For official US nuclear stockpile quantities, see Department of Defense, "Fact Sheet: Increasing Transparency in the U.S. Nuclear Weapons Stockpile," May 3, 2010, <www.defense.gov/npr/docs/10-05-03_Fact_Sheet_US_Nuclear_Transparency_FINAL_w_Date.pdf>; For Soviet/Russian estimates, see Thomas B. Cochran, William M. Arkin, and Milton M. Hoenig, *Nuclear Weapons Databook, Volume I: U.S. Nuclear Forces and Capabilities*, Natural Resources Defense Council, 1984. p. 12; and Richard L. Garwin, "Nuclear Weapons in the 21st Century: Prospects and Policy," Presentation at the Henry Kendall Memorial Symposium, Cambridge, MA, October 23, 1999, <www.fas.org/rlg/102599nw21.htm> .

15. Stephen I. Schwartz, ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940* (Washington: Brookings Institution Press, 1998).
16. Winston Churchill, "Never Despair," House of Commons, March 1, 1955, <www.winstonchurchill.org/learn/speeches/speeches-of-winston-churchill/102-never-despair>.
17. *Deterrence and Survival in the Nuclear Age*, Security Resources Panel of the Science Advisory Committee, Executive Office of the President, November 7, 1957.
18. David Monteyne, *Fallout Shelter: Designing for Civil Defense in the Cold War* (Minneapolis: University of Minnesota Press, 2011), p. 46.
19. Lisa Jean Daly, *Defending a Way of Life: Civil Defense in the United States, 1940–1963*, PhD dissertation, Graduate School of Syracuse University, May 2005.
20. Christopher J. Bright, *Continental Defense in the Eisenhower Era: Nuclear Antiaircraft Arms and the Cold War* (New York: Palgrave Macmillan, 2010).
21. Fred Kaplan, "JFK's First-Strike Plan," *Atlantic Monthly*, October 2001, <www.theatlantic.com/past/docs/issues/2001/10/kaplan.htm>. See also William Burr, ed., "First Strike Options and the Berlin Crisis, September 1961," National Security Archive Electronic Briefing Book No. 56, September 25, 2001 <<http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB56/>>.
22. Kaplan, "JFK's First-Strike Plan."
23. Fred Kaplan, *The Wizards of Armageddon* (Stanford, CA: Stanford University Press, 1983), p. 306.
24. Leslie Groves, "Statement on the Atomic Bomb and its Effect on the Army," Appendix to JCS 1477/6, January 21, 1946, in CCS 471.6 (8-15-45) Sec. 2, Record Group [RG] 218, US National Archives, Washington, DC.
25. George W. Rathjens, *Destruction of Chinese Nuclear Weapons Capabilities*, Arms Control and Disarmament Agency, December 14, 1964.
26. William Burr and Jeffrey T. Richelson, "Whether to 'Strangle the Baby in the Cradle': The United States and the Chinese Nuclear Program, 1960–64," *International Security* 25 (Winter 2000/2001), pp. 54–99.
27. See Matthew Fuhrmann and Sarah E. Kreps, "Targeting Nuclear Programs in War and Peace: A Quantitative Empirical Analysis, 1941–2000," *Journal of Conflict Resolution* 54 (December 2010), pp. 831–59.
28. Joshua Handler, "National Missile Defense, Proliferation, Arms Control, Russia, and the United States," Working Paper Series on Russia and the Former Soviet States, Liechtenstein Institute on Self-Determination, August 2003.
29. David E. Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and its Dangerous Legacy* (New York: Random House, 2009), pp. 219–21.
30. Gennady Gerasimov "Current Problems of World Policy," *Mirovaya Ekonomika i Mezhdunarodnyye Otnosheniya* [World Economics and International Relations] No. 7, 1983, p. 100.
31. Ronald Reagan, "Address to the Nation on Defense and National Security."
32. See Glenn A. Kent and Randall J. DeValck, "Strategic Defenses and the Transition to Assured Survival," RAND Corporation Report R-3369-AF, October 1986. See also Cortright and Väyrynen, *Towards Nuclear Zero*.
33. David Wright and Lisbeth Gronlund, "Twenty-five Years After Reagan's Star Wars Speech," *Bulletin of the Atomic Scientists*, April 1, 2008, <www.thebulletin.org/web-edition/op-eds/twenty-five-years-after-reagans-star-wars-speech>.
34. See "Table of US Strategic Offensive Force Loadings," Natural Resources Defense Council, revised November 25, 2002, <www.nrdc.org/nuclear/nudb/datab1.asp>, and "Table of USSR/Russian Strategic Offensive Force Loadings," Natural Resources Defense Council, revised November 25, 2002, <www.nrdc.org/nuclear/nudb/datab2.asp>.
35. George Perkovich, Jessica Tuchman Mathews, Joseph Cirincione, Rose Gottemoeller, and Jon Wolfsthal, "Universal Compliance: A Strategy for Nuclear Security," Carnegie Endowment for International Peace, June 2007, <http://carnegieendowment.org/files/univ_comp_rpt07_final1.pdf>.
36. Treaty on the Non-Proliferation of Nuclear Weapons, March 5, 1970, Article VI.
37. Nikolai Sokov, "Reykjavik Summit: The Legacy and a Lesson for the Future," Nuclear Threat Initiative Issue Brief, December 2007, <www.nti.org/analysis/articles/reykjavik-summit-legacy/>.
38. Fred Kaplan, "Ron and Mikhail's Excellent Adventure: How Reagan Won the Cold War," *Slate*, June 9, 2004, <www.slate.com/articles/news_and_politics/war_stories/2004/06/ron_and_mikhails_excellent_adventure.html>.

39. George P. Shultz, William J. Perry, Henry A. Kissinger, and Sam Nunn, "A World Free of Nuclear Weapons," *Wall Street Journal*, January 4, 2007, <www.hoover.org/publications/hoover-digest/article/6109>.
40. See Josef Joffe and James W. Davis, "Less Than Zero: Bursting the New Disarmament Bubble," *Foreign Affairs* 90 (January/February 2011), pp. 2–9.
41. George Perkovich and James M. Acton, eds., *Abolishing Nuclear Weapons: A Debate*, Adelphi Paper 396, Routledge: 2009, p. 22.
42. McNamara, "The Dynamics of Nuclear Strategy."
43. See David E. Hoffman, "Mutually Assured Misperception on SDI," *Arms Control Today*, October 2010, <www.armscontrol.org/act/2010_10/Hoffman>.
44. Kaplan, "Ron and Mikhail's Excellent Adventure."
45. Thomasingar, "How China Views US Nuclear Policy," *Bulletin of the Atomic Scientists*, May 20, 2011, <www.thebulletin.org/web-edition/features/how-china-views-us-nuclear-policy>.
46. Wright and Gronlund, "Twenty-five Years After Reagan's Star Wars Speech."
47. See McGeorge Bundy, et al. "The President's Choice: Star Wars or Arms Control," *Foreign Affairs* 63 (Winter 1984/1985), pp. 264–78.
48. For further discussion of the "low numbers problem," see James M. Acton, "Low Numbers: A Practical Path to Deep Nuclear Reductions," Carnegie Endowment for International Peace, March 28, 2011, <<http://carnegieendowment.org/2011/03/28/low-numbers-practical-path-to-deep-nuclear-reductions>>; and James M. Acton, "Deterrence During Disarmament: Deep Nuclear Reductions and International Security," Adelphi Paper No. 417, Routledge: March 2011.
49. See Fred S. Hoffman, "The SDI in U.S. Nuclear Strategy: Senate Testimony," *International Security* 10 (Summer 1985), pp. 13–24.
50. "Ionson defends SDI program," *The Tech* 105 (October 29, 1985), <<http://tech.mit.edu/V105/N45/sdi.45n.html>>.
51. Edward Aldridge, testimony before the Senate Armed Services Committee, March 18, 2003.
52. Jamie McIntyre, "Obama to be Told U.S. Missile Defense Capable, General Says," CNN, November 12, 2008, <www.cnn.com/2008/POLITICS/11/12/obama.missiles/index.html>.
53. See Elaine M. Grossman, "On Heels of Failed Intercept Test, Missile Defense Leader Excoriates Contractors," *Global Security Newswire*, February 2, 2010, <www.nti.org/gsn/article/on-heels-of-failed-intercept-test-missile-defense-leader-excoriates-contractors>, and William J. Broad, "Antimissile Testing Is Rigged To Hide a Flaw, Critics Say," *New York Times*, June 9, 2000, <www.nytimes.com/2000/06/09/us/antimissile-testing-is-rigged-to-hide-a-flaw-critics-say.html>.
54. Former Senator Sam Nunn (D-GA) has remarked that "... missile defense must be debated as a technology, not a theology." See Sam Nunn, "Toward a New Security Framework," Woodrow Wilson Center, October 3, 2001, <www.nti.org/media/pdfs/speech_samnunn_100301.pdf?_id=1316466791>.
55. See Robert Powell, "Nuclear Deterrence Theory, Nuclear Proliferation, and National Missile Defense," *International Security* 27 (Spring 2003), pp. 86–118.
56. Benn Tannenbaum, "Bridging the Gap," American Association for the Advancement of Science, <<http://www.aaas.org/cstsp/files/BridgingTheGap.pdf>>.
57. See David Cliff, Hassan Elbahtimy, and Andreas Persbo, "Verifying Warhead Dismantlement: Past, Present, Future," VERTIC Research Report, September 2010, <www.vertic.org/media/assets/Publications/VM9.pdf>.
58. See "A Fissile Material Cut-off Treaty: Understanding the Critical Issues," United Nations Institute for Disarmament Research, 2010, <www.unidir.org/files/publications/pdfs/a-fissile-material-cut-off-treaty-understanding-the-critical-issues-139.pdf>; "Technical Steps to Support Nuclear Arsenal Downsizing," A Report by the American Physical Society Panel on Public Affairs, 2010, and Andreas Persbo, "Verifying a Ban of Fissile Material Production," *Trust & Verify*, Issue No. 126 (July-September 2009), pp. 8–11.
59. International Panel on Fissile Materials, "Global Fissile Material Report 2009: A Path to Nuclear Disarmament," 2009, pp. 94–96, <<http://fissilematerials.org/library/gfmr09.pdf>>.
60. See Francis Slakey and Linda Cohen, "NRC Should Perform Non-Proliferation Assessment of Laser Enrichment Technology," *Physics & Society* 39 (July 2010), pp. 15–17, <<http://www.aps.org/units/fps/newsletters/201007/upload/july10.pdf>>

61. Patricia Lewis, "Verification, Compliance, and Enforcement," in Perkovich and Acton, *Abolishing Nuclear Weapons*, pp. 233–40.
62. For further discussion of latent deterrence, see Thomas C. Schelling, "Who Will Have the Bomb?" *International Security* 1 (Summer 1976), pp. 77–91; Jonathan Schell, *The Abolition* (New York: Alfred A. Knopf, 1984); and Michael J. Mazarr, "Virtual Nuclear Arsenals," *Survival* 37 (Autumn 1995), pp. 7–26.
63. Obama, "Remarks by President Barack Obama."
64. Brad Roberts, "On Order, Stability, and Nuclear Abolition," in Perkovich and Acton, *Abolishing Nuclear Weapons*, pp. 163–69.
65. See James R. Schlesinger, "Rhetoric and Realities in the Star Wars Debate," *International Security* 10 (Summer 1985), pp. 3–12.
66. Frances FitzGerald, *Way Out There in the Blue: Reagan, Star Wars and the End of the Cold War* (New York: Simon & Schuster, 2000), p. 258.
67. See Richard D. DeLauer, preface to *The Strategic Defense Initiative Defensive Technologies Study* (Washington, DC: Department of Defense, 1984).
68. See William Hartung, "Star Wars Pork Barrel," *Bulletin of the Atomic Scientists*, January 1986, pp. 20–24.
69. A running joke in the national security community at the time was that if all the Vu-Graph transparencies (this was before PowerPoint) created for the SDI program could somehow be placed into orbit, the nation would indeed enjoy an impenetrable shield.
70. John Kogut and Michael Weissman, "Taking the Pledge Against Star Wars," *Bulletin of the Atomic Scientists*, January 1986, pp. 27–30.
71. See Lee Butler and Andrew J. Goodpaster, "Joint Statement on Reduction of Nuclear Weapons Arsenals: Declining Utility, Continuing Risks," National Press Club, Washington, DC, December 4, 1996.
72. The initial pursuit of SDI was strictly unilateral, though Reagan formally offered to share the technology with the Soviets to assuage their concerns that the system was offensively oriented. Soviet leaders were naturally suspicious of Reagan's sincerity, and nothing became of the proposal. See Rhodes, *Arsenals of Folly*, pp. 206–08. More recently, the United States has closely collaborated with several allies, notably Israel and Japan, on regional missile defenses.
73. Department of Defense, "Nuclear Posture Review Report," April 6, 2010.
74. George Perkovich, "The Obama Nuclear Agenda One Year After Prague," Carnegie Endowment for International Peace, March 31, 2010, <<http://carnegieendowment.org/files/prague41.pdf>>.
75. See Rhodes, *Arsenals of Folly*, p. 247.
76. Bruce Parrott, "The Soviet Debate on Missile Defense," *Bulletin of the Atomic Scientists*, April 1987, pp. 9–12.
77. William J. Broad, "Dispute on Star Wars Device Erupts," *New York Times*, October 22, 1987, <www.nytimes.com/1987/10/22/us/dispute-on-star-wars-device-erupts.html>. See also Robert Scheer, "The Man Who Blew the Whistle on 'Star Wars,'" *Los Angeles Times*, July 17, 1988, <http://articles.latimes.com/1988-07-17/magazine/tm-9636_1_x-ray-laser>.
78. Charles E. Bennett, "The Rush to Deploy SDI," *Atlantic Monthly*, April 1988, <www.theatlantic.com/past/docs/issues/88apr/bennett-p1.htm>. See also "Strategic Defense Strategic Choices," Recommendations of the Task Force on the Strategic Defense Initiative, Democratic Caucus of the US House of Representatives, May 1988, p. 7.
79. The rigged missile intercept occurred during the final test of the Homing Overlay Experiment, a series of flight tests of a system that employed a kinetic kill vehicle. According to General Accounting Office investigators, after three unsuccessful intercept attempts, "steps were taken to make it easier for the interceptor's sensor to find the target." These "enhancements" included heating the target missile for increased infrared visibility. See General Accounting Office, "Ballistic Missile Defense: Records Indicate Deception Program Did Not Affect 1984 Test Results," GAO/NSIAD-94-219, July 1994. See also Tim Weiner, "Inquiry Finds 'Star Wars' Tried Plan to Exaggerate Test Results," *New York Times*, July 23, 1994, <www.nytimes.com/1994/07/23/us/inquiry-finds-star-wars-tried-plan-to-exaggerate-test-results.html>; and Tim Weiner, "General Details Altered 'Star Wars' Test," *New York Times*, August 18, 1993, p. A19.
80. General Accounting Office, "Strategic Defense Initiative: Some Claims Overstated for Early Flight Tests of Interceptors," GAO/NSIAD-92-282, September 1992.
81. James A. Abrahamson and Henry F. Cooper, "What Did We Get For Our \$30-Billion Investment in SDI/BMD?" National Institute for Public Policy, September 1993, <[www.nipp.org/National%20Institute%20Press/Archives/Publication%20Archive%20PDF/What%20for%20\\$30B_.pdf](http://www.nipp.org/National%20Institute%20Press/Archives/Publication%20Archive%20PDF/What%20for%20$30B_.pdf)>.

82. New Deterrent Working Group, "Letter to Senators Harry Reid and Mitch McConnell," December 13, 2010.
83. Ironically, SDI itself represented an evolution in the purpose of missile defenses. When the original ABM system was announced in 1967, its nominal mission was to defend the United States against a limited Chinese attack. Political, technical, and cost concerns then transformed it into a system to defend ICBMs rather than people. See Morton H. Halperin, "The Decision to Deploy the ABM: Bureaucratic and Domestic Politics in the Johnson Administration," *World Politics* 25 (October 1972), pp. 62–95.
84. See Stephen J. Hadley, "A Call to Deploy," *Washington Quarterly* 23 (Summer 2000), pp. 95–108.
85. Jessica Tuchman Mathews, "Reinvigorate Nuclear Nonproliferation," *Democracy: A Journal of Ideas* 6 (Fall 2007), pp. 17–20.
86. Barack Obama and Jacob Zuma, "Remarks by President Obama and President Zuma of South Africa before Bilateral Meeting," Blair House, Washington, DC, April 11, 2010, <www.whitehouse.gov/the-press-office/remarks-president-obama-and-president-zuma-south-africa-bilateral-meeting>.
87. Winston Churchill, "Never Despair."
88. Sam Nunn, "Moving Away from Doomsday and Other Dangers: The Need to Think Anew," National Press Club, March 29, 2001, <www.nti.org/media/pdfs/speech_samnunn_032901.pdf?_id=1316466791>.