CRITICAL ISSUES

SDI At The Turning Point: Readying Strategic Defenses for the 1990s and Beyond

edited by
Kim R. Holmes
and
Baker Spring

The

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ISSN 0-889195-224-1
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Introduction

Kim R. Holmes

The Strategic Defense Initiative (SDI), the missile defense program started by Ronald Reagan in March 1983, is at a turning point. A decision whether to deploy strategic defenses is around the corner. If George Bush plans a go-ahead with SDI, he must begin preparations now. He will have to not only protect the program from budget cuts, but develop a convincing plan that can justify increased spending on deployment at a time when the defense budget is otherwise being cut. Moreover, turmoil inside the Soviet Union and new missile threats in the Third World could revive political support for the program, weaken opposition, and create a new consensus behind the need to defend the country against missile attack. This could give SDI a new lease on life and end the intellectual stalemate that has characterized much of the debate on strategic defenses.

The security of the United States requires that Bush succeed in shepherding SDI through this critical time, and in laying the groundwork for building a strategic defense system. SDI promises to deter war not by threatening retaliation with offensive nuclear forces alone, as present U.S. strategy dictates, but by defending America and its allies. Through a combination of defensive and offensive forces, a defensive strategy of deterrence would deny the Soviet Union or any other aggressor any hope for victory through nuclear war. If deterrence should fail, it would also greatly reduce the damage done by nuclear attacks, something which could not be done now because America is completely undefended. And as other countries like Iraq, Libya, and Syria acquire ballistic missiles and chemical weapons (and possibly nuclear ones someday as well), SDI could diminish greatly the risk not only of long-range assaults from sources other than the Soviet Union, but of accidental launches from any quarter.

SDI has shown impressive progress. Successful research and testing have enabled Pentgon officials to identify which technologies are the best candidates for near-term deployment in this decade. The Strategic

Defense Initative Organization (SDIO), the managing office of SDI, also has a good idea of what the "architecture" or construction blueprint of a first-phase SDI system will look like. The U.S. has staked out a strong position on SDI in the Strategic Arms Reduction Talks (START) in Geneva, not only protecting it from slow-downs caused by unnecessary negotiated restrictions on testing and development, but avoiding, so far at least, prohibiting SDI deployment in exchange for a START agreement, as the Soviets would like.

It is time to make good on this progress. To do so, Bush must address four key questions facing SDI today. They are:

1) Will he decide to deploy strategic defenses by 1992, as promised in his 1988 presidential campaign, and what "architecture" will he choose?

2) Will he reorganize the Strategic Defense Initiative Organization (SDIO) to prepare for deployment?

3) Will he develop a new strategic doctrine providing military guidelines on how to deploy and operate a strategic defense system?

4) Will he resist Soviet attempts to use arms control to limit and ultimately kill SDI?

The fate of SDI rests on how Bush answers these questions.

If the answers are "yes," SDI will be deployed and the U.S. will enter a new strategic age in which deterrence will be more stable and peace more secure. If the answers are "no," the U.S. will likely enter a new strategic age in which deterrence could be more unstable, peace less secure, and old ways of thinking about nuclear deterrence increasingly obsolete.

If Bush chooses deployment, he will have to give the SDI program new direction. Absent clear and realistic goals, SDI may not get the support it deserves. This book is designed to set a realistic agenda for the SDI program for the next several years, and to give the program the direction it needs to become a full-fledged system in the arsenal of the United States.

The Heritage Foundation has assembled a panel of experts to assess what the Bush Administration can and must do to guarantee the long-term success of the SDI program. Each of the authors establishes a list of specific goals for the program that the Administration can reasonably be expected to achieve. All the authors conclude that it is reasonable to expect Bush to decide on deployment before the end of

1992, to which Bush committed himself in his 1988 presidential campaign. The panel recommends that Bush:

♦ **Decide in favor of SDI deployment and choose a space and ground-based "architecture."**

The strategic need for defenses and the success of the SDI research program are sufficient reasons for favoring deployment. Technical progress makes it possible for the Administration to choose among several deployment blueprints or "architectures." These include both limited defenses to provide protection against accidental or small-scale missile attacks, as well as more comprehensive defenses in space and on earth for protection against large-scale assaults.

Bush thus has a wide range of deployment options for the near-term or "Phase I" system, which SDIO envisions will be the first installment of a comprehensive defense system. All options for the "Phase I" system will be available for deployment in the 1990s. From these, however, he should choose a "multilayered" defense consisting of both ground- and space-based weapons and sensors, including a revolutionary new concept called *Brilliant Pebbles*, which is a relatively inexpensive but highly effective interceptor system capable of destroying missiles in space.

♦ **Reorganize the Strategic Defense Initiative Organization so that it is better suited to deploy strategic defenses.**

SDIO is primarily a research organization. As a deployment decision nears, SDIO will have to prepare itself to implement that decision. If Bush decides to go ahead with deployment, SDIO will have to be ready with concrete plans for specific military systems. This will require that it concentrate more on engineering and the construction of prototypes for weapons, sensors, and command, control and communication systems, and less on pure research. SDIO also will have to shed its image as a temporary office whose existence depends almost exclusively on the support of the President or other top officials. To better prepare for deployment, SDIO needs to be integrated into the permanent Pentagon bureaucracy.

♦ **Develop a new strategic doctrine that sets military guidelines for deploying and operating strategic defenses.**

No strategic doctrine yet exists outlining the military strategy and operational guidelines for strategic defenses. Existing U.S. strategic doctrine is based solely on the threat of offensive nuclear retaliation to deter war. What is needed is an entirely new strategic doctrine that provides guidelines for how both offensive and defensive strategic forces can combine to deter war. The aims of this new strategy should be to improve the survivability of U.S. retaliatory forces, defeat the Soviet strategy of threatening preemptive nuclear strikes with large land-based forces, and limit the capability of Moscow or any other aggressor, should deterrence fail, to wreak destruction on U.S. territory.

♦ **Press for a Defense and Space Treaty that preserves SDI testing and deployment options.**

This will require that the Bush Administration work to achieve a Defense and Space Treaty of unlimited duration that is separate from and has no legal relationship whatsoever with either the 1972 Anti-Ballistic Missile (ABM) Treaty or the Strategic Arms Reduction Talks (START) currently underway in Geneva. In the coming rounds of the Defense and Space Talks (DST) Bush should insist that Moscow live up to earlier concessions, such as allowing SDI testing in space under the "broad interpretation" of the ABM Treaty, and granting the right for either side to deploy defenses if it so chooses. Key provisions in a sound DST Treaty should include:

1) Measures to improve the capability of each side to predict the other's progress on developing anti-missile systems; these would include data exchanges, on-site inspections of research sites and weapons facilities, and meetings between technicians and experts to discuss the progress of their respective programs;

2) A commitment to engage in further negotiations of how to ensure strategic stability as deployment of defenses proceeds.

The time has come for George Bush to translate the vision of his mentor Ronald Reagan into reality. This will require a concrete agenda for the SDI program.

This book points the way for the Bush Administration to assign specific goals to the SDI program, and thereby give clear definition to a project that until now has been an elaborate feasibility study. The days of asking whether SDI is workable are over. The Bush Administration needs to get down to the business of building the country's first nationwide defense against the horror of nuclear war.

CHAPTER 1

Four Key Questions Facing SDI

Baker Spring

The Strategic Defense Initiative is now an advanced research and development program. During its seven-year history, it has made considerable progress toward determining the feasibility of deploying strategic defenses. Technologies have been successfully developed and tested, and the Pentagon has a very good idea of what a first-phase strategic defense system should look like. George Bush should build on this progress to ensure that strategic defenses are deployed sometime later this decade.

This chapter argues that Bush must answer four critical questions with respect to SDI. These are:

1) Whether he will fulfill his campaign promise to select an SDI system for deployment during his first term;

2) Whether he will reorganize the Strategic Defense Initiative Organization (SDIO) so that it is in a position to build and deploy, not just research and develop, strategic defense systems;

3) Whether he will develop a new strategic doctrine that will provide military operational guidelines for the deployment of strategic defenses; and,

4) Whether he will resist Soviet attempts to use arms control to kill the SDI program.

Chapter 1

The SDI program has come a long way since March 23, 1983, when Ronald Reagan called upon the nation's scientists, engineers, and military to investigate the possibility of developing defenses against ballistic missiles. Important technological breakthroughs have been achieved, the military requirements for a near-term deployment of missile defenses have been established, and it has become increasingly apparent what a deployed SDI system might look like.

This brings the SDI program to a turning point. With the work of the scientists, technicians, military planners, and policy makers paying off, the need to decide whether to build SDI is around the corner. This impending decision raises four key questions. They are:

1) Will George Bush decide whether to deploy strategic defenses before 1992, as he has promised, and if he does deploy, what strategic defense architecture will he choose?

2) Will Bush reorganize the Strategic Defense Initiative Organization to prepare for deployment?

3) Will Bush develop a coherent strategic doctrine for strategic defenses?

4) Will Bush resist Soviet attempts to use the arms control process to limit and ultimately kill SDI?

The fate of SDI depends on Bush's answers to these questions. As a presidential candidate, he said on August 3, 1988, in Chicago, "My policy will be to develop a viable strategic defense system, an outgrowth of the SDI research program, to protect our people from ballistic missile attack. Already, the first phase of a space-based SDI technology is ready to come out of the lab and begin demonstration." He added: "The technology isn't the problem. I am committed to deployment of SDI, as soon as feasible, and will determine the exact architecture of the system in my first term, as the technologies are tested and proven." If Bush is to keep this pledge, he will have to address these questions seriously and promptly.

THE ORIGINS OF THE SDI PROGRAM

SDI was born at a time when the United States was falling behind the U.S.S.R. in strategic forces. The Reagan Administration faced the chore of catching up in the early 1980s. Reagan re-started the B-1 bomber program, which had been cancelled by the Carter Administration in 1977, pushed development of the MX intercontinental ballistic missile (ICBM) and the Trident submarine and missile (SLBM), and upgraded the strategic command and control systems for these weapons.

But just two years into his attempt to rebuild the nation's arsenal, Reagan ran into congressional opposition to his strategic proposals. Congressional critics claimed that the B-1 bomber was not needed because of the impending development of what was then referred to as the "Stealth" bomber, now called the B-2. There was considerable controversy, meanwhile, over how to deploy the MX missile in a way that would survive Soviet attack. At the same time, Moscow was turning up the political heat by opposing NATO's decision to deploy intermediate-range nuclear missiles in Europe. And, most important, on the American domestic political front, Reagan faced a growing "nuclear freeze" movement which was threatening to undermine the consensus in strategic policy that had supported nuclear weapons programs for four decades.

The concern that the very strategy of nuclear deterrence, based on the threat of offensive retaliation, was in trouble prompted a rethinking of U.S. strategic policy. The Reagan Administration began to search for a new foundation for strategic policy that would create public and congressional support for its strategic modernization program, make arms control more fruitful, and, above all, preserve the American public consensus on national defense.

Reagan and his close advisors felt that a program to build strategic defenses could serve all of these purposes. Holding out the long-term goal of a defensive strategic policy would allow Reagan to paint the strategic build-up as an interim measure while he pursued a long-term military strategy based on non-nuclear strategic defense. A strategic defense program, moreover, would give him bargaining leverage in the arms control talks; it would keep Moscow at the table because of Soviet concern over SDI, and would create a new approach to arms control in which deep reductions in offensive arsenals could serve the ultimate aim of strategic defense by reducing the threat with which defenses must contend.

Reagan felt that the American public would not support forever a nuclear strategy that piled up lethal offensive nuclear weapons without providing the nation with genuine defenses. He believed that the likely alternative to strategic defense would be mounting pressure for unwise unilateral disarmament, as was already happening in the nuclear freeze movement.

These factors prompted Reagan in spring 1983 to challenge the scientific and national security communities to develop and design a system for defending the U.S. and its allies against a missile attack. Following Reagan's speech, two expert panels ruled that the idea of deploying missile defenses had enough merit to warrant an ambitious government research program to investigate its technical feasibility.

Former Administrator of the National Aeronautics and Space Administration (NASA) James Fletcher chaired the first panel in 1983 and examined the technological feasibility of the Reagan proposal. The Fletcher Panel concluded: "powerful new technologies are becoming available that justify a major technology development effort offering future technical option to implement a defensive strategy."

The second panel, led by Fred Hoffman of the private research firm Pan Heuristics, reviewed the strategic implications of the proposal, also in 1983. The Hoffman Panel said: "A strategy that places increased reliance on defensive systems can offer a new basis for managing our long-term relationship with the Soviet Union."

The two reports, along with the Reagan speech, established the conceptual foundation for what was awkwardly named the Strategic Defense Initiative and that, in turn, led to the founding in 1984 of the Strategic Defense Initiative Organization (SDIO). These studies laid out a five-year plan for researching and developing defensive technology estimated to cost $26 billion. They also provided the strategic rationale for the program, describing the need for strategic defenses to strengthen the U.S. capability to deter nuclear war.

THE FUTURE OF SDI: A NEED TO ANSWER IMPORTANT QUESTIONS

Over the next the several years the Administration will have to address each of these questions. Otherwise, SDI's future will be in jeopardy.

Question #1: Will Bush decide by the end of 1992 to deploy strategic defenses; if so, what strategic defense "architecture" will he choose?

Until now, SDI almost exclusively has been a technology research program. It is not surprising that its greatest progress has been in researching and developing missile defense technologies. From these it has become clear which technologies are becoming available for deployment in the 1990s and which will be suitable for deployment later.

The technical success of the program became particularly evident in 1987. In July that year, the Defense Acquisition Board (DAB), a panel of Pentagon senior executives that makes recommendations to the Secretary of Defense on purchasing policy, issued a so-called Milestone I recommendation for the technologies needed to deploy a "Phase I" missile defense system. "Milestone I," despite its misleading name, actually is the second stage of development in the Pentagon's standard procedure for advancing research and development programs. A Milestone I designation implies that a weapons system's technologies are nearing full-scale development. "Phase I" is the Pentagon's official designation for the near-term deployment plan for SDI. Secretary of Defense Caspar Weinberger approved the DAB recommendation the following September.

This Phase I system relies on non-nuclear, kinetic energy weapons, that will destroy enemy missiles by the force of collision. The full Phase I system is to include: 1) ground-based and space-based kinetic energy interceptor missiles; 2) a group of four sensor systems (two space-based and two ground-based); and, 3) an integrated battle management and command and control system to allow human commanders (rather than computers) to run the system.

Originally, the Phase I price tag was estimated at $115 billion. Cost-saving measures announced in October 1988, trimmed this to $69 billion. Further cost-reductions announced on February 9, 1990, lowered the Phase I price to $55 billion.

The DAB's Phase I recommendation implies that the deployment of directed energy weapons, like lasers and neutral particle beams, would be put off for a later or "Phase II" SDI deployment. The Phase I system continues to serve as the framework for a near-term SDI deployment plan.

A technology introduced in 1988, called *Brilliant Pebbles*, has altered the Phase I deployment plan. Former SDIO Director, James A. Abrahamson, in his "end of tour" memorandum in February 1989, argued that the *Brilliant Pebbles* system, if included in a multilayered defense against ballistic missiles, would cost only $50 billion to $55 billion. High-ranking officials of the Bush Administration, including

Vice President Dan Quayle and Secretary of Defense Richard Cheney, also have expressed support for *Brilliant Pebbles*. SDIO announced on February 9, 1990, that Bri*lliant Pebbles* would be incorporated into the Phase I system.

The *Brilliant Pebbles* proposal envisions the deployment of thousands of individual, autonomous kinetic energy interceptor missiles in low-earth orbit. *Brilliant Pebbles* is the concept of Lowell Wood, a physicist at the Lawrence Livermore National Laboratory in California. A series of flight tests to demonstrate and validate the technology of *Brilliant Pebbles* will begin this year and deployment could begin in the mid-1990s.

Whether a Phase I of SDI is deployed by the mid-1990s will be primarily a Bush decision. Though he promised during his 1988 Presidential campaign to make an SDI decision in his first term, he may be tempted to postpone it, citing cutbacks in critical SDI tests, caused by congressional reductions of the SDI budget. Nonetheless, the Bush campaign pledge remains binding and thus is an issue with which he will have to deal before the end of 1992. This may be the most critical decision facing SDI. It will represent the answer to Ronald Reagan's challenge about whether it is feasible to deploy strategic defenses.

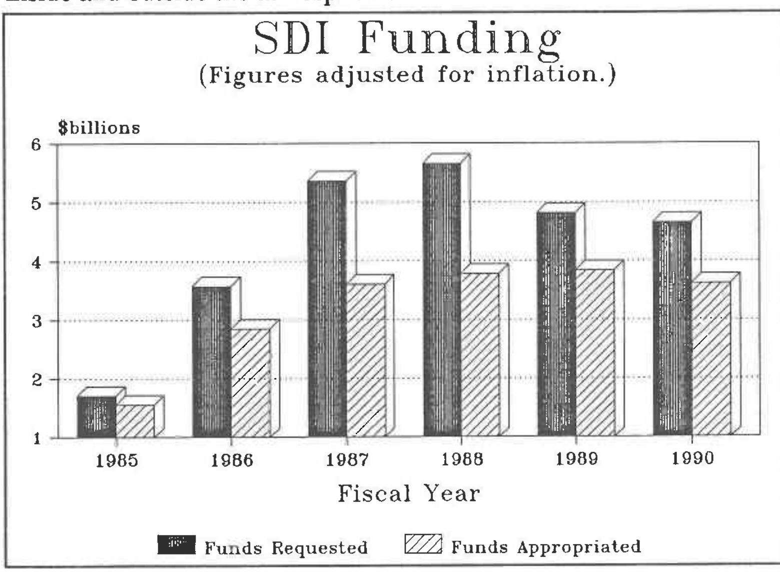
A Bush decision to deploy SDI must be accompanied by his choice of architecture and supporting technologies, which will define the roles and missions of individual components in the overall system. Options will be determined by the varying degrees of progress on SDI technologies. Those technologies not available in the near-term will have to wait for deployment in a follow-on strategic defense system. The Bush Administration must decide which of these technologies should go forward, and which ones should wait.

Question #2: Will Bush reorganize the Strategic Defense Initiative Organization to prepare for deployment?

SDIO formally opened its doors in January 1984. SDIO was designated as the lead organization in managing the SDI program, although it relies on other government agencies and private contractors to perform certain tasks under of the program. The most prominent of these outside SDIO are: the Office of the Secretary of Defense (OSD), the military services (primarily the Air Force and the Army), private defense firms, the Department of Energy (DOE), and the National

Aeronautics and Space Administration (NASA). The organizational design of the SDI program was geared to conducting the research necessary to assist the President in determining the feasibility of deploying missile defenses.

SDIO is a separate entity in the Pentagon, with the Director of SDIO reporting directly to the Secretary of Defense. This independent position gave SDIO a special status during the Reagan Administration. SDIO enjoyed access to resources throughout the entire Pentagon, and even to several agencies outside of it, including DOE and NASA. This allowed SDIO during the Reagan years to pursue aggressively the technical study that represents the core of its mandate. The result: SDIO and the organizations that it supervises have made dramatic progress toward determining the feasibility of deploying missile defenses. This is particularly true with respect to the development of the advanced technologies necessary to deploying strategic defenses. Example: Tests in 1984 and 1987 demonstrated the ability of interceptors to destroy incoming missiles or warheads by crashing into them both inside and outside the atmosphere.



Source: Congressional Research Service.

SDIO has grown as the SDI program has expanded. Its budget has climbed from $1.6 billion in fiscal 1985 to $3.8 billion in fiscal 1990, while its payroll has grown to some 260 persons in 1989. Though there were some organizational changes at SDIO when Lt. General George L. Monahan in 1989 succeeded founding director Lt. General James A. Abrahamson, the organization of SDIO and the overall organization of the SDI program continues to be geared to research on the feasibility of deploying missile defenses.

So far, therefore, the SDI program has been an elaborate feasibility study. As the program shifts from study and research to construction and deployment of the weapons, SDIO's role too must shift. A deployment decision will require SDIO to change its structure internally and alter its relationship with other federal bureaucratic entities, particularly with respect to the military services and the Pentagon's civilian bureaucracy. The reason: weapons and supporting systems will have to be procured through the Pentagon's acquisition arm and supplied to those military services that ultimately will operate them. How the Bush Administration prepares for SDIO's inevitable organizational transition brought about by a deployment decision will be an important indicator of the how the Administration is progressing toward a deployment decision. The sooner SDIO transition planning begins, the more serious the Bush Administration will be about moving toward deployment.

Question #3: Will Bush develop a coherent strategic doctrine that accounts for the deployment of strategic defenses?

The main goal of the SDI program is to provide the President with the technical information to allow time to decide whether or not to deploy strategic defenses. From the beginning of the SDI program it was understood that strategic defenses would require developing a military strategy beyond the existing theory of deterring war solely by threatening retaliation with offensive nuclear weapons. Two documents best reflect the progress that has been made in reexamining strategic doctrine in light of the SDI program.

The first of these outlines the military requirements for an initial SDI deployment and was determined by the Joint Chiefs of Staff (JCS) in 1987. The second document is National Security Decision Directive (NSDD) 14, which outlines the findings of an official review of U.S.

strategic policy conducted in 1989 by the Bush Administration. Though both documents are classified, public accounts of their general contents exist.[1] It is widely speculated, for example, that the JCS document sets the requirement that the first phase of SDI be able to intercept and destroy 50 percent of Soviet SS-18 missile warheads and 30 percent of all missile warheads launched in a large-scale Soviet first strike. NSDD 14 reportedly reaffirms the basic Reagan Administration goals of SDI. These goals include placing deterrence on a more stable plane by moving away from an offense-only strategy toward one that increases reliance on defenses and the difficulty they would cause for Soviet warplanners.

A new strategic doctrine will craft the military principles by which the U.S. will build and deploy its forces to deter aggression, or if deterrence fails, use these forces to end hostilities on terms favorable to the U.S. SDI, of course, begins a shift away from the existing strategic doctrine which relies exclusively on retaliation by offensive nuclear forces. This means that the new principles based on the JCS and NSDD 14 requirements must give direction not only to SDI and future deployments of missile defenses, but to the U.S. strategic forces, including offensive nuclear missiles and bombers, as a whole.

This new strategic doctrine must be sufficiently detailed to be believable to the Soviets and to provide clear operational guidelines to the U.S. military. And it must be developed well in advance of the deployment of missile defenses to ensure that the force that is developed and ultimately deployed can meet the goals outlined in the doctrine. The question for the Bush Administration is whether it will complete work on developing a new strategic doctrine in time for the promised deployment decision before the end of 1992.

Question #4: Will Bush resist Soviet attempts to use the arms control process to limit and ultimately kill the SDI program?

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1 See Steven A. Hildreth, *The Strategic Defense Initiative: Issues for Phase I Deployment* (Washington, D.C.: Congressional Research Service, January 4, 1989), p. 4, and the Strategic Defense Initiative Organization, "SDI Progress and Promise Update," September 1989.

An important goal of the SDI program always has been to establish a framework for negotiating agreements with the Soviet Union to reduce offensive nuclear weapons dramatically. This was to be achieved by encouraging both the U.S. and the Soviet Union to ensure security by relying more on non-threatening strategic defenses than on very dangerous and threatening offensive nuclear weapons. For this reason, Washington in 1985 offered proposals to Moscow for a mutual, cooperative transition to the deployment of strategic defenses, in the Defense and Space Talks (DST) negotiations in Geneva, Switzerland. The Soviets have balked at this and instead have attempted to use the DST negotiations to kill SDI.

This Soviet objective was evident from the beginning of the DST negotiations during the Reagan years. After breaking off the Strategic Arms Reduction Talks (START) and the Intermediate-range Nuclear Force (INF) talks in November 1983, to protest NATO's deployment of INF missiles, the Soviets returned to the bargaining table in March 1985. A primary reason that they did so almost surely was to use arms control agreements to limit the U.S. SDI program. Soviet fear of SDI became a central issue in the DST negotiations in Geneva. DST is one of the original three "negotiation groups" that comprised the Nuclear and Space Talks (NST), as the combined talks were labeled, and also began in March 1985. The three-part design of the NST negotiations provided a convenient organizational structure for the Soviets to hamper SDI by linking the outcome of START and INF to restrictions on strategic defenses.

In the DST negotiations it clearly has been and remains the Soviet goal to kill SDI by obtaining U.S. agreement to reaffirm the legitimacy and permanence of the 1972 U.S.-Soviet Anti-Ballistic Missile (ABM) Treaty. The ABM Treaty prohibits the deployment of more than one ABM system consisting of 100 fixed, land-based interceptors; the U.S. agreement to adhere to it in perpetuity, as the Soviets want, would destroy the chances of deploying a comprehensive U.S. strategic defense system.

The U.S. has taken the position that it will enter into no agreement with the Soviets that limits the SDI program. While the U.S. has refused to agree to limitations on the SDI program, it is willing to agree to "confidence-building measures" to allow each side to know what the other is doing in research. The U.S. is not willing, however, to agree to restrictions on testing that would so constrain the program that it would become impossible to determine the feasibility of deploying an anti-missile system.

The Soviet strategy has been to create an artificial choice for the U.S. between reducing offensive nuclear forces on the one hand, and testing and building SDI on the other. Moscow tries to do this by establishing "linkages" between a future Defense and Space Talks agreement and a START treaty to limit offensive forces. Example: Moscow warned in September 1989 that it would pull out of a START treaty, even if signed and ratified, if the U.S. built a strategic defense system. The Soviets know that an agreement locking the U.S. into continued adherence to the ABM Treaty would kill SDI.

So far, the U.S. has been steadfast in resisting Soviet pressure. If the Administration fails to resist the Soviets, the SDI program is likely to be so severely restricted that the deployment of effective defenses will become impossible.

CONCLUSION

SDI has come a long way since Reagan's 1983 speech. Strategic defense technologies have been advanced, near-term military requirements have been set, and it is becoming clearer what systems will be included in a near-term SDI architecture.

Important steps still need to be taken. The time is rapidly approaching when a decision to deploy strategic defenses can be made. Bush can fulfill his campaign pledge to make such a decision by the end of 1992 by addressing four key questions: 1) Will he decide to deploy strategic defenses and, if so, what architecture will he choose? 2) Will he reorganize the Strategic Defense Initiative Organization to prepare for deployment? 3) Will he develop a coherent strategic doctrine that accounts for the deployment of strategic defenses? 4) Will he resist Soviet attempts to use the arms control process to limit and ultimately kill the SDI program?

CHAPTER 2

Strategic Defense and U.S. Military Strategy

Keith B. Payne

A deployment of strategic defenses will require that the Pentagon develop a military strategy for employing both offensive and defensive strategic forces. Such a new strategy should define how strategic defenses will ensure a stable military relationship with the Soviet Union, deter a nuclear attack on the U.S., and protect U.S. allies against attack. This strategy should also establish the basic military requirements for the system and operational guidelines on how it would be employed in wartime. A strategic doctrine should be developed for SDI soon. Failing to do so runs the risk of continuing to design an SDI system that for technological reasons may turn out to be incompatible with the strategy it is meant to support.

The author first examines the historical development of strategic doctrine in the U.S., which has been based on threatening nuclear retaliation against Soviet aggression. The traditional aim of offensive deterrence has been to ensure that the amount of destruction to the Soviet Union would be greater than any potential gain achieved by attacking the U.S. or its allies. Although this strategy of offensive deterrence has helped so far to maintain peace, it could fail and result in the destruction of millions of American lives.

Chapter 2

The author distinguishes between near-term and long-term strategies. The near-term strategy for SDI foresees using missile defenses not only to defend U.S. offensive nuclear forces from nuclear attack, but to provide a full measure of protection against attacks launched by less advanced nations such as Iran or Iraq, which are now acquiring ballistic missiles. Under the near-term strategy, strategic defenses would protect offensive nuclear weapons from attack and thus strengthen the capability of those weapons to deter war. The long-term strategy foresees strategic defenses becoming ever more capable and eventually assuming a preeminent role in maintaining deterrence. This long-term strategy is what the author terms "defensive deterrence." Under this strategy, defenses would so limit the potential damage to the U.S. of a Soviet missile attack that the Soviets would have little incentive to strike, as well providing direct protection to the American people should deterrence fail.

If the United States is to move toward deploying missile defenses, the Bush Administration must publicly articulate the role that such defenses can play in military strategy. There is a high level of latent public support for strategic defense, but presidential attention to the subject almost certainly will be necessary for that support to bear fruit. Missile defenses can make important contributions to strengthening the traditional U.S. strategy of deterrence and may offer the opportunity to move beyond traditional deterrence to a safer, more defensive basis for U.S.-Soviet relations. Missile defenses not only can help protect American retaliatory nuclear weapons from a first-strike attack by the Soviet Union, thus strengthening the capability to deter such an attack, but can protect American territory, allies, and forces abroad against an emerging threat of the 1990s – Third parties armed with ballistic missiles and weapons of mass destruction.

Formulation of a new military strategy that incorporates missile defense will enable the U.S. to proceed in a rational way toward a decision to deploy SDI. Such a strategy should:

♦ **Include a role for missile defenses to help make the U.S. retaliatory nuclear capability more survivable.** This could be done concurrently with so-called passive defense measures. Defenses would make untenable Soviet military plans for preemptive attacks against U.S. nuclear weapons, and therefore strengthen the traditional U.S. strategy of deterrence based on the threat of offensive nuclear retaliation.

♦ **Promote stability between the U.S. and the Soviet Union** by providing defensive avenues for signaling U.S. resolve in a conflict – avenues that would be less provocative than current notions of using limited offensive nuclear strikes for political effect.

♦ **Include options for defense against limited missile threats.** Such a defense would provide some protection against a Soviet nuclear strike and highly effective protection for the United States and its allies against third parties that may be able to launch nuclear missiles armed with weapons of mass destruction.

♦ **Provide a long-term approach to deterrence** that is compatible with reducing the vulnerability of the U.S. and its allies to nuclear attack. Since the mid-1960s the notion that defense and deterrence are incompatible grew to orthodoxy. In contrast, the late Herman Kahn, a widely-respected global strategist, included strategic defenses in what he called "multistable deterrence." In this, the aim of deterring war and defending against attack were the cornerstones of strategy. These should remain as such when developing a strategy that incorporates strategic defenses.

THE ROLE OF DETERRENCE IN AMERICAN STRATEGY

The goals of American strategy have changed little since the founding of the Republic. The most fundamental objective of this strategy is to protect America's people, institutions, territory, and political values from outside threats. As stated in the 1990 edition of *National Security Strategy Of The United States*, the official statement of U.S. national strategy, the primary objective is: "The survival of the U.S. as a free and independent nation, with its fundamental values intact and its institutions and people secure."[1]

U.S. military strategy is intended to support this goal; and deterrence is the cornerstone of U.S. military strategy. The U.S. intends to deter aggression by persuading potential adversaries that the likely costs of an attack against the U.S. or its allies would exceed any possible benefits.[2] U.S. deterrent forces, including strategic ballistic missiles

1 George Bush, *National Security Strategy Of The United States*, March 1990, p. 2.

2 See, for example, Richard Cheney, *Report of the Secretary of Defense to the President and the Congress* (Washington, D.C.: USGPO, January 1990), p. 2.

and bombers in particular, are intended to deny the Soviet Union any plausible benefit from attacking the U.S. or its allies. This deterrence strategy is based on the premise that potential damage caused by American nuclear retaliation would so outweigh any possible benefit that Soviet leaders would be deterred from aggression in the first place.

THE FLEXIBLE RESPONSE DOCTRINE

For deterrence to be effective, America needs flexible nuclear options for responding to an attack. The official U.S. and NATO guidelines for these options is called the "Flexible Response" Doctrine. Under Flexible Response, Moscow is confronted with the prospect of Washington escalating to a nuclear response if the Soviet Union attacks the West. Such nuclear escalation would deny the Soviet Union the ability to control or limit the cost incurred as a result of its aggression.[3] At every level of provocation against the U.S. or its allies, the Soviet Union would be faced with proportionate U.S. responses and the possibility of further escalation to a higher level of conflict. Under this doctrine the U.S. has the flexibility to threaten retaliation with nuclear weapons if necessary to deter the Soviet Union from invading Western Europe with conventional or nuclear forces. This doctrine thus compels Soviet leaders to confront the possibility of losses from aggression that would far outweigh any potential gains.

The logic behind U.S. deterrence strategy is basic: if Soviet expectations of cost inflicted by U.S. retaliation can be made sufficiently certain and grievous, then no potential benefit could reasonably justify aggression. This requires American strategic nuclear forces to be sufficiently lethal to threaten what Soviet leaders value, sufficiently survivable to withstand a Soviet first strike and still pose a reliable retaliatory threat, and flexible enough to be a credible threat to Moscow.[4] This combination of lethality, survivability, and flexibility has long been considered the key to deterrence stability.

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3 Frank C. Carlucci, *Report of the Secretary of Defense to the Congress on the FY 1990/FY 1991 Budget and FY 1990-94 Defense Programs* (Washington, D.C., USGPO, January 17, 1989), pp. 34-35.

4 *Ibid.*, p. 37. See also, Secretary of Defense Cheney, *Report of the Secretary of Defense to the President and the Congress, op. cit.*, pp. 2, 32.

The interpretation of how high the cost must be to the Soviets for deterrence to work has evolved over the decades. Officially stated estimates have ranged from the relatively simple threat of inflicting massive damage to cities and industrial centers to one in which Soviet political control and military power is put at risk by targeting Soviet military forces and strategic command bunkers and facilities. A political and military strategic targeting policy was highlighted in the "Scowcroft Report" of 1983, which Ronald Reagan requested to provide recommendations for strategic force modernization:

> We must be able to put at risk those types of Soviet targets – including hardened ones such as military command bunkers and facilities, missile silos, nuclear weapons and other storage, and the rest – which the Soviet leaders have given every indication by their actions they value most, and which constitute their tools of control and power.[5]

The U.S. attempts to control Soviet calculations by threatening retaliatory strikes that would deny the Soviet Union its strategic objectives. Those Soviet objectives include: The protection of the Communist Party, Soviet state, and industrial infrastructure and "essential" workers against nuclear attack. Such protection is to be provided by destroying as much of the U.S. nuclear capability as possible before it can be launched (i.e., in a Soviet "first strike"), and intercepting or absorbing U.S. nuclear forces that survive the Soviet first strike.[6] This Soviet goal requires both strategic offensive and defensive capabilities, and a first-strike strategy for Soviet strategic offensive forces. As the 1989 edition of *Soviet Military Power* noted, Soviet strategic plans are driven by the assumption that, "the best way to limit damage in a strategic nuclear war is to initiate the attack."[7]

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5 President's Commission of Strategic Forces, *Report of the President's Commission on Strategic Forces* (April 6, 1983), p. 6.

6 As best described in *Soviet Military Power: 1984* (Washington, D.C.: USGPO, 1984), pp. 19-20.

7 *Soviet Military Power: Prospects For Change, 1989* (Washington, D.C.: USGPO, 1989), p. 43.

U.S. strategic nuclear retaliation would be intended to deny Soviet leaders any hope that the Soviet state, Communist Party, or Soviet military industry could survive the U.S. retaliatory strikes that would follow a Soviet attack. Because Soviet leaders could never expect to realize their objectives they would, presumably, be deterred from ever initiating an attack. That is the objective of U.S. strategy. In short, influencing the calculations by which Soviet leaders weigh the potential costs and benefits of an attack on the U.S. or its allies is the manner by which the United States intends to prevent nuclear war.[8] It is the psychological essence of deterrence.

SDI AND CURRENT U.S. MILITARY STRATEGY

When Ronald Reagan launched SDI many believed that it would revolutionize U.S. military strategy, perhaps even supplanting deterrence by threats of nuclear retaliation with a strategy based exclusively on defense. As officially described, however, the key near-term SDI goal is that of "enhancing deterrence" by contributing to U.S. nuclear retaliatory capabilities.[9] Thus, the near-term SDI goal of enhancing deterrence is not fundamentally different from the traditional goal of other U.S. deterrent forces. The near-term combination of offensive and defensive strategic forces will still aim to deter Soviet aggression by threatening the Soviet Union with nuclear retaliation.

SDI would contribute to the traditional goal of deterring aggression by threatening retaliation in various ways. A space-based SDI system, for example, could destroy Soviet missiles in space shortly after they are launched (in their so-called boost and post-boost phases). Soviet missiles could be destroyed randomly, thus thinning out a Soviet first strike and eliminating a significant number of warheads regardless of their intended targets in the U.S. This could provide some protection for all potential targets in the U.S., including cities, industrial centers,

8 "Preventing" such a war is the U.S. policy goal. *Report of the Secretary of Defense to the Congress on the FY 1990/FY 1991 Budget and FY 1990-94 Defense Programs*, p. 36.

9 See the discussion in Strategic Defense Initiative Organization, *1989 Report to the Congress on the Strategic Defense Initiative* (March 13, 1989), pp. 1-1 through 1-9.

missile sites, bomber bases, naval points, or even the political leadership in Washington, D.C.

SDI would contribute to deterrence by making the successful outcome of a Soviet attack on a defended America highly uncertain. The reason: SDI would deny Moscow its offensive targeting goals which place first priority on destroying the U.S. capacity to retaliate with nuclear weapons. Undercutting Soviet military objectives in this manner would require strategic defenses that protect U.S. nuclear forces and thereby contribute to the survivability of forces that could retaliate against a Soviet attack.

Increasing the survivability of U.S. retaliatory forces, even with a limited deployment of SDI, would undermine the Soviet first-strike strategy and thereby strengthen deterrence. This goal for near-term defenses was identified explicitly in a Department of Defense publication released in July 1989:

> Strategic defenses, by having the capability to destroy ballistic missiles and nuclear warheads before they reach their targets, would reduce the confidence Soviet leaders have in their ability to launch a first strike and destroy the forces we would use to retaliate. Lacking confidence that they could destroy our retaliatory forces, and faced with the threat of enormous damage to their nation if we retaliate, Soviet leaders would not risk an attack.[10]

This initial role for SDI does not alter the U.S. objective of deterring aggression or the military strategy intended to support that objective.

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10 Department of Defense, *Strategic Defense Initiative: Progress And Promise* (Undated [1989]), p. 6.

SDI would protect the U.S. retaliatory capacity much as can moving missiles around on trucks and trains, concealing them in submarines underwater, or placing them in super-hardened buried silos. Just as such "passive defenses" protect U.S. weapons from a Soviet first strike, SDI would do so actively. Both passive and active defenses would deny the Soviet Union its objective of destroying U.S. retaliatory capabilities in a surprise attack. This objective for SDI is evident in the official military requirements reportedly developed for the first phase of SDI deployment (called Phase I) by the Joint Chiefs of staff.[11] SDI, therefore, would not initially alter the U.S. military strategy supporting deterrence; it simply would add to the survivability measures available for U.S. retaliatory forces.

"ENHANCING DETERRENCE:" SDI AND OFFENSIVE NUCLEAR FORCES

The focus on SDI as a means of enhancing deterrence – as opposed to supplanting deterrence – has permitted the SDI to fit comfortably with traditional thinking about what strategic forces are supposed to do, i.e., deter aggression by threatening retaliation. The drawback of tying SDI so tightly to traditional deterrence, however, is that there are

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11 According to public reports, the JCS identified interception of a significant percentage of the Soviet ICBM arsenal as the Phase I goal. See for example, "Pointing Out The Obvious On SDI," *The Washington Times*, April 22, 1988, p. F-4. As is noted about the JCS requirements in a report by the Congressional Research Service, "Although those requirements are classified, it can be said that the major Phase 1 deployment objective is to ensure, albeit with less than 100% effectiveness, the survival of an effective U.S. retaliatory force capability. The purpose is to deny the Soviets their objectives in an initial ballistic missile attack, thus deterring Soviet aggression." Steven Hildreth, *The Strategic Defense Initiative: Issues For Phase 1 Deployment*, *Issue Brief*, Order Code IB88033, Congressional Research Service, Library of Congress, Updated March 7, 1988, p. 4.

alternative ways of protecting U.S. retaliatory forces and thereby enhancing deterrence.

For example, a 1988 House Democratic Caucus report on SDI states that because the SDI role is to enhance deterrence, it "must therefore be judged against other systems that complicate Soviet attack plans such as mobile intercontinental ballistic missiles, cruise missiles and our nearly invulnerable submarines." In comparing SDI to these other alternatives for protecting retaliatory capabilities, the House Democratic Caucus charged that SDI deployment would be more expensive than other available measures.[12] Deployment of the proposed *Midgetman* mobile ICBM, a missile that would be mounted on a truck and could move on and off roads, is suggested by some as an alternative means of protecting retaliatory capabilities that would be preferable to SDI deployment.[13]

Rather than being competitors, SDI and *Midgetman* could combine mobility on the ground and interception in space to ensure the survivability of the ICBM force. Mobile missiles are in themselves difficult to target and destroy. With strategic defense protection, the mobile *Midgetman* and U.S. ICBMs in their silos would likely be impossible for the Soviets to wipe out in nuclear attack.

Defending some missile sites but not others, a technique known as preferential defense, would likely be the most effective way to protect ICBMs. Soviet planners would be unable to identify prior to an attack which missiles would be defended and which would not, and would be therefore be forced to plan as if every missile site were defended. The fact that Soviet military planners would not know which ICBMs the

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12 House of Representatives, Democratic Caucus, *Strategic Defense, Strategic Choices: Recommendations of the Task Force on the Strategic Defense Initiative*, May 1988, pp. 3, 13-14. The report is quoted in Paul Mann, "Democrats Propose Shift in SDI Research Program To Warhead Upgrades," *Aviation Week and Space Technology*, June 13, 1988, p. 17.

13 See Brent Scowcroft, John Deutch and R. James Woolsey, "A Small Survivable, Mobile ICBM," *The Washington Post*, December 26, 1986, p. A-23.

U.S. was defending would create a targeting nightmare for any Soviet first-strike strategy. Moscow could have no confidence in planning successful strikes against U.S. missile fields. Indeed, the combination of ICBM mobility and strategic defense would protect the U.S. retaliatory capability so effectively that any Soviet notions of offensive preemption for the purpose of limiting damage to themselves would be foreclosed.[14]

It is important to note in this regard that the United States could deploy defenses that would be "cost effective at the margin." That means that U.S. defenses would be less expensive than the offensive forces that the Soviet Union might attempt to deploy to overcome U.S. defenses. This type of "cost effectiveness" is extremely important because it should help discourage the Soviet Union from initiating an offensive-defensive arms competition in response to the U.S. deployment of SDI. As Secretary of Defense Richard Cheney has stated, "At each stage of escalation, upgrading the defense should be cheaper than maintaining the offense. Therefore, we hope that the Soviet Union would avoid this kind of losing competition and move to a greater mutual reliance on strategic defense."[15]

Some commentators have suggested that concern over the Soviet first-strike threat and the rationale for SDI deployment have been overtaken by reform in the Soviet Union.[16] However, the need to preserve deterrence by ensuring the survivability of U.S. retaliatory forces remains, and will become even more important as the START process significantly reduces the numbers of U.S. deterrent forces.

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14 There have been many analyses showing the benefits of combining active and passive defenses. For a pre-SDI study that demonstrates the significant benefits of synergism between active and passive defense for ICBM survivability see, Raymond Starsman, *Ballistic Missile Defense and Deceptive Basing: A New Calculus for the Defense of ICBMs* (Washington, D.C.: National Defense University Press, 1981).

15 Quoted in Vincent Kiernan, "Cheney: Soviets Could Not Afford to Beat SDI," *Space News*, March 26-April 1, 1990, p. 3, 28.

16 See, for example, Richard Matthews, "Air Force's Strange New Argument For 'Star Wars'," *Atlanta Journal*, January 16, 1990, p. 14.

Reform in the Soviet Union has not led to a reduction in Soviet strategic nuclear capabilities to parallel the reduction of the Soviet conventional threat. The bulk of evidence about Soviet strategic forces reveals a robust modernization program that is improving the overall Soviet capability.[17] For example, the Soviet Union deployed two new silo-based ICBM systems last year, and continued deployment of the road-mobile SS-25 and rail-mobile SS-24 ICBMs. The new, highly accurate SS-18 Mod 5 ICBM is so lethal that its deployment will help allow the Soviets to maintain their offensive targeting requirements even with the 50 percent cut in heavy ICBMs envisaged in START. As the Director of the Defense Intelligence Agency recently stated, "Even after INF and expected START Treaty reductions, the Soviets will likely be able to satisfy their critical nuclear targeting requirements as effectively as with their current arsenal due to ongoing force modernization."[18] Soviet strategic submarine and bomber strategic programs are also impressive. Consequently, a review of on-going Soviet strategic programs does not suggest that the need to protect U.S. retaliatory forces has lessened.

In addition, the START process does *not* reduce the need to protect U.S. strategic forces; indeed, it increases that need. As the number of U.S. forces goes down significantly, the need to protect each becomes even more important for deterrence. Also, Soviet offensive counterforce capabilities will not be reduced by START. But the Soviets will have fewer U.S. forces to target and destroy in a first strike. Consequently, an extra measure of protection for U.S. retaliatory forces after START will become even more desirable.[19]

Nevertheless, if increasing Soviet first-strike uncertainties were the only "value" of SDI, it is doubtful that an argument for SDI deployment would be sufficiently persuasive, since just making U.S. missiles mobile will help protect that U.S. retaliatory capability and undermine Soviet

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17 See the discussion in, William Webster, *Statement Of The Director Of Central Intelligence Before The Senate Armed Services Committee*, January 23, 1990, pp. 4-5.

18 Statement of the Director, Defense Intelligence Agency, To The Senate Armed Services Committee, January 23, 1990 [Prepared Text], p. 4.

19 See Kim R. Holmes, "In the Nuclear Arms Talks, Go Slow on START," Heritage Foundation *Backgrounder* No. 684, January 11, 1989.

offensive targeting plans. But increasing Soviet first-strike targeting problems is not SDI's only, or even main, potential value. There are roles for SDI beyond protecting U.S. retaliatory forces. These are roles that can be filled only by SDI deployment; they cannot be met by making ICBMs mobile or by any other "passive" defensive measure.

A UNIQUE ROLE FOR SDI IN THE COUNTERFORCE MISSION

SDI has unique qualities as an alternative means for neutralizing certain kinds of Soviet offensive forces that now may be assigned to the U.S. strategic offensive forces. For example, SDI could be given the task of countering Soviet ICBMs, including those "reserve" ICBMs not used by the Soviets in their first strike. SDI could counter these missiles, not with nuclear attacks while Soviet missiles are in silos or on mobile launchers, but in space after they have been launched.

SDI, in fact, is better suited in some ways than strategic offensive forces for countering not only those Soviet ICBMs in stationary or "fixed" silos, but also those on trucks and trains. There are two advantages for SDI in this regard. First, using defense instead of offense in this way would "free up" U.S. strategic offensive warheads to threaten retaliation against other targets, such as Soviet command and control centers.[20] It will become increasingly important to conserve U.S. strategic offensive warheads as the START process reduces their number dramatically. Second, using SDI to counter Soviet ICBMs could make Moscow less trigger-happy in time of crisis. Facing the possibility that their reserve missiles could be destroyed on the ground by U.S. offensive nuclear strikes, Soviet leaders could be tempted to launch their nuclear missiles merely upon receiving warning of what may be a U.S. attack. This incentive to "launch-on-warning" is thought by many to be very dangerous during a crisis.[21]

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20 For an excellent discussion of this point see Stephen A. Cambone, *Offenses, Defenses And The Future Of American Security Policy* [unpublished manuscript], pp. 39-41.

21 This possible "crisis instability" quality of offensive counterforce capabilities has been a staple in the congressional arguments against the MX missile. See for example, Daniel Patrick Moynihan, *Loyalties* (New York: Harcourt Brace, 1984), pp. 15-27.

By contrast, assigning this part of the counterforce mission to SDI would give the Kremlin an incentive not to launch its ICBMs – which clearly would be in the U.S. interest. Kremlin leaders no longer would face the "use'em or lose'em" dilemma that could trigger a launch-on-warning. Indeed, when faced with SDI, the Soviets risk the destruction of their ballistic missiles only if they are launched; if kept on the ground, those same ICBMs might retain some value for wartime political bargaining.

Assigning some key counterforce targeting duties to SDI rather than to strategic offensive forces would represent a sharp departure for the U.S. in assigning missions to its strategic forces. Whether performed by offensive or defensive forces, the point of such targeting duties is to enhance deterrence by undermining the Soviets' confidence that their military plans will allow them to prevail. SDI should contribute to that goal without the destabilizing potential of offensive threats.

SDI: BENIGN SIGNALLING AND ESCALATION CONTROL

SDI also could promote more effectively than could offensive forces what the Reagan Administration identified in 1988 as the "the ultimate goal" of using or threatening to use military force: the political resolution of conflict.[22] The U.S. has long had nuclear targeting options that avoid civilian areas and are intended to signal resolve and encourage Soviet conciliation before a war could escalate to all-out nuclear exchanges[23] The problem is that using even limited numbers of offensive nuclear warheads against the Soviet Union to encourage Soviet conciliation is an inherently complex and dangerous proposition. Employing limited numbers of offensive nuclear warheads, as U.S. nuclear strategy now envisages, to signal U.S. resolve may easily encourage escalation and diminish the chances for a political resolution of the conflict. The attempt to disperse or otherwise use offensive forces for

22 Ronald Reagan, *National Security Strategy Of The United States*, January 1988, p. 13.
23 See for example, the presentation in, *Report of the Secretary of Defense to the Congress on the FY 1975 Defense Budget and FY 1975-1979 Defense Program*, pp. 4-5, 35-36. Most recently see Cheney, *Report of the Secretary of Defense to the President and the Congress, op. cit.*, p. 32.

signalling purposes may well be so provocative that it incites rather than prevents crisis escalation.

In contrast, SDI deployment would permit the U.S. to signal resolve in much more benign ways, such as increasing the number of SDI satellites on orbit, increasing SDI surveillance, SDI demonstration tests, or blatantly increasing the readiness of U.S. defensive capabilities. SDI also could help protect American leaders who, the Soviets say, are primary targets for their first strike, but who would need to survive that strike in order to negotiate.

Offensive nuclear weapons are effective instruments for threatening retaliation and thereby influencing the "cost" side of Soviet cost-benefit calculations; this is their contribution to deterrence. Their use, however, is not well-suited for encouraging restraint during war and or for facilitating a negotiated settlement to conflict. SDI is better suited for this. It would lessen the prospects for a successful Soviet preemptive attack, reduce incentives to "use'em or lose'em," protect leaders from initial strikes so they could engage in political bargaining, encourage restraint, and generally stabilize crises.

DEFENSIVE CAPABILITIES UNIQUE TO SDI

There are other unique qualities of SDI that could support deterrence and the existing military strategy. For example, even a partial or limited strategic defense system consistent with the 1972 Anti-Ballistic Missile (ABM) Treaty as signed could provide some protection for America's urban and industrial centers. Now, U.S. offensive weapons provide no useful protection at all. A partial defense system could at least defend against small, unauthorized attacks by the Soviets, accidental Soviet launches, or strikes by countries other than the Soviet Union.[24] A capability to protect the U.S. and its allies against less-than-

24 For an examination of the previous debate on limited protection see Charles Murphy, *The Anti-Ballistic Missile Defense of Washington*, Congressional Research Service, Uc-500-USC, February 7, 1973.

Examples of Arab Countries Possessing Missiles With the Range to Reach Israel

Syria: Scud-B, range 185 miles (map assumes border deployment).

Iraq: al-Hussayn, range 370 miles (map assumes border deployment).

Not shown: Saudi Arabia's 1,350-mile range CSS-2, if deployed near Riyadh could cover the entire Middle East region and as far as Afghanistan and Pakistan.

massive missile strikes is becoming increasingly important. Particularly worrisome in this regard is the worldwide proliferation of ballistic missiles and weapons of mass destruction.

The proliferation of ballistic missile technology and the spread of weapons of mass destruction will jeopardize U.S. and allied security in the future.[25] A growing number of states throughout the world – including some that support terrorism – are obtaining ballistic missiles and weapons of mass destruction. For example, at least fifteen developing countries will either have produced or be capable of producing ballistic missiles by the year 2000, at least six countries probably will have ballistic missiles with ranges of 3,000 km, and some will possess missiles with intercontinental ranges.[26] In addition, while there are five declared nuclear powers, several additional countries either possess a nuclear device or can fabricate and assemble one on short notice.[27] Four of the countries developing missile capabilities already have nuclear weapons or advanced nuclear weapons programs. By the year 2000, four additional countries could develop similar capabilities.[28]

The threat from proliferation in the 1990s, however, will stem not simply from the availability of nuclear warheads to countries with newly-acquired ballistic missiles. Chemical weapons can be an inexpensive, accessible, and effective weapon of mass destruction and

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25 The recent obvious developments of Iraqi ballistic missile capabilities and statements by Iraqi President Saddam Hussein that with chemical weapons Iraq could, "make fire eat up half of Israel" are a foretaste of the dangers introduced by such proliferation. See, Patrick Tyler, "Iraqi Warns of Using Poison Gas," *Washington Post*, April 3, 1990, p. 1.

26 William Webster, Prepared Statement, *Testimony on Nuclear and Missile Proliferation Before the Senate Committee On Governmental Affairs,* May 18, 1989, p. 9; and, William Webster, *Statement Of The Director Of Central Intelligence Before The Senate Armed Services Committee*, January 23, 1990, p. 15.

27 Text of remarks by William H. Webster, Director of Central Intelligence, before the Town Hall of California, Los Angeles, CA, March 30, 1989, p. 3.

28 *Statement Of The Director Of Central Intelligence Before The Senate Armed Services Committee, op. cit.*, p. 15.

instrument of terror. In some important cases the proliferation of chemical weapons is a *fait accompli*. Sixteen countries are judged to have a chemical weapons capability today. More than twenty countries may be developing chemical weapons.[29] And at least ten countries are working to produce biological weapons.[30]

Proliferation during the 1990s will lead to the unprecedented condition wherein numerous countries will be armed with ballistic missiles and weapons of mass destruction. Third World and terrorist states armed with ballistic missiles could, in the future, cause widespread loss of life in America and catastrophic harm to U.S. allies and forces sent abroad. Given the nature of the proliferation threat, there also will be an increased risk of accidental or unauthorized launches because of the greater political instability in the countries acquiring these weapons and their lack of experience in the physical and organizational safeguards necessary to ensure the security of such weapons. This risk of accidents should be taken seriously. Even countries with long experience in handling such weapons can experience accidents. Soviet Major General Boris Surikov acknowledged that Soviet warning satellites

> often sound false alarms. I myself witnessed a facility receive such a signal from space: a missile attack against the USSR from the [U.S.] Grand Forks base. Patches of sunlight were mistaken for American missiles. Its good that the panel had a competent operator who instantly sized up the situation. There have been many such false alarms in the USSR.[31]

And, the Chief of the Main Staff of the Soviet Strategic Rocket Forces recently disclosed in *Pravda* that a Soviet missile "left" its launcher "of its own accord," but "fell not far from the launch pad."[32] A future accident may not have so fortunate an outcome.

SDI deployment, including anti-tactical ballistic missiles (ATBM) defenses, would offer the most reliable protection against accidents

29 *Ibid.*, p. 8.

30 Statement by Dr. Thomas Welch, Deputy Assistant To The Secretary Of Defense (Chemical Matters), Before the House Committee On Appropriations, Subcommittee On Defense, March 22, 1989, Page 2 of statement.

31 Quoted in *Moscow News*, March 18, 1990, p. 6, in FBIS-SOV-90-059, March 27, 1990, p. 3.

32 *Pravda*, February 21, 1990, p. 6.

and the use of ballistic missiles by third countries. No other reliable option exists for responding to the threat of proliferation emerging during the 1990s. Multilateral arms control agreements certainly offer no hope of solving the problem. The other alternative of taking preventive offensive military actions against emerging threats, similar to the Israeli strike against Iraq in 1981, would be extremely difficult for the U.S. politically. And if the United States attempted an offensive military response to the threat, but was unsuccessful, it would virtually guarantee the launching of those missiles against the U.S., its allies, or overseas forces. In short, there appears to be no reliable alternative to SDI deployment for protecting the United States, its allies and interests abroad against proliferation. As Secretary of Defense Cheney has stated regarding this problem, "second-class powers will become first-class threats."[33]

This emerging capability of third parties to threaten U.S. allies and overseas forces will constrain the U.S. will and capability to project power and influence abroad unless a reliable response is developed. Imagine the difficulties confronting a President who must decide whether to send U.S. forces to a trouble spot if the U.S., its allies, or forces would, as a consequence, be subject to attack by third party ballistic missiles armed with weapons of mass destruction. Such a condition would paralyze U.S. power projection options and undermine U.S. credibility as a reliable, distant security partner. SDI must be a key part of the response to this emerging problem.

In addition, a capability for defense is becoming more important because of developments inside the Soviet Union itself. Recent events in the Soviet Union have undermined the basic assumptions that Soviet leadership will retain control over its strategic nuclear arsenal and act in a rational manner.

The Soviet government however, is facing a profound crisis. According to CIA Director William Webster, "the crisis in the Soviet Union is

33 Remarks as delivered by the Honorable Richard Cheney, Secretary of Defense, American Defense Preparedness Association SDI Forum, Washington, D.C., March 19, 1990. Text from, Department of Defense, News Release, No. 124-90, p. 5.

likely to be deep and prolonged, and the government will be hard pressed to maintain control."[34] It is by no means certain that the Soviet government will not lose control of the Soviet Union and its military forces, including nuclear forces. This would lead to the absence of central Soviet authority and power, and undermine the reliability of deterrence by retaliatory threat. Earlier this year, a major uprising in the Soviet Republic of Azerbaijan saw Azeri nationalists call for independence from Moscow. It is difficult to know if the uprising ever threatened the Soviet government's control of the nuclear weapons reportedly stored in Azerbaijan. Indeed, voices of concern have recently appeared in the U.S. Congress about the security of Soviet nuclear weapons in areas of instability. As Senator Sam Nunn observed regarding this concern, "I think you have to worry about thousands of nuclear weapons in a nation that has a lot of turmoil."[35]

What is clear is that the offense-only deterrence policy of the U.S. is ill-equipped to protect the U.S. or its allies against groups coming into control of nuclear weapons, who are unknown, cannot be effectively threatened for deterrence purposes, and who may have a radically different value structure. The fact is that deterrence can fail for reasons beyond control or prediction, and relying exclusively on retaliatory deterrence, without defenses, makes no provision for that fact.[36]

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34 William Webster, "The Role of Intelligence In a Changing World," Remarks at the Kennedy Political Union, American University, March 20, 1990, p.5.

35 Quotes in, "Nunn asks Soviets 'fail-safe' review," *The Washington Times*, February 13, 1990, p. A4. See also Peter Amond, "Nunn, military discuss nuclear terrorism threat," *The Washington Times*, March 30, 1990; William J. Broad, "Specter Is Raised Of Nuclear Theft," *The New York Times*, January 28, 1990, p. 2; Bill Gertz, "Concern mounts over access of Soviets to nuclear arsenal," *The Washington Times*, February 18, 1990, p. 1; and Robert Toth, "U.S. Worried by Nuclear security in Unstable Soviet Empire," *Los Angeles Times*, December 15, 1989, p. S-7. The Soviet Union has acknowledged an attempted rebel raid on a military depot in Barnaul. Reported in TASS International Service, FBIS-SOV-90-039, February 27, 1990, p. 88.

36 See the discussion in, Keith B. Payne and Lawrence Fink, "Deterrence Without Defense: Gambling on Perfection," *Strategic Review*, Winter 1989, pp. 25-40.

SDI AND FUTURE AMERICAN MILITARY STRATEGY

Threatening offensive nuclear retaliation alone has not always been America's military strategy for deterrence. Until the early 1960s, the U.S. not only had bombers to retaliate against the Soviet Union but also a substantial air defense system to defend against Soviet bombers. This mixture of offensive and defensive strategic forces was designed to deter war, and if deterrence failed, to attack approaching Soviet offensive forces and limit damage to the U.S. As Moscow deployed an increasing number of ICBMs in the 1960s and 1970s, America's capability to limit damage by destroying approaching Soviet forces waned and then ended. What remained was America's capability to threaten the Soviet Union with offensive retaliation; the hope was that this would deter Soviet attacks against the U.S. and its allies. If deterrence failed, of course, America no longer could limit the damage caused by Soviet missiles.[37] The 1972 Anti-Ballistic Missile (ABM) Treaty, moreover, prohibited the deployment of strategic defenses sufficient to limit damage from a Soviet attack.[38] Indeed, the fact that both the U.S. and the U.S.S.R. were mutually vulnerable to nuclear destruction came to be viewed officially by the U.S. as stabilizing. It is this doctrine that was called Mutual Assured Destruction. As Jimmy Carter's Secretary of Defense Harold Brown observed in 1979:

> In the interests of stability, we avoid the capability of eliminating the other side's deterrent, insofar as we might be able to do so. In short, we must be quite willing – as we have been for some time – to accept the principle of mutual deterrence, and design our defense posture in light of that principle.[39]

In the event of hostilities, however, relying exclusively on mutual threat of annihilation for "stability" would be incompatible with the

37 For a useful official discussion of these developments see, Dr. Paul Wolfowitz, *Statement Of The Under Secretary Of Defense (Policy) Before The Senate Armed Services Committee*, June 15, 1989 [Advance Copy], pp. 2-4.

38 As observed in, *Report of the Secretary of Defense to the Congress on the FY 1975 Defense Budget and FY 1975-1979 Defense Program*, p. 37.

39 *Report Of Secretary Of Defense Harold Brown To The Congress On The FY 1980 Budget, FY 1981 Authorization Request And FY 1980-1984 Defense Programs* (Washington, D.C.: USGPO, January 25, 1979), p. 61.

overarching U.S. strategy objective of national survival. That is, the American military strategy of retaliatory deterrence is incompatible with its fundamental national strategy objective at precisely that point when military strategy becomes most important, when deterrence fails. Strategic offensive forces and retaliatory deterrence cannot protect one inch of U.S. territory from nuclear attack. Once Soviet offensive forces are launched, retaliatory deterrence has failed. Blasting away at the Soviet Union with retaliatory nuclear strikes, could contribute little to the goal of national survival, unless accompanied by a complementary defensive means of protecting the U.S. from nuclear attack.

Developing a Defensive Deterrence Relationship With the Soviet Union

SDI was intended to help address this fundamental problem of vulnerability to nuclear attack. The Reagan and Bush Administrations consistently have stated that the ultimate goal of SDI is to establish a U.S.-Soviet deterrence relationship that is based not on retaliatory nuclear threats, but on defensive capabilities. Such defensive capabilities would include a U.S. capability for directly limiting damage if deterrence failed.[40] This would be a fundamental shift in U.S. military strategy.

The basic deterrent qualities of a defensive-oriented strategic relationship were identified almost three decades ago by Herman Kahn.[41] He described a defensive deterrent as resulting in what he called "multistable deterrence." He envisaged strategic defenses as allowing both the U.S. and Soviet Union to maintain deterrence stability but escape mutual threats of nuclear annihilation. With strategic defenses,

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40 This goal is identified in *National Security Strategy Of The United States*, January 1988, p. iv; *Report of the Secretary of Defense to the Congress on the FY 1990/FY 1991 Budget and FY 1990-94 Defense Programs, op. cit.,* p. 40; *Strategic Defense Initiative: Progress And Promise, op. cit.*, pp. 1,7; George Bush, *Report To The Congress On The Analysis Of Alternative Strategic Nuclear Force Postures For The United States Under A Potential START Treaty*, July 25, 1989, pp. 5-6. It was most recently and articulately stated by the Under Secretary of Defense (Policy) in, *Statement Of The Under Secretary Of Defense (Policy) Before The Senate Armed Services Committee, op. cit.*, pp. 7-8.

41 Herman Kahn, *On Thermonuclear War* (Princeton, N.J.: Princeton University Press, 1961), pp. 141-144.

he explained, threats of retaliation would be less lethal, but would have greater credibility. For example, the U.S. policy of extended deterrence to protect its NATO allies would be much more credible if the U.S. were defended because it would no longer be suicidal for the U.S. to escalate to the use of nuclear weapons in response to a Soviet attack in Europe. In addition, because defense of retaliatory deterrent forces would be a relatively easy task, neither side could anticipate achieving a successful first strike. As a result the incentive of either side to launch a preemptive first strike would be minimized, and stability preserved. By the same token each side would retain some offensive retaliatory capability. Consequently, neither could be cavalier about provoking a crisis.

Kahn maintained that this "multistable" defensive-deterrent relationship could provide stability in all areas of U.S. vital interest, without the need for U.S. strategic superiority, and without the possibility of massive societal annihilation that stems from a military strategy that protects the U.S. exclusively by retaliatory deterrence. Such a multistable defensive deterrent would not constrain the U.S., which has no designs against Eastern Europe or for a preemptive first strike anyway. In contrast, historically the Soviet Union has prepared both an offensive blitzkrieg strategy for Europe and a first-strike strategy of preemption against the U.S. A defensive deterrent, as described by Kahn would counter both strategies, and therefore should deter.

A defensive deterrent would follow the two-millenium-old advice of the great Chinese military theorist Sun Tzu: it is of "supreme importance" to "attack the enemy's strategy.... The worst policy is to attack cities."

Rather than relying almost exclusively on offensive retaliatory threats to influence Soviet calculations of the costs and benefits of attacking the U.S., as now is the case, the U.S. should proceed toward a defensive deterrent capable of countering the Soviets' strategy. Doing this would not undercut the goal of deterrence. Rather, it would enhance deterrence, and make deterrence safer and more compatible with the primary national strategy goal of survival by defending the U.S. and its allies directly if deterrence failed.

Given the long-term SDI goal of damage limitation, the U.S. no longer would design its strategic forces as if preventing the destruction of U.S. territory with defenses were incompatible with deterrence. A new military strategy could employ strategic defenses to deter war first by denying the Soviet Union its offensive military objectives, and second by undermining the capability of Moscow to annihilate the U.S. Although deterrence would still be the primary U.S. objective, the ultimate protection of the U.S. no longer would be based exclusively on the optimistic hope that all potential opponents of the United States will forever practice the rational restraint of mutual deterrence.

A "COOPERATIVE TRANSITION"

The relationship between strategic offensive and defensive forces in a new military strategy would depend on how they, together and separately, support this strategy. Bush Administration officials have continued the initiative for a "cooperative transition" begun during the Reagan Administration. This means that both the U.S. and the Soviet Union would cooperate in the transition to the deployment of strategic defenses such that the transition guarantees stability and reduced vulnerability to nuclear attack. A key characteristic of this cooperative transition is the mutual reduction of strategic offensive capabilities through the mutual deployment of defenses and negotiated arms reductions.[42] The reduction of U.S. offensive capabilities under a defensive transition is seen as an incentive for Moscow to cooperate in a defensive transition. As Dr. Fred Iklé, Under Secretary of Defense (Policy) for the Reagan Administration, noted:

> [A cooperative transition] offers the Soviet leaders a new strategic relationship with the United States that will better meet their fundamental security requirements...if the Soviet leaders are willing to cooperate on a purpose both East and West can share, that purpose surely cannot be the perpetual hostility that is inherent in unopposed forces constantly poised for mass destruction. It can, however, be a strategic order that will

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42 President Reagan often referred to the goal of mutual U.S. and Soviet safety from nuclear attack through strategic defenses. See also Caspar Weinberger, "Arms Reductions And Deterrence," *Foreign Affairs*, Spring 1988, pp. 714-715; Fred Iklé, "Nuclear Strategy: Can There Be A Happy Ending?" *Foreign Affairs*, Spring 1985, pp. 810-826. A "cooperative transition" is discussed recently in *1989 Report to the Congress on the Strategic Defense Initiative*, *op. cit.*, p. 1-7.

> eventually eliminate Soviet vulnerability to massive nuclear destruction, even if this means in turn surrendering their capability to inflict mass destruction on Western Europe and the United States.[43]

In the changed strategic relationship created by a cooperative transition, American deterrence of Soviet attack no longer would necessarily require the U.S. to maintain a "massive nuclear" anti-Soviet retaliatory capability if Moscow cuts its offensive nuclear arsenal deeply and seeks to ensure security through the deployment of non-threatening strategic defenses. Although the U.S. would retain some offensive retaliatory capability to threaten the Soviet Union, deterrence of Soviet attack would be based primarily on a defensive capability to deny Moscow any expectation of achieving its offensive objectives. From the Soviets' point of view, to engage U.S. defenses then would be a fruitless exercise in self-disarmament. To use ballistic missiles against the U.S. or its allies would mean not only that the strikes would fail, but that the Soviet Union would be initiating a dangerous and unwinnable war with a United States that could not be coerced by threats of nuclear annihilation, and would mobilize its massively superior military potential – a deterring prospect indeed.

A cooperative transition to defensive deterrence would depart significantly from current military strategy and the official U.S. and NATO doctrines of Flexible Response. Unlike existing strategy and doctrine, a new defensive deterrent could support what historically has been the fundamental objective of national strategy: protecting the people, territory and institutions of the U.S. before and, if deterrence should fail, after a war has begun. The old incentives of the offense-minded strategy would be changed as well: instead of relying on continual programs to modernize strategic offensive forces, Moscow and Washington would have mutual and compatible incentives for deploying effective defenses to neutralize offensive threats.

43 "Nuclear Strategy: Can There Be A Happy Ending?" *op. cit.*, pp. 816, 825.

Soviet officials adopted a strict position against SDI soon after it was introduced by President Reagan – leading many American arms control commentators to claim it is impossible to pursue SDI and offensive reductions simultaneously.[44] The U.S. has, nevertheless, pursued a cooperative defense transition in negotiations at the Defense and Space Talks (DST).

In mid-1989 some Soviet officials began to break formation and publicly endorse the notion of cooperation and "defensive deterrence." "Defensive deterrence," as they describe it, involves the combination of offensive reductions and the deployment of defenses – essentially accepting the basic U.S. framework for the future of strategic forces and arms control. Soviet cooperation in the mutual reduction of offensive forces and deployment of defenses would be extremely significant. It would virtually eliminate the instability and arms race concerns raise by some with regard to SDI. Soviet cooperation would, in effect, open the door to a stable process of deployment.

A reason specifically cited by Soviet officials for their unprecedented support of mutual defenses is the persistence of the SDI program. For example, in the Soviet journal *Soviet Military Review*, an author identified as an official in the Soviet Foreign Ministry, wrote:

> It is time we became realistic and gave up the hope that SDI-related work will be discontinued. It appears that if the trend towards the development of defense technologies is correctly oriented, it may, far from leading to destabilization, result in a better model of strategic stability than the one we have.
>
> The model of defense domination will make it possible to switch over, indeed, and not in word, to a defensive military doctrine at all levels of confrontation.

44 See, for example, McGeorge Bundy, George Kennan, Robert McNamara, and Gerard Smith, "The President's Choice: Star Wars or Arms Control," *Foreign Affairs*, Winter 1984-85, pp. 264-278.

> There is no doubt the transition to the new model of strategic stability will involve a certain political risk...It seems, therefore, that the only way to the new strategic structure is that of gradual mutually agreed and coordinated steps, which include phased deployment of ABM components....[45]

Similarly supportive of defensive deterrence is an article by a Soviet Foreign Ministry official, Ednan Agayev, appearing in a journal of the Soviet Foreign Ministry, *Mezhdunarodnaia zhzn'*:

> As it was once pointed by Rene Descartes, who was a strict logician, in order to get to the truth it is necessary to call everything in question. And hasn't the present "offensive deterrence" been long ripe for that? The only modern deterrence is defensive.[46]

A senior Soviet military official also recently endorsed the notion of mutual U.S. and Soviet defenses. Maj. Gen. V. Belous noted that U.S. officials had discussed the possibility of limited defenses, and, "Mindful of current realities, we should hardly deny the possibility of reasonable compromises in the future and the development of defenses for U.S. and U.S.S.R. territory against accidental missile launches or blackmail attempts and threats made by third countries."[47] As this statement suggests, a second reason for the apparently new Soviet sympathy for mutual defenses is the emerging threat of third country ballistic missiles. Soviet officials have expressed greater concern over this threat.[48] As the Chief of the Main Staff of the Soviet Strategic Rocket Forces, Col. Gen. Kochemasov recently observed, "Say nuclear missile weapons fall into the hands of irresponsible, incompetent

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45 The article is identified as being authored by Mikhail Aleksandrov, described as a Senior Expert in the Assessment and Planning Department of the Soviet Foreign Ministry, "Defense Domination Versus Nuclear Containment," *Soviet Military Review*, December 1989, pp. 50-51.

46 See, "Knovoi modeli strategicheskoi stabil'nosti [Toward A New Model of Strategic Stability]," *Mezhdunarodnaia zhizn'* [International Affairs], No. 2, 1989, pp. 107-111.

47 "The SDI Syndrome, Seven Years Since the United States Announced the 'Strategic Defense Initiative'," *Sovetskaya Rossiya*, March 23, 1990, p. 5. Quoted in FBIS-SOV-90-058, March 23, 1990, p. 1.

48 See for example, Thomas Friedman, "Spread of Missiles Is Seen As Soviet Worry in Mideast," *The New York Times*, March 24, 1989, p. A2.

people. What then? Any use of such weapons could provoke World War III. That is a terrible danger."[49] The Soviets clearly recognize the emerging danger posed by proliferation, and see mutual defenses as a possible response.

The significance of these new very positive Soviet statements about mutual defenses and "defensive deterrence" is unclear as yet. What is certain, however, is that there is some official support within the Soviet Union for mutual defenses and defensive deterrence. This may ultimately lead to a change in the current Soviet position and enable the U.S. to realize its DST goal of a cooperative defense transition.

Defensive deterrence, though a fundamental shift from current military strategy, would return to military strategy as it was understood prior to the mid-1960s, when the loss of U.S. strategic superiority forced Washington to rely exclusively on deterrence by threats of offensive retaliation. As was the case before the mid-1960s, a new doctrine could combine offensive and defensive capabilities to deter war and limit the damage caused to U.S. territory and citizens should deterrence fail.[50]

NEAR-TERM VERSUS LONG-TERM GOALS

SDI has near-term and long-term goals that may differ. This is because SDI will be deployed in phases over many years.

The initial goal of SDI deployment should be to strengthen deterrence based on the threat of nuclear retaliation. In the near term, SDI could help protect America's retaliatory forces and strategic command and control centers. In this case strategic offensive forces would retain their primary role of deterring war by surviving a Soviet attack and threatening the Soviets with offensive retaliation.

Over time, however, offensive reductions and increasingly capable strategic defenses can replace offensive forces as the primary means for maintaining deterrence, while protecting the U.S. should deter-

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49 FBIS-SOV-90-037, *op. cit.*, p. 89.

50 See the discussions in *Statement Of The Under Secretary Of Defense (Policy) Before The Senate Armed Services Committee, op. cit.*, pp. 2-4; and *Report of the Secretary of Defense to the Congress on the FY 1990/FY 1991 Budget and FY 1990-94 Defense Programs*, op. cit., p. 39.

rence fail. As such, the long-term strategic goal for SDI is "defensive deterrence." This is composed of: 1) a reduced retaliatory nuclear threat to the Soviets; 2) defenses that protect America's retaliatory arsenal and defeat Moscow's first-strike planning; and 3) defenses that protect the American homeland and U.S. allies should deterrence fail.

The idea of defensive deterrence, with its recognition of the desirability of limiting damage through defenses, is foreign to American thinking about strategic stability. The existing notion of stability based on mutual vulnerability maintains as its central tenets the inescapability of utter destruction in the nuclear age and the "stabilizing" effect of that condition. Many SDI critics are wedded to this approach to deterrence and thus complain that a strategy designed to limit damage and reduce vulnerability would undermine deterrence and substitute what they view as an impossible goal of surviving a nuclear attack.

This criticism ignores the increasingly obvious fact that defensive deterrence is the only way to defend America that does not forever rely on perfect rationality, control, and cooperation by Soviet leaders – motivated by fear of U.S. nuclear retaliation. If U.S. military strategy is designed, as it must be, to protect the U.S. without having to depend on such restraint by Soviet leaders and all other future third parties armed with ballistic missiles, then strategic defenses must be part of that military strategy.

The Bush Administration has endorsed both the near-term and long-term goals for SDI.[51] The best route now would be for the President to ask the Pentagon to plan for coordinating SDI deployments with programs to modernize offensive nuclear forces and to coordinate both plans with stated Administration goals for arms control. Otherwise, the integration of offense, defense, and arms control in a defensive transition ultimately could become confused.

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51 See for example President Bush's discussion of SDI in *Report To the Congress On the Analysis of Alternative Strategic Nuclear Force Postures For the United States Under a Potential START Treaty*, *op. cit*., pp. 5-6; Vice President Dan Quayle, "SDI and Its Enemies," *Policy Review*, Fall 1989; and, *Statement of The Under Secretary of Defense (Policy) Before the Senate Armed Service Committee*, *op.cit.*

CONCLUSION

American nuclear doctrine approaches a crossroads. What Washington does with SDI will determine whether the U.S. will continue to rely on the threat of offensive retaliation alone to deter attacks or whether it will place U.S. security on the safer ground of defensive deterrence.

The first road leads to continued American acceptance of vulnerability to a missile attack and may or may not include SDI deployment. The second road rejects vulnerability as the basis of deterrence and security and leads to the deployment of SDI.

For the next ten to fifteen years, SDI deployments can enhance the survivability of U.S. retaliatory forces by defending them. They complicate Soviet plans for attack and thus permit the retaliatory forces to remain the backbone of U.S. deterrence. There exist, of course, other passive ways to protect retaliatory forces; and these are seen as competitive with SDI. None of these, however, can match the unique capabilities that SDI would provide: e.g., protection against the emerging proliferation of ballistic missiles and weapons of mass destruction. And, over the long term, only strategic defenses can offer the opportunity to move toward a defensive deterrent, where strategic defenses assume the primary role for deterring attack through direct defense and also protect the country if deterrence fails.

The Bush Administration has the opportunity to redefine fundamental thinking about deterrence. It has the opportunity to resolve the glaring inconsistency in U.S. strategy: the incompatibility of existing military strategy with the overarching goal of national survival. If the President chooses the road of defensive deterrence and SDI, he will make American survival less dependent on the restraint of a Soviet Union that appears increasingly out of control, and in the future, the restraint of highly unpredictable third parties armed with ballistic missiles and weapons of mass destruction.

As President Bush prepares for a decision to deploy SDI, he should articulate these different visions of protecting the nation and make it clear why the road of defensive deterrence is safer for the nation and its allies. He should explain the distinction between the near-term and long-term goals for SDI – the former going to shore up the existing offensive strategy, the latter to replace that strategy with one based on defenses.

Public support for a defensive transition is high. That support, however, will remain latent unless the President explains how the transition can be made from depending on offensive nuclear forces and mutual vulnerability for security to greater reliance on strategic defenses for deterrence and ultimately protection. Setting the stage for making these changes in U.S. strategic policy and doctrine should now begin.

Chapter 3

The Strategic Defense Initiative Organization: The Need to Move Beyond Just Research and Development

Baker Spring

Opening its doors in early 1984, the Strategic Defense Initiative Organization (SDIO) is the lead Pentagon office for managing the SDI program. SDIO's central task is to answer the question posed by Ronald Reagan in his famous speech of March 1983: is it feasible to build and deploy an effective defense against ballistic missiles? SDIO's mandate has not yet extended beyond answering this question of feasibility. So long as the bureaucratic purpose of SDIO is to research, and not deploy, strategic defenses, the question of SDI's future will remain open. Likewise, SDIO will remain an organization in limbo, uncertain whether it will have life after its current mandate is fulfilled.

While Bush has not yet decided that defenses against ballistic missiles are feasible, it is becoming increasingly clear that they are and that such defenses can in fact be deployed. It is thus now appropriate for the Bush Administration, along with the leadership of SDIO, to prepare for the day *when SDIO will no longer be just a research organization conducting a feasibility study. Failing to undertake such preparations now will leave SDIO flat-footed when a deployment decision is made. Action on these preparations, however, will signal that the Bush Administration is serious about deploying defenses against ballistic missiles in the near future.*

The chapter recommends that prior to a deployment decision SDIO should:

1) set new organizational goals beyond a deployment decision;

2) change its organizational internal structure to give greater attention to building and deploying those systems;

3) carve out a niche for itself in the permanent Pentagon bureaucracy; and

4) take steps to protect programs such as Brilliant Pebbles and the Exoatmospheric Reentry vehicle Interceptor Subsystem (ERIS), which are top-priority programs in SDIO's near-term deployment plan. The result of these preparations will be an SDIO to which Bush can turn after he makes a deployment decision.

The Strategic Defense Initiative Organization (SDIO) opened its doors in January 1984. Ronald Reagan directed it to assume overall management responsibilities for the Strategic Defense Initiative (SDI). Its main task was to provide the President with the information that would enable him to make a decision about the technical feasibility of deploying strategic defenses. Under its founding director, Air Force Lt. General James A. Abrahamson, SDIO made considerable progress, conducting a wide variety of studies and experiments. For example, the "Homing Overlay Experiment," conducted by the U.S. Army's Ballistic Missile Defense Systems Command in 1984, demonstrated that a missile could fly directly into the path of an incoming reentry vehicle and destroy it from the force of the collision.

If a presidential decision to deploy strategic defenses is made by the end of George Bush's first term in 1992, then SDIO's primary goal will have been achieved. With a go-ahead for deployment, SDIO will have to make an important transition from being a basic research organization to one preparing for the development and procurement of weapons systems. Preparations for this fundamental change in the SDI program must begin now to ensure its long-term success. This important transition requires that SDIO:

♦ ♦ **Establish new goals.** These goals must go beyond the current mandate to determine the technical feasibility of missile defenses and extend to building and deploying anti-missile defenses. These new goals should include managing the procurement and deployment of a near-term missile defense system and to preparing for its actual operation according to a predetermined timetable.

♦ ♦ **Change its structure to prepare for deployment of missile defenses.** SDIO should begin planning for a transition that will allow it to begin providing a missile defense system to those in the military who will command and control it once deployment is underway. The likely candidate for this new responsibility is the U.S. Space Command based in Colorado Springs, Colorado, which is responsible for all U.S. military space systems. With a deployment decision SDIO must focus its energies more explicitly on applied engineering and managing the construction of missile defense components and less on basic scientific research.

♦ ♦ **Integrate its organization and functions fully into the permanent** Pentagon bureaucracy. SDIO is currently an independent bureaucratic organization in the Pentagon whose director reports directly to the Secretary of Defense. This independent status, while important in obtaining high-level support for the program, could make SDIO an easy mark for such foes within the Pentagon bureaucracy as some of the military services or other offices dedicated to research. Consolidating SDIO's position will require that it be given a permanent niche within the Pentagon by dropping its current independent status. This could be accomplished by creating a new Assistant Secretary of Defense to control strategic and space systems under the Under Secretary of Defense for Acquisition.

♦ ♦ **Retain SDI's research team.** This requires that SDIO do all it can to insulate the scientists, technicians, and engineers that are most important to making the near-term deployment of SDI a reality. When SDIO applies congressionally-mandated budget cuts, it should favor near-term programs over long-term research. Otherwise, the important technicians that will make the deployment of SDI a reality in the 1990s may be driven out of the SDI program altogether.

THE GOALS OF SDIO

SDIO's mandate was derived directly from the challenge posed to the nation by Reagan in his historic March 1983 speech launching SDI. SDIO was organized in spring 1984 with a specific task: to assist the President in making a decision as to whether deploying a defense against ballistic missiles is feasible. This mandate has not changed.

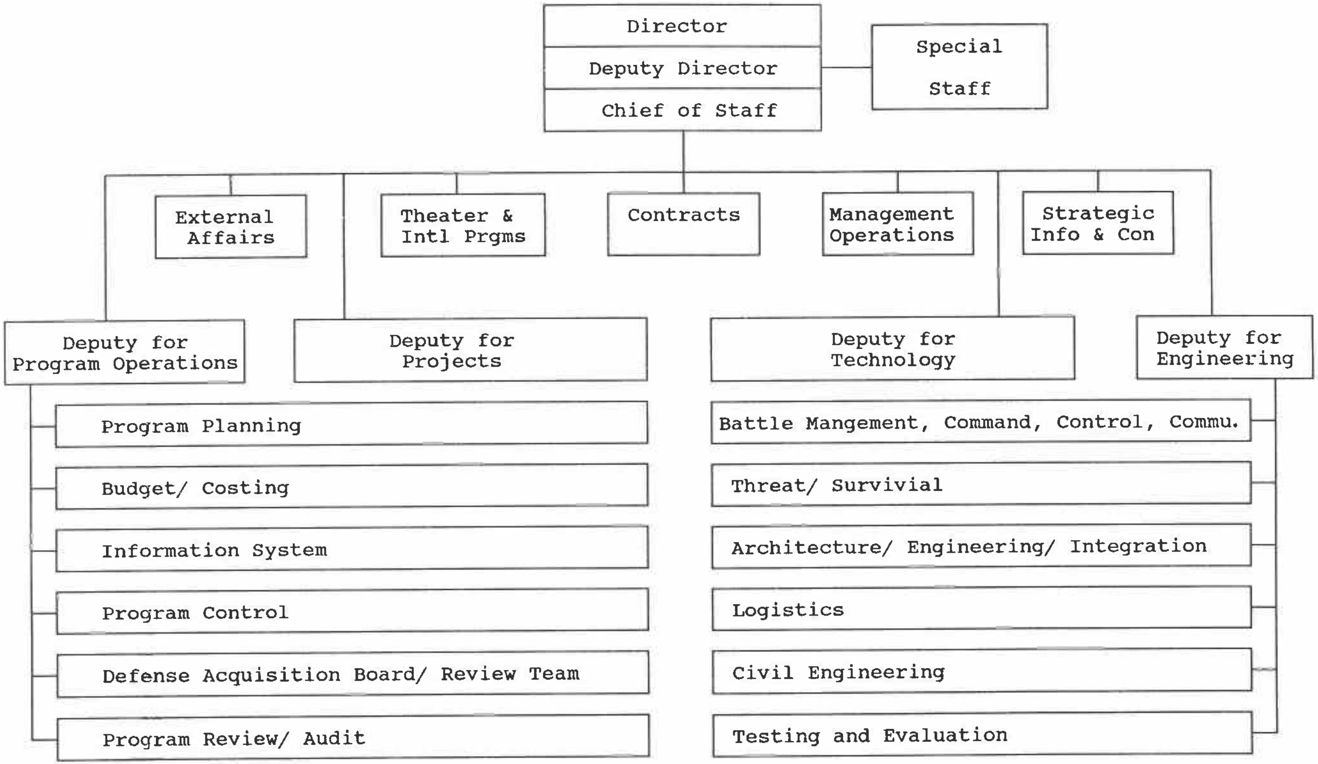
The progress made toward answering this question has been great: SDIO has supervised thousands of experiments on strategic defense technologies; it has furthered the design of an SDI system for near-term deployment; and it has conducted extensive studies on the weaknesses and vulnerabilities of defensive deployments. The progress brought about by this research means that it is all but certain that Bush will be able to make to a decision selecting a specific SDI system for deployment by 1992.

If a deployment decision is made, presumably before the end of 1992, SDIO will have to define new goals for itself. These will fall into two categories. One category of new goals will be for SDIO to determine what defensive systems are to be built and deployed and how long it will take. The second category of goals will be to determine how to proceed with research on more advanced technologies, such as laser weapons, to be included in the follow-on deployments of strategic defenses.

These new goals will have to be established in careful consultation with the other Pentagon bureaucracies that have an interest in the SDI program, such as the Office of the Secretary of Defense (OSD), the Joint Chiefs of Staff (JCS) and the four military services. These offices, along with SDIO, will play important roles in deploying missile defenses. OSD, for example, will supervise the acquisition of weapons and supporting systems, while the JCS will establish official military requirements for the system ultimately deployed. The military services, particularly the Army and the Air Force, will mainly be in charge, either individually or through unified commands, of actually operating the system.

Establishing new institutional goals for itself is a challenge that SDIO will have to confront well before the deployment decision. The specific recommendations for deployment will influence greatly the new goals to be established for SDIO. Therefore, SDIO must begin planning to establish these new institutional goals that will adopted

The Strategic Defense Initiative Organization



when a deployment decision is made. Progress toward formulating these plans also will indicate that the Bush Administration is moving toward a deployment decision.

It would be a mistake for SDIO's mission to end once a deployment decision is made. To create an entirely new organization would lose institutional momentum, continuity and the perspective of a decade of study and research. Much better would be a modification of SDIO's structure so that it could manage the SDI program beyond a deployment decision.

ORGANIZATIONAL STRUCTURE

SDIO is organized into three tiers.[1]

The first is the Executive Office, consisting of: 1) the Director, who is responsible for the overall management of the program; 2) the Deputy Director, who oversees the daily operations of the organization; 3) the Chief of Staff, who manages the personal staff of the Director; and 4) a Special Staff. The Special Staff includes: the Chief Scientist who supervises all scientific activity conducted by SDIO and advises the Director on scientific matters; the General Counsel; a Special Action Officer who trouble shoots and handles special tasks for the SDIO Director; and, the Small and Disadvantaged Business Office which handles relations with small and minority businesses.

The second SDIO tier consists of five directorates managing support programs: 1) External Affairs, which handles relations with the press, public, and Congress; 2) Theater and International Programs, which oversees relations with U.S. allies involved either directly or indirectly in the SDI program; 3) Contracts, which manages the myriad of SDIO contracts with defense industries; 4) Management Operations, which runs SDIO's internal affairs, including personnel matters; and, 5) Strategic Information and Concepts, which reviews SDI programs to determine their relationship to military strategy and doctrine.

The third SDIO tier consists of the four offices referred to as "deputates" responsible for pursuing the programmatic goals of SDIO:

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1 A description of the new organization plan for SDIO is found in a memorandum sent to SDIO personnel by SDIO Director Monahan on July 12, 1989. Monahan retired in July 1990. Ambassador Henry F. Cooper was nominated to succeed him at SDIO.

1) Program Operations, which is responsible for program planning, the budget, cost analyses, and auditing; 2) Projects, which is the managerial leader in designing, testing, and deploying SDI sensors and weapons and which serves as the chief liaison to the military command structures that ultimately will operate the missile defense system; 3) Technology, which is responsible for researching, developing, and testing all technologies supporting SDI; and 4) Engineering, which studies alternative weapons and engineering design concepts for missile defense systems, such as the "architecture" and command structure for the so-called "Phase I" or first phase of a deployed strategy defense system.

In addition to the three tiers, a Planning and Resources Board makes budget and management recommendations to the Director. Board members include the Deputy Director (Chairman), the Deputy for Program Operations, the Deputy for Technology, the Deputy for Projects, the Deputy for Engineering, the Chief of Staff, and the Chief Scientist.

SDIO AND OTHER PENTAGON OFFICES

While SDIO is the lead organization in managing the SDI program, it depends on other offices in the defense community outside its control to perform a number of functions critical to SDI's success. These other offices include the Office of the Secretary of Defense, the Joint Chiefs of Staff, and the military services.

The most important of these offices is OSD. The Director of SDIO reports directly to the Secretary of Defense in the overall conduct of its operations. As such, the Secretary of Defense is the "boss" of the SDIO Director. Thus, SDIO depends very much on OSD for guidance and approval.

OSD provides this in a number of ways. Example: The Office of the Undersecretary of Defense for Policy, which is part of OSD, formulates the strategy and doctrine for the SDI program. The purchasing authorities of OSD, led by the Defense Acquisition Board (DAB), decides which SDI programs will continue and which ones will not. It does this by recommending to the Secretary of Defense that he approve or disapprove the continuation of a program at each stage of the research, development, and procurement process. In this function, the DAB issued a "Milestone I" in July 1987. This meant that the specific technologies associated with SDI's Phase I near-term deployment plan were given official approval by the Secretary of Defense. The DAB will have to issue a "Milestone II" decision for SDIO to put the Phase I systems into full-scale development.

OSD also serves as the main political advocate for SDIO, representing its interests at the White House, before Congress and to the public. This requires that OSD, particularly the Secretary of Defense, be an advocate for the program. SDIO's Director and its External Affairs directorate, of course, must also assist the Secretary of Defense in defending the program.

The Joint Chiefs of Staff are responsible for defining specifically what is SDI's military role. The JCS has done this for the Phase I system by establishing minimum military goals that SDI must meet if it is to be approved for deployment. While these JCS requirements are classified, public accounts suggest that SDI, in its initial deployment, must be able to intercept and destroy 50 percent of Soviet SS-18 missile warheads and 30 percent of all missile warheads in a large-scale Soviet first strike.[2]

The military services have two important roles relative to the SDI program and SDIO. First, they participate in many of the research programs managed and funded by SDIO. For example, the U.S. Army Strategic Defense Command, located in Huntsville, Alabama, is working on many SDI projects related to researching ground-based sensors and weapons, including: 1) the Ground-Based Radar (GBR) program, which tracks missile reentry vehicles; 2) the Exoatmospheric Reentry vehicle Interceptor Subsystem (ERIS) program, which is an interceptor missile designed to destroy incoming enemy missile reentry vehicles outside the atmosphere by smashing into them; 3) the High Endoatmospheric Defense Interceptor (HEDI) program, which is designed to collide with incoming enemy missile reentry vehicles inside the atmosphere; and 4) and the Ground-Based Laser (GBL) program, which is designed to neutralize enemy missiles or their subsequent stages at different points in their flight trajectory.

The military services ultimately will command and control deployed missile defense systems. In this key sense, the military services are

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2 See Steven A. Hildreth, *The Strategic Defense Initiative: Issues for Phase I Deployment* (Washington, D.C.: Congressional Research Service, January 4, 1989), p. 4.

SDIO's ultimate customer. The military command likely to receive the SDI system is the U.S. Space Command, based in Colorado Springs, Colorado. The Space Command is the unified command, assigned elements of the Air Force, Army and Navy, responsible for U.S. military space systems. SDIO's relationship with the Space Command will become more important as a deployment decision nears and SDIO prepares to equip the Space Command with the actual weapons and supporting systems for the Phase I system.

PERSONNEL

As a high-technology endeavor, the SDI program depends enormously on the quality of its people. Its personnel considers some of the world's most advanced technological matters. SDIO has sought to recruit some of America's best scientists and engineers. Of SDI's 28,000 full-time project workforce, only 260 are employees of SDIO. Most of the others work for private defense companies that are under contract to SDIO.

SDI's extraordinary technological progress confirms that SDIO has done extremely well in attracting and retaining top scientists and engineers. A good example, is the Lawrence Livermore National Laboratory's scientist Lowell Wood, who pioneered the *Brilliant Pebbles* proposal. But SDIO's ability to attract and retain capable people should not be taken for granted, especially if Congress reduces SDI's budget and restricts progress on some SDI technologies. An important criterion for deciding how to allocate congressionally mandated budget cuts should be to insulate its most important scientific and technical personnel from interruptions in the program. This could be done by focusing resources on those projects most critical to the near-term deployment of SDI.

WORKING TOWARD A PERMANENT SDIO

As the Bush Administration moves toward an SDI deployment decision by the end of 1992, SDIO should devise a new role for itself. Behind SDIO will have been the task of determining the feasibility of missile defenses; ahead will be the challenge of building and deploying a strategic defense system.

SDIO has less than three years to plan for deployment. How it does so will signal how serious the Bush Administration is about deployment. If SDIO begins advanced planning for the management of the program, it will be clear that George Bush is determined to give America a defense against missiles.

To prepare for its new role, SDIO should:

1) Set goals for it to pursue after a deployment decision. Goal number one will be to oversee production of the Phase I missile defense system and to establish a timetable to ensure that deployment proceeds on schedule. This will require that SDIO focus more on applied engineering and production of weapons and supporting systems and less on research and development. Building strategic defenses will shift SDIO's attention to solving specific engineering problems rather than developing new technologies.

Goal number two will be to establish timetables for the development and deployment of new technologies and systems following the Phase I deployment. Because a "Phase II" deployment plan will rest on the foundation of the Phase I system, planning for Phase II should begin well before a Phase I deployment decision. By planning ahead, SDIO can assure that the Phase II deployment will be compatible with the Phase I deployment.

2) Reorganize SDIO to reflect its new goals after a deployment decision. A presidential decision to deploy SDI will require setting new goals for SDIO. To prepare for meeting these new goals, SDIO will have to change the way it is organized.

The new goals for SDIO, beyond a deployment decision, will be to build the system designated for the near-term deployment of SDI and to continue conducting research on the advanced technologies to be included in later deployments. Currently, all four of SDIO's program offices participate in the development of both near-term and long-term technologies. When a deployment decision is made, the existing structure no longer will be appropriate. SDIO should divide the existing program offices into two management teams, one concentrating exclusively on the building and deployment of the near-term defensive system and the other concentrating on continuing research to develop advanced technologies for later SDI deployments. While a deployment decision may not be made until 1992, this is something that SDIO can start planning for now.

First, SDIO should plan to form a management team out of the existing four program offices. This new management team should have as its sole responsibility the execution of a near-term deployment plan.

This management team would assume authority for getting the near-term system into production and deployed. It would also assume responsibility for performing maintenance on the Phase I system beyond deployment. Finally, this management team should be the designated liaison office for SDIO to the military command assigned to operate the system after it is deployed. This latter responsbility will ensure a close working relationship between SDIO and the "user" in the military as a near-term deployment plan goes forward.

Second, those functions in SDIO's program offices not included in a near-term SDI deployment plan, such as research on advanced technologies like laser weapons, should be consolidated into a second management team. This means that research on advanced systems would continue along current lines. Since SDIO's program offices are set up to conduct such research already, this second managment team would be organized in way that mirrors the existing structure for the program offices. Thus, the organization of this second management team would look like a smaller version of the existing organization of the program offices.

Finally, the organization of SDIO's Executive Office and the support offices need not be modified as result of the other changes. A future deployment decision will not result in dramatic changes in their responsibilities. This is because these office perform duties such as managing contracts and conducting public relations, which are not affected by changes in the research program.

Again, SDIO should plan a reorganization of this sort well in advance of a deployment decision in order to ease the transition. When Bush makes a decision to deploy SDI, SDIO must be prepared to respond to his orders.

3) Integrate SDIO fully into the Pentagon bureaucracy. From its first day, SDIO has enjoyed a special status as an independent and autonomous bureaucratic entity. During the Reagan Administration this special status served SDIO well. It always was recognized that SDI was a special priority of the President and it was given the resources and authority it needed to fulfill the President's mandate. But SDIO's independent bureaucratic position may soon become a serious handicap. Rather than remaining isolated, SDIO should become more part of the permanent Pentagon structure. This will lessen SDIO's vulnerability to its bureaucratic foes elsewhere in the Pentagon and better position to address the problems related to the Pentagon's elaborate system for acquiring new weapons. Such a move also would make it clear that missile defenses are a permanent fixture of American security efforts, like strategic bombers, land-based missiles, and nuclear submarines. The result: SDIO no longer will be considered a hybrid office conducting an elaborate feasibility study, subject to the political whims of the times, and dependent on the welcome but uncertain support of presidents.

SDIO should be strengthened and organized so that it reports to the Under Secretary of Defense for Acquisition (USD/A). This could be done in conjunction with a deployment decision in 1992. A new Assistant Secretary position should be created by fusing the existing Deputy Director for Strategic and Theater Nuclear Forces, now directly under the Director of Defense Research and Engineering in USA/D, with the office of the Principal Deputy Under Secretary of Defense for Acquisition. This new Assistant Secretary of Defense would serve as the Director of the SDI program, and the functions and organization of SDIO would be installed in the office of the new Assistant Secretary.[3]

Much of the preparation for this kind of reshuffling of SDIO's current functions must occur outside SDIO, specifically in OSD where changes in its organization would be necessary. Planners within SDIO should begin preparations for expanding and entrenching the management of SDI by defining the responsibilities of the new Assistant Secretary and deciding who would be appropriate to occupy important positions in this new office once a deployment decision is made. A decision to deploy SDI will confront SDIO with the many hurdles in DOD's purchasing system. Moving SDIO into the Office of the Under Secretary of Defense for Acquisition will help SDIO clear these hurdles.

4) Preserve the highly-skilled SDI team. SDIO has done an extraordinary job attracting and retaining high quality personnel for the program. To continue doing so will become more difficult if Congress cuts the SDI budget. SDIO thus must plan to protect the scientists and engineers most important to the future success of the progam by using

3 This proposal builds on an idea put advanced by former SDIO Director Abrahamson in his "end of tour" memorandum of February 9, 1989, to create a spokesman for the SDI program removed from SDIO's day-to-day operations.

funds for near-term programs, which reducing funds for such less important programs such as exotic beam weapons. Applying budget cuts across all SDI programs equally could result in driving the scientists and engineers who are most important to the success of the SDI program out of it altogether.

CONCLUSION

SDIO has made great progress since its creation in 1984. With a decision on deployment on the near horizon, SDIO must look to the future. It must assure that it will manage an SDI procurement and deployment system and that it will be well-armed to fight in the Pentagon's internal battles over resources. To do this, SDIO should: 1) establish new goals for itself that extend beyond a deployment decision; 2) reorganize in order to give special attention to deploying the Phase I system, whatever its architecture; 3) plan to move itself into permanent Pentagon bureaucracy, preferably under the Under Secretary of Defense for Acquisition; and, 4) protect the skilled personnel working on the program, particularly the scientists and engineers, to ensure that budget cuts and political controversaries do not drive them out of SDI. Planning for these steps now will ensure that SDIO continues in its leadership role in researching, developing, and ultimately deploying strategic defenses.

Planning by SDIO for its future role will signal the determination of the Bush Administration to go ahead with building strategic defenses. If SDIO establishes goals beyond a deployment decision, and reorganizes to prepare for it, this will mean that the decision to deploy SDI probably is nearing. How these future planning decisions unfold, will speak volumes about how serious the Bush Administration is in supporting SDI.

CHAPTER 4

The SDI Technology Program

James A. Abrahamson

The central focus of the SDI program has been to research and develop technologies for a defense against ballistic missiles. Great progress has been made in identifying and testing those technologies that eventually will be deployed in a near-term deployed strategic defense system.

The SDI program was to develop a design or "architecture" for a deployable strategic defense system. SDI research focused on creating a multilayer design consisting of space-based and ground-based layers of weapons, sensors, and command, control and communications systems. A multilayer system would be highly effective because it would give the defense more opportunities to attack incoming enemy missiles. The research that followed from these architectural studies fell into seven categories: 1) practical demonstrations of relatively advanced technologies, such as ground-based interceptors; 2) improving and upgrading existing technologies, such as satellites for finding and tracking enemy missiles; 3) demonstrating the feasibility of individual components of SDI systems, such as low-cost guidance systems for missile interceptors; 4) advanced research on more exotic technologies, such as laser weapons; 5) compiling technical data for SDI sensors, such as information on ballistic missile exhaust plumes so enemy missiles can be identified and thus destroyed in space; 6) studies of communications, command and *control systems, which are needed to run the overall system; and 7) space-launch studies, which are required to ensure that the U.S. will have enough space launch vehicles to put SDI systems in space.*

The author discusses the progress made in specific SDI systems. Such progress includes a series of successful "hover tests" of space-based interceptor test vehicles last year. These tests took place in a hanger at Edwards Air Force Base in California where they demonstrated the ability of heat-seeking and visual sensors of a mock-up interceptor vehicle to detect and "lock on" to a rocket exhaust plume. Also, an exciting new proposal for deploying thousands of individual interceptor rockets in low-earth orbit, referred to as "Brilliant Pebbles," has proved to be technically promising. A number of expert panels have ruled that "Brilliant Pebbles" is so promising that it warrants further research. One such panel is the Jason Study Group, a Pentagon-sponsored committee of scientists and academics which completed its favorable report in September 1989. Another example of progress is the Alpha chemical laser, which was successfully fired for the first time on April 10, 1989, at a facility in San Juan Capristrano, California. Tests showed that this laser could be used in a future SDI deployment of space-based laser weapons.

The SDI research and development program will allow George Bush to choose from a range of deployment options for SDI. The least expensive and robust of these options is what the author calls a "simplified, Brilliant Pebbles, architecture." The plan envisions the deployment of space-based "Brilliant Pebbles" interceptors in low-earth orbit, some 400 miles from the earth, along with both space-based and ground-based command and control systems for about $25 billion. The most expensive and effective of Bush's options is what the author refers to as the "initial layered defense architecture." This would add ground-based interceptors and additional additional sensor systems to the simplified "Brilliant Pebbles" deployments and could be built for about $55 billion. The sensors would discriminate between real warheads and decoys. The author believes that no technological impediment exists to selecting a specific architecture by 1992. A near-term SDI system thus could be ready for deployment by the middle of the 1990s.

When Ronald Reagan unveiled the Strategic Defense Initiative on March 23, 1983, he offered the nation and the world three vital challenges: 1) to reexamine the theory of strategic deterrence, based as it had been for three decades on the threat of offensive nuclear retaliation; 2) to accelerate research on technology to develop a cost-effective defense against ballistic missiles; and, 3) to develop a new approach to arms control that would be more effective than past negotiations on reducing ballistic missiles had been.

The Department of Defense, after Reagan's speech, commissioned two major studies of strategic defenses. The first, the so-called "strategic study," was delivered in October 1983 and was headed by Fred Hoffman, the director of the private Marina del Rey, California-based research firm Pan Heuristics. It examined how strategic defense could contribute to deterrence. The second study, also completed in October 1983, was chaired by the former Administrator of the National Aeronautics and Space Administration (NASA) James Fletcher. It was an in-depth review of the technologies that could lead to an effective defense against ballistic missiles.

Both studies concluded that a major research program into strategic defense feasibility was warranted. The result of these efforts: the SDI research program began in earnest in spring 1984. SDI was rare among military research projects because it consciously aimed to create and develop technology to achieve a specific objective of national strategy; by contrast, the Pentagon typically sought to exploit technology as it develops, irrespective of military strategy and doctrine.

THE SDI ARCHITECTURE

Much has been written about the role of deterrence strategies based on strategic defenses, or "defensive deterrence," in preventing nuclear war. The central idea in the strategy of defensive deterrence is that defenses against ballistic missiles could introduce so much uncertainty into nuclear strike effectiveness that a belligerent would be deterred from making the attack in the first place. The key to this uncertainty is many layers of defenses, on the ground and in space; these layers multiply a strategic defense system's opportunities to attack "enemy" missiles.

With such a layered defense "architecture" the attacker could never know which of his missiles would be destroyed in the first or succeeding layers of the defense. When facing many lines of defense, stacked upon each other and each capable of stopping warheads that may have penetrated the front line, the attacker quickly concludes that his probability of success has fallen unacceptably low. This approach is analogous to the traditional military doctrine of "defense in depth" for conventional warfare, which establishes three layers of defense to counter an attack. These three layers are, in military terminology, the covering force, an initial line of defense, and the main line of resistance.

The covering force determines the characteristics of the pending attack and is the defensive force that initially engages the attacker.

The initial line of defense represents the deployment of forces against the chosen path of attack by the aggressor.

The main line of resistance is the attempt to destroy the attacking forces of the offense.

All of these defensive techniques will be used by SDI, but the layers of the SDI architecture are more straightforward than for conventional warfare because, unlike attacking infantry or tanks, the flight paths of the missiles to be countered are highly predictable. In conventional warfare an enemy has more options to choose from in devising a plan of attack.[1]

Full development of an offensive and defensive deterrent strategy, however, needs additional work. A more detailed military deterrence policy governing strategic defenses still needs to developed. Nonetheless, the concept of a layered defense provides a firm foundation on which to build a full-fledged defensive deterrence. Example: the architecture of layered defense is flexible and can be adapted to handle such unforeseen developments in an enemy's force posture as the size and mode of deployment of offensive ballistic missile forces, including ballistic missiles that are based at sea in submarines, or on land in fixed launchers, or roving the countryside on mobile launchers.

The layered architecture also provides the flexibility for addressing advances in missile technologies and of countermeasures to defeat the

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1 For a more detailed discussions of "defense in depth" in terms of strategic offenses and defenses, see Frances X. Kane, Maj. General Stewart C. Meyer, and James R. Howe, "Strategic Defenses and Deterrence: A Strategic-Operational Assessment," *Strategic Review*, Winter 1989, pp. 41-54.

defense. Example: if missile advances make destroying enemy offensive missiles in their "boost phase" more difficult, the layered architecture still allows for effective defenses in the later stages of a missile's flight. What is of increasing importance, moreover, the layered architecture is best suited for dealing with the emergence of ballistic missile threats from Third World countries. This requirement for flexibility was evident at the outset of the SDI program. That is why the goal all along has been to create the technologies that would work best within the layered defense architecture.

THE SDI RESEARCH CONCEPT

The Strategic Defense Initiative Organization (SDIO) was created in spring 1984 to provide a single management agency for the nation's most vigorous and diverse technology research effort in existence at the time. Housed in the Pentagon and reporting directly to the Secretary of Defense, SDIO was to be the focal point of research, while encouraging full utilization of the technical talent, management expertise, and experience of the military services, and the special expertise possessed by such other government agencies as the Department of Energy and NASA.

This approach permitted SDI research to proceed as quickly, affordably, and effectively as possible. Some research was conducted "in-house" in such federal facilities as the Lawrence Livermore National Laboratory in Livermore, California. The large majority of the effort was conducted by private defense firms under contract to SDIO. Each project reflected the technical goals set by SDIO and was carried out with SDIO supervision, while responsibility for the day-to-day execution of the contract was delegated to such management agencies as the Army Strategic Defense Command and the Defense Advanced Research Projects Agency (DARPA).

The SDI layered architecture became the principal tool for integrating and evaluating individual programs. Each layer, for example, requires a surveillance function to "see" ballistic missiles or warheads in flight, a command and control function to target the missiles or warheads, and a weapons function to destroy the targeted missiles or warheads.

Some programs already were underway in 1984 to accomplish specific parts of these functions. Examples: existing research on ballistic missile defense, research into laser weapons, and the development of more advanced early warning systems. These existing research and development programs were conducted by a variety of Pentagon agencies, including the Air Force, the Army Strategic Defense Command and DARPA. Other programs in 1984 appeared to be technically feasible, but would have been too costly. Examples: the Space-Based Interceptor (SBI), which is designed to destroy enemy missiles in flight by crashing into them, and the Space Surveillance and Tracking System (SSTS), which is a surveillance satellite. These systems were redesigned in 1988 to reduce costs, in the case of the SBI program from $52 billion to $18 billion. Finally, there were new concepts, such as very large, high-energy lasers and neutral or charged particle beams, that required very basic research to determine whether they were scientifically and practically feasible.

The question for SDIO in 1984, therefore, was to evaluate these systems and technologies and to define new ones to fit into the layered SDI architecture. To achieve this, SDI research was be divided into the following categories:

Architectural Studies

One of the most important categories of SDI research was architectural studies that examined how well specific technologies and systems fit into the multi-layered architecture of strategic defense. The most prominent example is the Space-Based Interceptor. SBI was examined in 1986 by a variety of contractors working under Air Force supervision. A key question was how many interceptors in various orbits would be needed for the "boost" or first layer of the defense to destroy a significant share of attacking Soviet missiles. Similar studies examined how many satellites with large lasers could accomplish the same task. These architectural studies were augmented by careful examinations of countermeasures that the Soviets could employ against a U.S. defense. These studies are being continually improved and updated.

Practical Demonstrations

Certain systems, such as the Ground-Based Interceptor (GBI), that are to intercept enemy missile warheads just before or as they reenter the atmosphere required practical demonstrations that could be attempted within the bounds set by the 1972 Anti-Ballistic Missile (ABM) Treaty. This treaty allows tests of fixed, land-based missiles from designated test sites. One such test included the Homing Overlay Experiment (HOE), in which a missile intercepted and destroyed a mock warhead: The interceptor was launched on June 10, 1984, from the Kwajalein test range in the Pacific.

Improvement and Upgrade Studies

Satellite warning and surveillance systems, which were in operation at the outset of the SDI program, needed upgrading if they were to be part of an SDI system. Included in these was an early warning system to detect and track missile launches. Research on improving these systems was undertaken within the limits of the ABM Treaty, which prohibits the testing or deployment of ABM sensors in space. One result of ground-based radar research has been improved data processing through digital technology.

Component Studies

Several promising strategic defense systems seemed technically feasible, but needed to be improved to be practical or affordable. This directed a major portion of SDI research to developing such components as improved and low-cost infrared (heat-sensing) sensors for detecting missile exhaust plumes, miniature and low-cost inertial measurement units for missile guidance systems, and miniature computers that can operate in space and withstand large doses of radiation caused by nuclear explosions. These miniature computers are necessary to control the full strategic defense system. A main goal of this of research was to dramatically lower costs of these items so that SDI deployment could be affordable. Complicated military programs, moreover, often are delayed greatly or exceed cost estimates because key components were not sufficiently developed or producible. Preliminary research on components was designed to prevent this.

Research on Exotic Technologies

Some exotic weapons that could destroy ballistic missiles or warheads in flight, such as particle beams or lasers, had never been demonstrated at the size and power levels required. Exotic weapons require making advances in science in order to be built. An important research priority for SDI therefore was to develop the scientific means of testing these advanced concepts in ground-based laboratories. Example: the first "firing" of the Alpha chemical laser at San Juan Capistrano, California on April 7, 1989, demonstrating that the new laser would produce a beam with the proper characteristics.

Phenomenological Studies

Certain critical phenomena associated with ballistic missiles had never been precisely observed and catalogued. Example: the appearance, size, and shape of ballistic missile rocket motor plumes in space. Such data were needed if enemy missiles were to be tracked in space. Not even the infrared or background "heat" of space had been fully observed. Such observations of space phenomena are necessary to ensure that SDI sensors over great distances can distinguish between infrared or heat emissions from rockets and those from distant stars. Simulations, laboratory measurements, and space experiments were devised to gather these data. One experiment was the launching of the Delta Star observation satellite on March 24, 1989, which collected the data sought by U.S. SDI scientists and engineers.

Command and Control Studies

A future SDI system must be completely reliable and subject to firm human control, to prevent the strategic defense system from being activated by accident or error. Ground-based simulations of the SDI command and control and communications systems were established to research and evaluate the problems associated with human control of the defense system. This research is conducted at SDI's so-called National Test Facility, which includes experimental command and control facilities in Colorado Springs, Colorado, and a smaller facility at the Army Strategic Defense Command in Huntsville, Alabama.

Space-launch Studies

The U.S. lacks enough booster rockets to orbit a space-based defense system. To develop a low-cost launch vehicle, the Defense Department organized a joint program with NASA and the Air Force. The result is the Advanced Launch System (ALS), a program exploring designs for a heavy-lift booster rocket capable of lifting into orbit a payload in excess of 100,000 lbs.

THE PROGRESS OF SDI RESEARCH

Since its inception in 1984, the SDI research program has yielded very significant technical progress.[2] The research is going forward in

2 The progress identified in this section represents my personal knowledge of the status of the program as of early 1989, supplemented by press reports of major SDI research events. More current information is available from the Strategic Defense Initiative Organization.

many hundreds of separate projects, too many to review all individually. The following are the most significant.

Space-based Interceptors

The research on space-based kinetic energy interceptors, which would destroy enemy missiles or warheads in space by crashing into them, has led to potentially startling cost reductions. Efforts to develop miniature computers, low-cost detectors for the infrared "eyes" of the system, inertial measurement units for guidance systems, miniature rocket motors for steering, and a simplified lens for tracking stars for navigational purposes all raise the possibility of interceptor missiles being mass produced for low costs inconceivable only a few years ago.

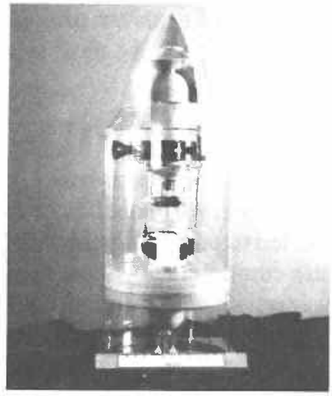
Guidance and steering test devices, which appear similar to a rocket and are about six feet long, have been flown in hovering flights, demonstrating that they can be controlled in flight and that, with further experiments, they can "lock on" to a simulated target and track and destroy enemy missiles. One such flight occurred in April 1989, in a special test facility at Edwards Air Force Base in California.

Related research is occurring under the Lightweight Exoatmospheric Project (LEAP) program, which is integrating advanced technologies, including propulsion, signal processing, seeker, and advanced avionic technologies into a single interceptor designed to intercept and destroy enemy missiles and warheads in space. While SDIO has downgraded the Space-Based Interceptor program in favor of *Brilliant Pebbles*, the SBI technologies could make important contributions to the *Brilliant Pebbles* system.[3]

The most promising space-based interceptor concept is *Brilliant Pebbles*. Its name reflects its key advantage: it is "brilliant" because of high-powered, on-board computers and it is a "pebble" because of its small size. A further advantage is *Brilliant Pebbles*' simplicity and expected low cost. *Brilliant Pebbles* offers the most survivable and

3 While there are a number of projects under the SDI program that are conducting research on space-based interceptors, one of these projects is formally known as the Space-Based Interceptor (SBI) program. The lead contractors working on the SBI program are Rockwell International Corporation and Martin-Marietta Corporation.

flexible basing concept yet. The reason: the interceptor missiles float free in space without highly expensive support satellites for commanding and controlling the system. With proper funding, this concept should move forward dramatically and be ready for testing in space by 1992.



Artist's conception of a "Brilliant Pebbles" interceptor.
Source: Strategic Defense Initiative Organization.

Brilliant Pebbles' tests can be conducted within the limits of the so-called "narrow" interpretation of the ABM Treaty, which limits certain types of anti-missile testing in space.This impressive array of space-based interceptor technology has been supported by laboratory and flight tests, including test flights on board the ARGUS-135 aircraft, to observe rocket plumes and objects in space Countermeasure and survivability studies conducted in 1987 and 1988 confirmed that SDI components could survive attack and remain effective. In fact, SDIO announced on February 9, 1990, that it was incorporating *Brilliant Pebbles* into the near-term deployment plans for SDI.

Command, Control and Communications

In addition to demonstrating the interceptors, the most complex issue still requiring substantial research is designing the communications and command and control system to support *Brilliant Pebbles* or other space-based interceptor systems. Much remains to be done in this area, including demonstrating the capabilities of the communications systems themselves. Simulations are underway which, if continued successfully would show that space-based interceptors reliably and affordably can provide the first layer of a defense against a major Soviet first strike. As important, the interceptors could counter smaller attacks of missiles fired by belligerent or terrorist Third World nations from anywhere in the world. One such success was the experiment by the Army Strategic Defense Command in Huntsville, Alabama. In it a computer-simulated war game demonstrated that an SDI command and control system could successfully track 16,000 attacking objects.

Surveillance and Warning Systems

Surveillance and warning systems for a future SDI deployment would be based in space and supplemented by ground-based sensors. These systems would detect and track enemy missiles in flight. Space systems operating in a variety of orbits are a vital part of U.S. offensive deterrent capability because they provide early warning of an enemy attack. Studies of early-warning requirements of a SDI system show that future satellites will be much more complex and will have to made more survivable against such enemy countermeasures as anti-satellite weapons (ASATs) and electronic jamming.

The Boost Surveillance and Tracking System (BSTS) is one such early-warning satellite sensor. It would be placed in geosynchronous orbit. This means that it would rotate with the earth and remain stationary relative to a fixed point on its surface. Research on BSTS has been very promising and is developing the components for the system, including data processors, focal planes, optics and cooling devices. Research emphasis has been on reducing production costs, while maintaining the required quality of performance. With adequate funding, the BSTS program will be ready for deployment to support an SDI system in the second half of the 1990s.

In contrast to the BSTS, the Space Surveillance and Tracking System (SSTS) has not progressed rapidly. SSTS is a surveillance satellite to be placed in low-earth orbit, 200 to 500 miles above the surface of the earth, for the purpose of discriminating between warheads and decoys as they fly through space. SSTS relies on huge satellites. This raises the cost of development and production. Because of these and other problems, the SSTS project was slowed and directed to find simpler and less costly satellites. This may have proved fortuitous, because alternate architectures, such the *Brilliant Pebbles* concept, may well reduce the need for SSTS. The reason: each *Brilliant Pebble* has its own on-board sensing and tracking system.

All sensors being developed by SDIO will benefit from gathering data on rocket plumes and background radiation from space. Ground-based sensors could be used to supplement the rocket emissions data gathered by the SDI Delta series of space experiments and less sophisticated probes. Better understanding the exact nature of the observable emissions given off by rockets (sometimes referred to as "optical signatures") in flight increases the ability of SDIO planners to test an SDI surveillance system. Funding permitting, the ground-based system will be augmented by the Airborne Optical Adjunct (AOA), which is the world's most advanced infrared or heat seeking sensor and is mounted on aircraft for specialized warhead tracking tests. Joined with a ground-based sensor, AOA could improve the capability of an SDI system to track and thus destroy enemy warheads in space.

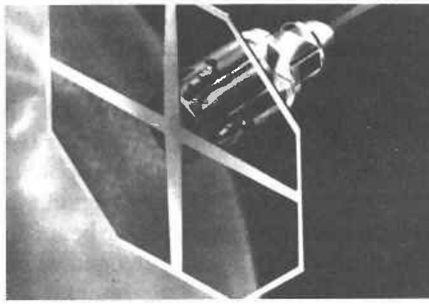
Behind this progress and expanding base of knowledge in the use of optical sensors, is the development of "state-of-the-art" ground-based radars. Research has yielded such advanced radar concepts as new solid state phased arrays, which are radars capable of switching rapidly from one target to another, and a greater capability for discriminating between real warheads and decoys. The technical feasibility of these radars could be tested by 1992, within the limits of the ABM Treaty, at Kwajalein Missile Range in the Pacific. These tests will demonstrate whether the integrated radar system will work.

Before the 1992 tests begin, however, more effective techniques must be found for providing enemy missile flight data to human decision-makers and to interceptor weapons. Advanced simulation tools generated by computer to prove that this can be accomplished are under development for the Army Strategic Defense Command at Huntsville, Alabama.

Ground-based Interceptors

Research on ground-based kinetic energy interceptors has made considerable progress. An SDI research interceptor fired in 1984 from a launching pad at the Kwajalein Missile Range intercepted a simulated missile warhead in space. Since then, another ground-based interceptor, the Flexible Lightweight Agile Experiment (FLAGE) missile, has intercepted simulated warheads and short-range missiles several times. In the next several weeks the longer-range Exoatmospheric Reentry vehicle Interceptor Subsystem (ERIS) missile will undergo its initial flight test. The shorter-range High Endoatmospheric Defense

Interceptor (HEDI) missile was tested for the first time on January 26, 1990, although not against a target missile.



Artist's conception of an Exoatmospheric Re-entry Interceptor Subsystem.
Source: Strategic Defense Initiative Organization.

While substantial work on ground-based interceptors remains, the implications of these activities are clear: 1) that ground-based weapons can be added to a multi-layer deployment plan that will be affordable and available when needed; and, 2) that interceptors against missiles with ranges less than 300 miles appear feasible and are a vital priority for America and its allies. The reason: Many U.S. allies are already well within the range of Soviet and Third World short-range missiles. And such U.S. allies as Britain, France, Germany, Italy, and Japan, have joined the SDI research program, even though the vast majority of the work is being accomplished within the U.S.

Exotic Weapons

Systems such as lasers and particle beams, known as exotic weapons, attracted much of the public's attention in the early phases of SDI research. Substantial advances have been made in these areas, but this research will take a long time to complete because of the scientific complexity of laser research. Cuts in the SDI budget forced planners to narrow research to a few promising technologies, such as space-based chemical lasers, ground-based free-electron lasers, and neutral particle beams.

Significant progress, nevertheless, has been achieved.

Example: A large, "designed for space" chemical laser was "fired" successfully in a space chamber on April 7, 1989, at San Juan Capistrano, California.

Example: Preparations also are underway for a major test of the free electron laser. Two contractor teams, one led by Boeing Aerospace and

Electronics and Los Alamos Laboratories and the other by TRW Corporation and Lawrence Livermore Laboratory, are competing for the right to develop a free electron laser prototype to be installed at White Sands, New Mexico. It is tentatively scheduled for "first firing" in the mid-1990s. Once completed, the system as whole will undergo tests led by the Los Alamos National Laboratory.

Example: Scientists are designing facilities, components, and even full systems for neutral particle beam devices, though on a smaller scale than envisioned for a full-fledged weapon system.

Example: A small, experimental neutral particle beam device was flown into space on July 13, 1989, to confirm how the beam propagates through space.

Many tests have been performed on these weapons to determine how vulnerable they are to enemy attack and how lethal they are. Tests also have been completed to help scientists design the components of a laser weapon, the technologies for aiming lasers, the techniques for controlling laser beams, and less expensive mirrors for reflecting lasers from the ground against a missile in space. These are important because they will determine the overall effectiveness of the weapons. In 1985, for example, a test of the Mid-Infrared Advanced Chemical Laser (MIRACL) demonstrated that a laser was capable of destroying a rocket booster. That year too, the Atmospheric Compensation Experiment (ACE) demonstrated that atmospheric distortions could be corrected for ground-based lasers directed against a rocket in flight. Light-weight and less expensive mirrors to control laser beams have been developed for the Zenith Star space-based laser program. The science and engineering needed for these exotic concepts is proceeding well, although the final feasibility and affordability for any one of these technologies has yet to be demonstrated.

Infrastructure

SDI will require support programs, or so-called "infrastructure projects," for deployment and operation. The two most important projects are a low cost space-launch system and a space-based nuclear power plant. Both projects are proceeding slowly, suffering from budget cuts and conceptual difficulties. Smaller but vitally important infrastructure projects, however, have progressed dramatically. These include efforts to develop improved batteries for powering satellites and their components; projects to develop advanced materials, like lightweight mirrors and composites; and research on special survivability techniques, such as the "Starmate" experiments conducted over Hawaii on September 4 and 11, 1989, which explored methods for space-based SDI components to evade attack.

RESEARCH IMPLICATIONS

The progress of SDI research by now has demonstrated clearly the feasibility for several first-step deployment options, which include both space-based and ground-based systems. While additional research remains to be done on all SDI components, this research should proceed so that George Bush can make a decision about an SDI architecture before the end of 1992.[4]

Although the exact SDI architecture that Bush chooses will depend ultimately on how the research proceeds between now and 1992, it is appropriate, even now, to contemplate a range of options. This range runs from the most modest to the most robust SDI architecture. The two primary options for SDI architectures together provide appropriate parameters for making the most crucial of decisions facing the SDI program. Besides these two, there are a wide variety of SDI architectures.

Of the two primary options, the less ambitious is the simplified *Brilliant Pebbles* concept. The more ambitious is a layered strategic defense with space-based and ground-based interceptors. In either case, the concepts for these architectures can soon be sufficiently defined so that the Department of Defense development programs can proceed with full-scale development and eventual deployment at reasonable risk and cost.

4 For further discussion of possible future SDI architectures, see the author's "end of tour" memorandum of February 9, 1989.

Chapter 4

The "Simplified" Brilliant Pebbles Architecture

Brilliant Pebbles is an architecture primarily consisting of several thousand individual space-based interceptors, floating separately in several different, relatively low orbits. Each interceptor is enveloped in its own "cocoon" to help protect against the hostile environment of space. Each interceptor also carries its own optical sensor or camera to allow it to "see" and track the bright rocket plume of an adversary's ballistic missile as soon as it appears above the clouds after liftoff. Each interceptor, moreover, has sufficient computer capability to process targeting data on its own, without the assistance of a centralized command and control system, thus enabling the interceptor to guide itself to its target. And the interceptors have back up communication channels to protect the entire strategic defense system if one channel is knocked out in battle.

The key features of the simplified *Brilliant Pebbles* concept are:

1) large numbers of low-cost interceptors;

2) the capability of interceptors to operate autonomously so that expensive support satellites are not required;

3) individual interceptor clusters of sufficiently low weight and small size that they can be launched on small, low-cost booster rockets that are currently available;

4) long-range interceptor optics that can "see" boosters thousands of miles away;

5) highly capable computers that make internal targeting decisions and calculations; and,

6) communications systems with two channels so that commanders can control the interceptors at all times.

The costs of *Brilliant Pebbles* research, development, and deployment should be well within $10 billion. To this simplified *Brilliant Pebbles* architecture, other systems could be added. A separate surveillance satellite system for early warning of an attack and redundant telecommunications with sufficient backup channels would cost no more than $11 billion. A command and control ground complex with its support structure and the necessary engineering of associated backup systems would cost no more than $4 billion. The total cost of this entire architecture, which also would replace today's attack warning system and updates today's command and control capability should not cost more than $25 billion. By contrast, the former cost estimate for the near-term deployment plan of a multi-layered defenses (sometimes referred to as Phase I), which was $69 billion.

The *Brilliant Pebbles* architecture should be tested by 1992 and, if diligently pursued, could be ready for initial deployment by 1995. There are very important strategic implications of this simplified *Brilliant Pebbles* architecture. Among them:

♦ ♦ **The U.S. can deploy an affordable SDI system, for less cost and as rapidly as it can new, survivable, offensive ballistic missiles.**

♦ ♦ **This SDI system will fulfill the requirements of the Joint Chiefs of Staff (JCS) for near-term deployment of SDI.** The JCS in 1987 set the military requirements for SDI deployment.

♦ ♦ **SDI will provide global protection against a missile attack.** The architecture outlined here would go beyond the military requirements for the first (or "Phase I") of a strategic defense system. It would extend a high level of protection from threats all over the globe against both intercontinental ballistic missiles and submarine launched ballistic missiles. Not only the U.S., but allies in Europe, Asia, and the Middle East would benefit.

♦ ♦ **The U.S. will obtain extended protection.** This *Brilliant Pebbles* architecture is not limited to protection against a "first-wave" attack. Enough space-based interceptors will be in orbit to defend against a number of strikes. This extended defensive deterrence amounts to an "area protection concept" which destroys missiles heading for any targets, no matter where they may be in the U.S. Such a defense should provide a more stable and cost-effective deterrent than would adding new survivability features to a small number of offensive missile systems, such as putting offensive missiles on mobile vehicles as is being proposed for the MX and *Midgetman* missiles. *Brilliant Pebbles* will be able to defend the full range of potential targets in the U.S., including bomber bases, missiles, submarine bases and command and control facilities, not just a portion of these targets.

The Initial Layered Defense Architecture.

The layered defense architecture is a more ambitious option than the simplified *Brilliant Pebbles* architecture. It would add to *Brilliant Pebbles*:

1) several thousand ERIS-type, ground-based interceptors that intercept enemy reentry vehicles outside the atmosphere;

2) some 1,000 HEDI missiles based near such key U.S. targets as missile silos, bomber bases, and command and control facilities to intercept enemy warheads inside the atmosphere; and

3) a mix of SSTS satellites, ground-based optical sensors capable of being launched into suborbital flight to "see" incoming enemy warheads, and ground-based radars to provide a more capable tracking system, primarily to provide the entire system with ability to discriminate between missile warheads and decoys during the mid-course phase of a missile's flight.

Depending on the specific military requirement, such as how many missiles and warheads must be intercepted, these systems could be purchased for an additional $25 billion to $30 billion over the $25 billion for the "simplified" *Brilliant Pebbles* architecture, covering the costs of completed research, development, procurement, and deployment. The total cost for this more ambitious, space and ground-based SDI systems would be no more than $55 billion. The strategic implications of this approach are essentially the same as those provided by the "simplified" *Brilliant Pebbles* architecture, only more robust, capable – and expensive. In fact, SDIO has taken a major step toward adopting this approach by announcing on February 9, 1990, that it was including *Brilliant Pebbles* in near-term SDI deployment plans.

The U.S. could consider deploying a "limited protection system" employing only ground-based weapons as step toward the deployment of this multilayer defense system. But deploying space-based weapons, including *Brilliant Pebbles*, should be the highest priority for SDI. If funds are limited, the space-based system should be the first priority. The reason: It will strengthen the U.S. capability to deter war at less cost than adding to the U.S. missile force such new survivability features as making missiles mobile. Space-based defense, furthermore, will provide what experts call "extended defensive deterrence" to U.S. allies as well, because the interceptors will be orbiting the entire earth and therefore will be capable of intercepting missiles aimed anywhere in the globe.

Finally, space-based systems will strengthen the U.S. hand at the arms control bargaining table because the Soviets are most concerned about space-based systems. The heightened Soviet concerns about space-based systems may induce them to make concessions in other areas of arms control to limit these kinds of systems.

CONCLUSION

The world is changing dramatically. The Soviet Union is becoming less stable, and missile technology is proliferating around the globe.

The meaning of this is unavoidable. Rather than becoming less relevant, a defense against ballistic missiles is becoming more compelling just as it is becoming more feasible and less costly.

The doctrine of defensive deterrence seeks to avoid threatening the Soviet Union with nuclear annihilation by relying on non-threatening, non-nuclear defenses for U.S. security. SDI also will provide the U.S. a defense against Third World missile arsenals, which are now expanding to such countries as India, Iran, Iraq, and Libya. The American people and America's allies will need and deserve protection as more Third World nations develop ballistic missiles, and chemical and nuclear warheads for those missiles.

SDI research has progressed to the point that George Bush, by the end of 1992, should be able to make an informed judgment about whether to deploy SDI. SDI research allows Bush to choose from a variety of systems for the initial stages of SDI deployment that are workable and affordable. SDI research also allows Bush to choose systems for follow-on deployments.

That Bush will have this valuable flexibility is a tribute to the research concept adopted for SDI. It broke with past Pentagon research and development efforts by pursuing technologies to meet set strategic goals, in contrast to taking advantage of developing technologies as they became available. The result has been a wide-ranging and systematic research effort that investigated a wide variety of both sensor and weapons technologies. The process ensures that Bush ultimately can deploy a strategic defense system that meets its military requirements and yet is affordable. What remains is for Bush and the nation is to take advantage of the opportunity made possible by all the effort expended on SDI research by ordering the deployment of strategic defenses.

Chapter 5

SDI and Arms Control

Henry F. Cooper

A consistent Soviet aim has been to use arms control negotiations to curtial and ultimately kill the SDI program. Moscow has tried to make Soviet agreement to a Strategic Arms Reductions Talks (START) treaty dependent on prior U.S. consent not to deploy strategic defenses. The Soviets have failed also to use the Defense and Space Talks (DST) in Geneva to constrain SDI testing. If the U.S. is to have a defense against ballistic missiles, President Bush will have to resist these Soviet attempts to undermine SDI, and craft an arms control policy that not only results in reductions of offensive forces, but in the deployment of strategic defenses.

Moscow has tried to stop SDI deployment by: 1) refusing to sign a START Treaty unless the U.S. retained its adherence to the 1972 Anti-Ballistic missile (ABM) Treaty banning most strategic defense deployments; and 2) reserving the right to back out of an already signed and ratified START Treaty if the U.S. deploys strategic defenses.

Moscow has tried to control SDI testing, and hence slow down progress on the program, by foisting upon the U.S. an interpretation of the ABM Treaty that is so restrictive that it all but prohibits realistic testing of strategic defenses. At various times over the past five years Moscow has insisted that: 1) the ABM Treaty prohibits any testing of SDI systems that could lead to a territorial defense; 2) all testing be limited to laboratories *on earth; and 3) testing be continued to a restrictive list of activities in space and on earth.*

The Soviets offered a concession by acknowledging the right of each side "to choose its course of action" with regard to the future deployment of strategic defenses at the 1987 Washington summit. At a meeting betwen Secretary of State James Baker and Soviet Foreign Minister Eduard Shevardnadze in Wyoming in September 1989, however, the Soviets withdrew their previous demand that each side pledge to abide by the ABM Treaty for a specified period of time and with also withdrew their earlier concession allowing for the future deployment of SDI.

To thwart the Soviet attempts to kill SDI through arms control, George Bush should: 1) insist that the Soviets acknowledge the legitimacy of SDI testing in space; 2) stipulate that any agreement preserve the right of both sides to deploy strategic defenses in the future; 3) avoid any sort of linkage, implicit or explicit, between DST and START; 4) pursue a DST Treaty that is of unlimited duration and separate from both a future START treaty and the ABM Treaty; to ensure that a DST agreement is not tied to the fate of other arms control agreements prior to the conclusion of a START agreement; 5) press for discussions with the Soviets on how both sides can cooperate as they deploy strategic defenses; 6) insist that "predictability measures" be included in a DST agreement, which should be familiar with each others' development and deployment activities; 7) ensure that a DST agreement contains a clause giving each side the right to withdraw from the treaty; this clause should say how much notice must be given before withdrawal takes place.

For the DST negotiations to bear fruit, the U.S. will have to maintain a strong SDI program. Continued progress provides bargaining leverage at the arms control talks. For negotiations on SDI to succeed, the Bush Administration will have to win the public debate over whether to deploy strategic defenses. This will require presidential leadership from Bush, not only by harnessing support from Congress, but by protecting the program at the negotiating table in Geneva.

The future of the Strategic Defense Initiative has been closely linked with strategic arms control since SDI began as a program. The question has been whether strategic arms talks between the United States and the U.S.S.R. would hinder SDI and thus keep the world wed to a purely offensive strategy or usher in a new strategic age in which deterrence strategy employs both offensive and defensive strategic forces. Attempts by the Soviets to constrain SDI, whether by prolonging the lifespan of the 1972 Anti-Ballistic Missile (ABM) Treaty or by negotiating new testing restrictions on SDI, have reflected Moscow's desire to continue an offense-dominant strategic order which best suits the large highly-MIRVed Soviet missile force while denying U.S. applications of its relative technological advantage to discount the effectiveness of such threatening weapons. At the same time, the U.S. has sought to use arms talks on defensive systems to discuss a transition for moving deterrence toward defensive strategies and forces. The history of the Defense and Space Talks (DST) in Geneva has been a tug-of-war between these two positions since they opened in March 1985.

The outcome of this struggle is critical for SDI and the future security of the U.S. and its allies. Negotiations that seek urgently to complete Strategic Arms Reduction Talks (START) treaty, which will limit offensive nuclear arsenals, could constrain the development of SDI. A DST treaty that prolongs the time in which both sides are denied the right to deploy strategic defenses would slow unnecessarily technological progress on SDI. And a focus on continuing the ABM Treaty, rather than negotiating an entirely new framework for defensive forces through a DST Treaty, not only would delay SDI deployment but would delay serious discussions about a transition toward strategic defenses that can benefit both Moscow and Washington. It would also prolong unnecessarily the flawed and dangerous notion that the best and only way to deter war is through threatening aggression with nuclear retaliation.

The key to getting Soviet agreement to a DST Treaty that accepts SDI deployment is to direct SDI toward near-term deployment while continuing to press the U.S. offer for a cooperative transition at the negotiating table. Previous American steadfastness in pursuing such a dual track approach has paid off in arms control negotiations with the Soviets, such as in the 1987 Intermediate-range Nuclear Forces (INF) Treaty; it will do so as well for DST. SDI should not, therefore, be constrained by any restrictive interpretation of the ABM Treaty that would prohibit SDI tests in space, and the most promising technologies – such as those employed with the *Brilliant Pebbles* concept – should be supported and accelerated to prepare as quickly as possible for the nearing day of deployment.

ARMS CONTROL: THE SDI FACTOR

The Soviets have viewed SDI with much apprehension. Seen as a technological threat with which they did not wish to compete, SDI has been falsely portrayed at different times by Moscow as a "space strike" weapon threatening the Soviet homeland, a destabilizing force in the strategic balance, or as a technical pipedream incapable of working.

Such Soviet concerns have given the U.S. leverage in arms control negotiations. The program helped bring the Soviets back to the negotiating table in 1985 after they walked out of the START and INF negotiations in Geneva. It also encouraged them to negotiate seriously toward a 50 percent reduction in ballistic missile warheads and throw-weight, which has been agreed upon in START.[1] The reason: Moscow believes a START agreement will cripple or stall SDI while significantly delaying, if not preventing, U.S. deployment of effective defenses. Linking a START agreement with stopping SDI remains a central objective of the Soviet arms control negotiating strategy – whether explicitly or implicitly stated.

Aside from their general respect for Western technology and their concern about unpredictable spin-offs to other kinds of weaponry, the Soviets have been concerned particularly by SDI for at least four reasons:

1) Ronald Reagan identified and strongly advocated a national goal that focused creative governmental and industrial forces on harnessing advanced technology in a way that would change the balance of power – or, as the Soviets say, the "correlation of forces" – in a way unfavorable to Moscow.

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1 Throw-weight is the payload capacity of a ballistic missile express in aggregate poundage for reentry vehicles (including decoys).

2) To change the balance of power, the specific SDI objective was to counter Moscow's intercontinental ballistic missiles (ICBMs), or that portion of the Soviet arsenal that the Soviets have emphasized at great expense for three decades. These Soviet ballistic missiles are superior in counter-military effectiveness to U.S. ballistic missiles – and SDI would change that fact.

3) SDI emphasized "space" as a sphere of military activity, albeit for non-nuclear defenses – and the Soviets would prefer that the *U.S.* not "militarize" space. The Soviets well understand how space influences the strategic balance and the relative effectiveness of terrestrial forces. On June 7, 1989, Soviet Prime Minister Nikolai Ryzhkov stated on Soviet television that, according to Soviet Ministry of Defense calculations, Soviet military space programs enhance the combat efficiency of Soviet armed forces by 1.5 to 2 times. Ryzhkov's observation explains that 50 percent reductions in offensive nuclear forces can be offset by improvements in military space programs.[2]

4) As SDI has progressed, the results of various studies and experiments have encouraged speculation, if not conclusions, that deployment could indeed occur in the foreseeable future. The most promising activity in this regard is the *Brilliant Pebbles* concept, which envisions thousands of small, orbiting satellites capable of knocking down Soviet missiles as they enter space. In his January 31, 1989, "End of Tour" Report, Lt. General James A. Abrahamson, the former SDI Director, said that the concept could be tested by 1991 and deployment of an effective, affordable system could begin as early as 1994.

The U.S. has sought to alleviate the Soviet concerns about SDI by proposing ways to ensure predictability and stability in the U.S.-Soviet strategic relationship while moving toward deployment. Example: Washington has offered to engage in intensive discussions with Moscow to ensure that stability will be maintained during the transition toward deployed strategic defenses. Washington also has offered to exchange visits to facilities involved in all phases of research, development, and deployment of strategic defenses. At the same time, Washington has made clear that it will not accept a Soviet veto of U.S. plans to develop

2 For further discussion, see Leon Goure, "The Strange Soviet Defense Budget," *Strategic Review*, Vol. XVII, No. 3 (Summer, 1989), pp. 83-85.

and deploy strategic defenses, even if this means U.S. withdrawal from the ABM Treaty. Throughout arms control negotiations, therefore, the U.S. has made clear that SDI is not a "bargaining chip"; that negotiations in START and the Defense and Space Talks should each proceed at their own pace toward separate agreements, and that each agreement should stand on its own merits, regardless of what happens in the other.

These Soviet concerns about SDI have affected Soviet negotiating behavior dramatically. Example: The Soviets withdrew from the START and INF negotiations to protest the NATO deployment of intermediate-range missiles in Europe. But they returned to these negotiations in 1985 because they were worried about the accelerating momentum of the SDI program, particularly regarding space applications.

There also seems little doubt that the Soviets have agreed to U.S. positions on START, such as reducing their ballistic missile warheads and throw-weight by 50 percent, in part hoping to persuade the U.S. to curtail SDI. At the March 1985 outset of the Nuclear and Space Talks (the name given to the set of negotiations consisting of DST, INF, and START) on long-range strategic forces, it was commonly assumed, including within the U.S. intelligence community, that the Soviets never would agree to the U.S. proposal in START that called for reducing each side's ballistic missile warheads to 5,000. Yet, at his Washington summit with Reagan on December 10, 1987, Gorbachev agreed to 4,900.

By making concessions on START, and thus making an agreement more likely, the Soviets apparently thought that they could make SDI look like an obstacle to a START treaty, which they assumed the U.S. Congress and the American public wanted badly.

THE DEFENSE AND SPACE TALKS

The Defense and Space Talks – or DST – opened in Geneva in March 1985. They have been the forum for discussing all arms control issues relating to strategic defense, including the nature of a cooperative transition toward a new strategic environment based on an increasing role for strategic defenses.

Very soon after the DST talks began, the focus became the Soviet demand to set a time period during which the U.S. and the U.S.S.R.

would agree not to withdraw from the ABM Treaty. Informal discussions during the summer of 1985 considered a five- to ten-year commitment. The first formal Soviet proposal, tabled in May 1986, asked the U.S. to commit to the ABM Treaty for another fifteen to twenty years. By the Reykjavik summit in October 1986, the Soviet demand was back to ten years. And by the end of the Reagan Administration it was seven to eight years. Moscow apparently thought that this approach would prolong the time in which strategic defenses could not be deployed. A central issue was to establish U.S. conditions for meeting this Soviet demand. The main American conditions were that: 1) necessary testing of SDI's ground-based and space-based systems should not be inhibited in any way during such a period; and 2) subsequently, both sides would be free to deploy strategic defenses notwithstanding the restrictions of the ABM Treaty.

Several important compromises were reached at the December 10, 1987, Washington summit. In preparing a Joint Statement, the Soviets agreed to work toward a DST agreement that would have the same legal status as the ABM Treaty; that such an agreement would include a period of time during which the sides would not withdraw from the ABM Treaty; and that intensive discussions on strategic stability would begin not later than three years before the end of the nonwithdrawal period, after which each side would be free to deploy – unless agreed otherwise. During this nonwithdrawal period, the length of which was to be negotiated at a later date, both sides would agree to adhere to the ABM Treaty, "as signed in 1972." And Mikhail Gorbachev agreed in the final moments of the Washington summit to include in the Soviet statement U.S. language which the Soviets had previously rejected for eighteen months because they said they understood that language to reflect the U.S. "broad" interpretation of the ABM Treaty.

For eighteen months after the summit, the Soviets backed away from these compromises, seeking instead an ambiguous agreement from the U.S. "to observe the ABM Treaty as signed in 1972 and not to withdraw from that treaty for a specified period." In response, the U.S. insisted repeatedly, in the DST negotiations, at several Ministerials and at the June 1988 Moscow summit, that the compromises made at the Washington summit must be respected and included in DST treaty language. The U.S. in fact proposed for the DST treaty text and associated documents language that was taken verbatim from the Washington Summit Joint Statement. To this, the U.S. added provisions that made unambiguous the commitments implied by the Joint Statement – which were understood by both sides prior to or at the Washington summit. In addition, the U.S. addressed a specific Soviet concern that SDI "testing" would be used to disguise what really would be SDI "deployment."

The Wyoming Meeting

When Round XI of the DST negotiations ended in early August 1989, U.S. negotiations had clearly signaled that George Bush intended to continue Ronald Reagan's policies on SDI and the DST negotiations. The Soviets then made one of their infrequent negotiating shifts at the meeting between Secretary of State James Baker and Soviet Foreign Minister Eduard Shevardnadze at Jackson Hole, Wyoming, on September 22-23, 1989. In effect, this was a classic Soviet maneuver, taking one step forward and three steps backward.

The step forward was Shevardnadze's surprise statement that the Soviet Union was dropping its previous demand that both sides agree to adhere to the ABM Treaty for a specified period of time. This removed a longstanding obstacle to an agreement: deciding what withdrawal rights might be retained, if any, during the time when both sides would agree to abide by the ABM Treaty.

But then the Soviets took three steps backward:

1) They retreated from their agreement, which predated the December 1987 Washington summit, to work toward a separate DST agreement with the same legal status as the ABM Treaty. In Wyoming, the Soviets retreated to their previous position that the DST agreement be given less status, and proposed a special protocol to the ABM Treaty. This would mean that the ABM Treaty would still be the primary binding legal document, reinforcing the existing severe constraints on strategic defense deployment. A DST agreement would be nothing more than a mere amendment to the ABM Treaty, having no separate legal force of its own that could pave the way for a transition to full defense deployments, as the U.S. wants.

2) They backed away from Gorbachev's acceptance at the Washington summit, of U.S. language referring to the U.S. "broad" interpretation of the ABM Treaty, which would permit SDI testing in space.

3) They retreated from the agreement at the 1987 Washington summit that, unless agreed otherwise, both sides would have the right

to deploy strategic defenses after a three-year period of discussions on defenses and strategic stability.

In changing their position in Wyoming, the Soviets undoubtedly hope to get the Bush Administration to commit implicitly if not explicitly, to observing the ABM Treaty indefinitely as a condition for carrying out the reductions in offensive forces required by a future START treaty. Gorbachev knew that Ronald Reagan would never cripple SDI in exchange for a START Treaty. The question posed by the Soviet action in Wyoming was would the United States, without Reagan's leadership, maintain that same sense of priority?

The issue was cast in a subtle way. Shevardnadze said they were delinking START and DST. But the Soviets said at Wyoming (and numerous times since) that they would reserve the right to withdraw from a START Treaty if the U.S. were not to comply with the ABM Treaty as the Soviets interpret the ABM Treaty. At the same time, the Soviets clearly hope to walk away from their previous DST agreements that advanced U.S. objectives, including an implicit Soviet acceptance of the U.S. "broad" interpretation of the ABM Treaty, and an agreement to negotiate in DST with the aim of producing a separate DST treaty, which would supersede the ABM Treaty by including the "right to deploy" and a mechanism to implement a cooperative transition toward deployments on both sides beyond the ABM Treaty.[3]

Linking SDI to START

The Soviet linkage between SDI and START raises an unavoidable fundamental question for the U.S.: Which has priority, START or SDI? The U.S. answer will determine the fate of DST and, more important, SDI. If the U.S. communicates START has priority, then the Soviets will continue to demand explicit or implicit concessions on SDI testing and deployment as a price for START. If SDI has priority, then getting a DST treaty will turn on how badly the Soviets want START

3 The status of DST was summarized by the author at the end of the Reagan Administration in "Passing the SDI Baton in Geneva," *The Washington Times*, February 2, 1989, and at the end of the first round of the Bush Administration in "The Defense and Space Talks - Small Steps Towards Agreement," *NATO Review*, No. 4 (August 1989), pp. 11-16.

The Soviets knew that Reagan's top priority was SDI, and they moved haltingly to meet U.S. concerns and conditions. For example, they wanted to complete the INF Treaty, and they knew Reagan would not do so if that meant crippling SDI or undercutting SDI's deployment options. So Moscow unlinked the fate of INF from SDI after a couple of false starts to test U.S. resolve. The Soviets unlinked INF after the November 1985 Geneva summit, re-linked it at the October 1986 Reykjavik summit, and unlinked it for the final time in a major policy announcement published in *Pravda* and tabled in Geneva, on February 28, 1987. At the same time, however, Gorbachev linked START's progress to SDI, saying that a START treaty depended on reaching an agreement not to deploy weapons in space. Yet, Gorbachev made implicit concessions on SDI at the Washington Summit on the testing of SDI components in space and acknowledging the right of both sides to deploy defenses in the future.

The Soviets now are testing where George Bush stands. Soviet statements in Wyoming and since reveal that the Soviets continue an implicit, if not explicit, linkage of SDI to START. Thus, the U.S. must hold firm to its DST agenda in concluding START. Notably the Soviets give every indication of seriously wanting to complete a START treaty, perhaps more than does the U.S. – and that should give the U.S. negotiating leverage to achieve its DST objectives.

THE ABM TREATY "PROBLEM"

If SDI is to be deployed, the ABM Treaty will have to be amended or terminated. The reason: The ABM Treaty explicitly prohibits the deployment of a nationwide strategic defense system. The ABM Treaty particularly disallows the deployment of anti-missile weapons in space. Although the Reagan Administration argued, and correctly so, that the ABM Treaty, broadly interpreted, allows the testing of SDI components based on "other physical principles" in space, the U.S. Congress has imposed a "narrow" ABM Treaty interpretation on the SDI program – even though the Soviets clearly have never agreed to this interpretation. This congressional restraint leads to sub-optimal SDI tests that cost more, take longer, and are more risky than the tests a good engineer would conduct. Even when such tests have persuasively demonstrated feasibility, the ABM Treaty must be amended or abandoned if, as Bush has promised, the U.S. moves to deploy.

This obvious reality is at the heart of what the Soviets refer to as the "ABM Treaty problem" in the START negotiations. The Soviet "linkage" of SDI to START is an attempt to go over the heads of U.S. negotiators – indeed even of President George Bush – to create public and congressional pressure that would force the SDI program to be governed indefinitely by the ABM Treaty. To counter these pressures, the U.S. needs a strategy to deal with two key Soviet demands: 1) that SDI testing be restricted by the ABM Treaty, and 2) that both sides abide indefinitely by the ABM Treaty, which unambiguously prohibits deployment of any effective strategic defenses.

The ABM Treaty "As Signed in 1972"

The Soviets say, as Gorbachev did at the 1987 Washington summit, that they support adhering to the ABM Treaty "as signed in 1972." But what does this mean? The reality is that the language of the ABM Treaty is imprecise, ill-defined, ambiguous, and fundamentally unverifiable. Given this situation, had the Senate subjected the ABM Treaty to the close scrutiny given the INF Treaty, the ABM Treaty never would have been ratified. Example: One section of the ABM Treaty refers to ABM systems based "on other physical principles" which could be tested but not deployed without a new agreement. Yet neither the Treaty nor the negotiating record defines the term "other physical principles." Example: According to the U.S. Congress, the ABM Treaty prohibits the testing and deployment of space-based sensors that could perform the functions of a fixed ground-based radar; but such a restraint is nowhere to be found in the ABM Treaty, and it is virtually impossible to determine through observation by national technical means whether a particular sensor satellite is or is not capable of substituting for an ABM radar.

A review of the ABM Treaty negotiating record dealing with "future systems," those not in existence in 1972, reveals that much of the ambiguity about the definition of such systems was understood by the Soviets at the time the Treaty was signed. During the ABM Treaty talks, for example, the Soviets resisted putting any restraints on ABM systems other than those that existed in 1972. In effect, they argued that it did not make sense to limit future systems that could not be defined – and they were correct. Originally, neither side proposed to include future systems in the ABM Treaty. When the U.S. insisted upon including them, the Soviets finally agreed. But the ABM Treaty is ambiguous as to how "future" systems were limited.

The ABM Treaty and DST: "Deployment" vs. "Development"

At the outset of the Defense and Space Talks, the U.S. position was that the ABM Treaty permits research and experimental work on space-based ABM systems prior to development. "Development" was understood to begin with the field testing of full-scale ABM systems or components, or their prototypes; and components were defined as ABM interceptor missiles, launchers, or radars (these were called "traditional" components) or devices that could substitute for such components (of so-called "future systems").

In part, because of Soviet disclaimers regarding this U.S. position and other disputes about the interpretation of the ABM Treaty, the U.S. reviewed the 1972 negotiating record in summer and fall 1985, and concluded that a "broad" interpretation, which would permit development and testing but not deployment of space-based ABM systems, was fully justified. (The U.S. took a new official negotiating position in 1988 to distinguish "testing" from "deployment" in much the same way space-based systems as test ranges provide for ground-based systems; i.e. ABM test satellites would be limited in number to enable sound testing while providing no significant deployed capability.)

Soviet comments in DST on various ABM Treaty provisions, however, made it clear that there was no common U.S.-Soviet understanding about many aspects of the ABM Treaty – particularly with respect to "future" ABM systems. And the Soviets have consistently sought more restrictions than the U.S. "narrow" interpretation. For example, the Soviets initially took the position that all "purposeful" research on space-based ABM systems was banned by Article I's prohibition on providing the base for a territorial defense. The 1986 Reykjavik Summit broke down when Gorbachev insisted that the ABM Treaty restricted all activities on space-based ABM systems to laboratories on earth. By September 1987, Moscow had agreed that some testing in space was legitimate under the ABM Treaty, yet they were unclear as to how much and what kind of testing they viewed the ABM Treaty to permit.

At the same time, Moscow has declared that its chief concern is deployment, not testing, implying that it will "settle" for an interpretation of the ABM Treaty that permits testing so long as the prohibition on deployment continues. But this would not meet all U.S. demands since the ultimate aim of U.S. policy is to remove the prohibition on deployment mandated by the ABM Treaty.

If the Soviets unambiguously propose the U.S. "narrow" interpretation, which is the position imposed on the SDI program by the U.S. Congress, pressure undoubtedly will mount for the U.S. to conclude a DST Treaty embracing the U.S. "narrow" interpretation. Moscow in effect would be saying that it asks for no more than the U.S. Congress seeks – continued adherence to the ABM Treaty according to the U.S. "narrow" interpretation as a condition for concluding a DST Treaty.

There are at least four reasons why the U.S. should resist this Soviet tactic:

1) The U.S. has nothing to lose by continuing to press its current position, which is less restrictive than the "broad" interpretation, while nailing down key Soviet definitions that would serve to assure unambiguous clarity on what interpretation the Soviets are advocating, which is presumably the "narrow" interpretation. (The U.S. proposed in 1988 that the sides agree not to dispute about testing or deployment of any space-base sensor, which in effect would make ABM Treaty restrictions more permissive than the "broad" interpretation.)

2) The ABM Treaty negotiating record provides as good a case for the "broad" interpretation as for the "narrow."

3) Neither the "narrow" nor the "broad" interpretation is verifiable by national technical means. For example, it is impossible to determine from national technical means whether any particular sensor satellite can perform ABM functions. Without knowing this, it is impossible to verify the occurrence of tests in space, which the "narrow" interpretation prohibits but the "broad" permits.

4) If the U.S. holds firm to its present position, there are indications that the Soviets will eventually move to a more verifiable regime that is less restrictive than the narrow interpretation. Among these is that Moscow has clearly signaled it is more concerned about deployment of space-based defenses than about testing. If the U.S. holds firm, Soviet objections to U.S. positions on testing will eventually subside.

Soviet opposition to U.S. positions on testing may have been a mere ruse to forestall discussing the issue of deployment. Their main objective has been to stop the "deployment of weapons in space." This was illustrated by an important statement by Gorbachev in *Pravda* on February 28, 1987, in which he spoke as chairman of the Soviet Defense

Council and unlinked INF from DST. His only reference to DST emphasized linkage between START and an agreement not to deploy weapons in space. Other senior Soviet spokesmen, including Marshal Sergei Akhromeyev, Deputy Foreign Minister Yuli Vorontsov (then head of the Soviet delegation to the Nuclear and Space Talks), Ambassador Viktor Karpov and Ambassador Aleksei Obukhov, emphasized this Soviet concern about "deployment" repeatedly over the next several months.

These statements led the U.S. to propose in 1988 that a DST Treaty should distinguish space-based "weapons" from "sensors" and space-based "testing" from "deployment." The aim was to clarify the activities allowed in space prior to deployment; i.e., to define exactly how permitted "testing" could be conducted without deploying a space-based ABM system. There were three elements to this U.S. position:

1) Confidence-building measures to provide predictability and stability while both sides conducted the research, development, and testing necessary to evaluate the feasibility of effective defenses;

2) Agreement not to object, on the basis of the ABM Treaty, to the development, testing, or deployment of any space-based sensor (This would alleviate misunderstandings that could result from disputes about inherently unverifiable provisions of the ABM Treaty.); and

3) An initiative that U.S. tests of interceptor or interceptor-substitutes would be made using a small number of specified ABM Test Satellites. Limiting the number of satellites in space was intended to reassure Moscow that the U.S. was not covertly deploying strategic defenses in space under the cover of a testing program. Also included were notification procedures, proposed as so-called "predictability measures," to identify which satellites are ABM test satellites (and not support systems for a deployed system).

The Soviet response to the U.S. position has been mixed. For most of 1988 the Soviets negotiated seriously on predictability measures. Agreement was reached in 1989 to exchange data on DST activities through the Nuclear Risk Reduction Centers, established in 1987. Based in Washington and Moscow, they are channels for exchanging information required by arms control agreements. Data were also to be exchanged at official expert meetings and through reciprocal visits to observe tests. However, the Soviets dispute the purpose of predictability measures, arguing that their primary purpose should be to insure strict compliance with the ABM Treaty. Also, the Soviets repeatedly and clearly reaffirmed in 1989 that their primary concern had to do with the deployment of ABM weapons in space. Ambassador Yuri Nazarkin, head of the Soviet delegation to the Nuclear and Space Talks, argued publicly to the Geneva Conference on Disarmament on August 3, 1989, that 50 percent reductions were possible "only in conditions of non-emplacement of weapons in outer space...." A press statement by Nazarkin, as reported by *TASS* on August 10, 1989, charged that DST was progressing slowly and 50 percent reductions would be impossible because "the U.S. stand is still based on the possibility of deploying ABM defenses, including space-based ones, in accordance with the SDI program."

Just before the beginning of Round XII of the DST in fall 1989, Ambassador Yuli Kuznetsov, the Soviet Chief DST negotiator, reviewed the Soviet position and, as reported by *TASS* on September 26, 1989, said that, "All devices that are not weapons can be permitted [in space]." If tabled in Geneva, this would come very close to accepting the U.S. proposal not to dispute space-based sensors.

Although the Soviets reaffirmed their concern about deployment during the early rounds of the Bush Administration's DST negotiations, they have not expressed interest in the U.S. position for allowing the testing of interceptors in space or interceptor-substitutes that would not constitute deployment. This U.S. proposal responds to concerns stated by Deputy Foreign Minister Vorontsov on at least two occasions in 1987 and 1988. During a March 1987 visit to Geneva by the Senate Observer Group, a group of senators that monitors arms control negotiations, Vorontsov, then head of the Soviet delegation in Geneva, told Arlen Spector of Pennsylvania that a "concern on testing would arise if the United States put 100 space stations [in space], had a test, and was then in a position to deploy."[4]

A year later, this concern was repeated, almost verbatim, on background with reporters following the March 1988 meeting in Moscow between Secretary of State George Shultz and Soviet Foreign Minister

4 See testimony by Senator Arlen Spector, "The ABM Treaty and the Constitution," *Joint Hearings before the Committee on Foreign Relations and The Committee on The Judiciary*, 100th Congress, First Session, March 11, 26, and April 19, 1987 (Washington, D.C.: GPO, 1987), p. 4.

Shevardnadze. The U.S. proposal for testing SDI components in space specifies that such tests would be conducted from so few satellites that deployment would not be feasible. The U.S. believes that fifteen ABM test satellites surely would be too few to constitute a space-based defensive deployment. This proposal distinguishes "testing" from "deployment" in space and will permit certain tests in space the same way the ABM Treaty allows certain tests at ranges on earth. Testing activities in space would be restricted to designated satellites. After this U.S. proposal on space tests was made, the Soviets repeated that their primary concern was deployment, not testing.

The Soviets will continue to test U.S. resolve with tough negotiating positions, but they have demonstrated that they eventually will compromise if the U.S. holds firm to its positions. The U.S. position on space testing is more verifiable than either the "broad" or "narrow" interpretation because it will not require verifying the difference between deployed and non-deployed space-based sensors and because space testing will be conducted from designated satellites, which makes it easier to monitor their activities. The U.S. position endeavors to meet Soviet concerns about deployment of weapons in space. And it enables each side to predict the likely action of the other through the exchange of important data on research into missile defenses.

Therefore, the U.S. should continue to resist Soviet proposals to "clarify" the ABM Treaty to establish what is permitted or prohibited. While pocketing Soviet clarifications of ambiguous ABM Treaty terms when they could serve U.S. interests, the U.S. should continue to press its current position in the context of a separate DST Treaty.

Right to Deploy

President Bush has made clear his intention that U.S. negotiators are to preserve the U.S. options to deploy advanced defenses when they are ready, preferably at a measured pace and in a cooperative way. Since such a deployment would go beyond that permitted by the ABM Treaty "as signed in 1972," this means that eventually the ABM Treaty must either be amended or abandoned. Thus, the U.S. should reject any Soviet condition, implicit or explicit, that would imply a commitment to the ABM Treaty into the indefinite future.

An agreement should be possible to assure that a strategic defense deployment takes place in a stable and predictable way. The Soviets were openly verbal in stating their interest in strategic defenses in the 1950s and 1960s, and their actions in maintaining and modernizing their extensive operational systems demonstrate that interest continues. Deployment initially could proceed as nuclear weapons are reduced by a START treaty. So far in DST, the Soviets have resisted this idea, arguing that the ABM Treaty itself is the cornerstone of a stable strategic regime, and that relaxation of its restraints, particularly for space-based ABM systems, would lead to an undesired spiral in the arms race. The U.S., by contrast, has made clear from the outset of DST that while it preferred a cooperative transition toward deployment of defenses, that it would not accept a de facto Soviet veto over its right to deploy strategic defenses, even if it required withdrawal from the ABM Treaty.

In a June 1986 letter to Gorbachev, Reagan indicated a willingness to sign a treaty at that time that would stipulate that should either side, after 1991, decide to move toward deploying strategic defenses, that side would provide a plan to assure strategic stability during deployment and to negotiate for no more than two years. Under the Reagan proposal, after two years of negotiations, unless agreed to otherwise, either side would be free to deploy.

The Reagan letter constituted the initial specific U.S. proposal for establishing "stability talks" in advance of actual deployment of missile defenses. After eighteen months of negotiation, Reagan and Gorbachev agreed at the Washington Summit that, "Intensive discussions of strategic stability shall begin not later than three years before [a date certain], after which, in the event the sides have not agreed otherwise, each side will be free to choose its course of action." The agreed language referred to three years of discussions beginning not later than three years before the "end of the nonwithdrawal period." The date ending continued observance of the ABM Treaty would have been nailed down by the time the DST treaty would have been signed.

The three-year stability talks would focus on how each side is likely to exercise its "right to deploy" (or not deploy if one side so chooses) and how strategic stability best can be improved by deploying defenses. The discussions are likely to include such topics as the relationship between offenses and defenses, outlining force postures for defensive deployments to reduce the risk of war, and a general discussion by each side on actual preparations for deployment.

Given the recent Soviet attempt to walk away from previous agreements, the U.S. should return to its earlier position of pressing for a cooperative transition to the deployment of missile defense rather than to continue to support the "compromise" agreement reached at the Washington summit, calling for "stability talks" prior to the expiration of a non-withdrawal period under the ABM Treaty.

On the other hand, the Soviet Union will, as a part of the START endgame, try to obtain U.S. agreement to open-ended arms talks following the completion of a START treaty. Such discussion will undoubtedly include matters related to strategic defenses. When the Soviets make this move, the U.S. should accept the idea of future discussions but insist that such discussions not be ill-defined and open-ended. A counter proposal following the 1986 Reagan pattern would reestablish the U.S. demand for a right to deploy as a condition for a limited period of discussion on strategic stability.

Since the Soviet Union will be wanting to complete a START treaty as soon as possible, and since Gorbachev previously accepted the "Right to deploy" formulation in just such a context at the Washington summit, there is good reason to believe the Soviets eventually will agree again to such a formulation that would explicitly permit the deployment of strategic defenses at some definite time in the future. But such agreement is likely to come in the last minute of the last twenty minutes of completing a START treaty, in an eyeball to eyeball meeting between Bush and Gorbachev. And, of course, such agreement can happen only if the U.S. holds firm to its demand until the very end of the START endgame.

RECOMMENDATIONS

The central goal of DST should be to seek arms control agreements that enhance U.S.-Soviet military stability and predictability, while at the same time expanding the role of strategic defenses in deferring war. To achieve this, the U.S. should:

♦ **Demand Soviet acknowledgment of the legitimacy of SDI testing in space.** This is necessary to evaluate the feasibility of defenses against ballistic missiles and is critical to the future technical progress of SDI.

♦ **Insist that both sides have the "right to deploy" after the completion of talks on how to establish a "cooperative transition" to strategic defenses.** The aim of these talks is to insure strategic stability during the transition when one or both sides move to deploy such defenses.

♦ **Avoid implicit or explicit linkage between START and DST, which would impede SDI testing and hinder U.S. efforts to deploy effective defenses.** Even implicit linkage associated with unilateral Soviet statements should be unacceptable to the U.S. Such conditions, given the ambiguities of the ABM Treaty, may well become very contentious during START ratification hearings.

♦ **Continue to advocate a DST treaty of unlimited duration, separate from a future START treaty and the ABM Treaty.** A separate DST agreement makes it more difficult for congressional opponents of SDI to oppose SDI in order to "save START." Keeping DST separate from the ABM Treaty will deprive the Soviets of the opportunity to turn the DST negotiations into a forum for discussing strict enforcement of the ABM Treaty, their preferred terms for conducting the negotiations.

♦ **Press for discussions of a future "cooperative" transition beyond the ABM Treaty.** This will assure that the focus of DST negotiations remains on future deployment options, and not on testing restrictions on the ABM Treaty. The U.S. should continue to emphasize the importance of predictability and stability in making the transition to deployed defenses.

♦ **Develop concrete predictability measures to begin when a DST treaty enters into force. Provisions achieving predictability should include:**

1) Data exchanges, experts meetings, and reciprocal visits to observe tests, all of which the Soviets have accepted in the DST negotiations;

2) Visits extending to research in laboratories, not observable by arms control verification tools such as satellite sensors and other so-called national technical means;

3) A pledge not to dispute the deployment of space-based sensors as violations of the ABM Treaty; and

4) Identification of ABM test satellites according to the characteristics of their orbits, and prior notification for space tests of interceptors and interceptor substitutes.

♦ **Commit to the U.S.S.R. that, should the U.S. decide to deploy SDI, it would provide a plan for assuring stability while deployment is underway.** The U.S. also should propose that the two sides discuss that plan for a period of no more than two years, after which time, unless agreed otherwise, either side would be free to deploy after giving six months' notice.

♦ **Include in a DST Treaty a clause giving each side the right to withdraw.** This will clarify the purposes of the agreement and outline which steps are required for either side to withdraw from the treaty. Among the provisions in this clause would be how much prior notice would have to be given before withdrawal.

♦ **Encourage promising technologies to strengthen the U.S. bargaining position.** Achieving U.S. goals will depend on the negotiating leverage provided by a strong SDI program that produces credible possibilities for deployment. The most promising technological development is *Brilliant Pebbles*. It would deploy thousands of small interceptor missiles in low-earth orbit, which could destroy ballistic missiles by smashing into them shortly after they are launched. Deployment of an affordable, effective system could begin as early as 1994. Progress on deployable systems like *Brilliant Pebbles* strengthens the U.S. negotiating position by focusing Soviet attention of the inevitability of deployment, and by shifting discussions away from marginal issues, such as restrictions on testing.

♦ **Explain to the Soviets, Congress, allies, and the American people the advantages of concluding a DST treaty.** These advantages are:

1) The establishment of a new and legitimate legal framework for testing and developing SDI by superseding the ABM Treaty;

2) A reduction of the possibility that either side will be caught off guard by technological breakthroughs by providing the means for monitoring both side's research, development, and testing activities through inspections and data exchanges; and

3) The stable and predictable deployment of strategic defenses in ways that complement the reductions in offensive strategic weapons achieved under a START treaty.

The Bush Administration should tell the Congress, allies, and the American public that the ABM Treaty, "as signed in 1972," is imprecise, ambiguous, and unverifiable, and that the separate DST Treaty would be a marked improvement over the ABM Treaty. The U.S. proposal for DST would be more verifiable than the ABM Treaty, under either the "broad" or "narrow" interpretation, because it avoids the ambiguities that exist in the ABM Treaty altogether.

For the time being the U.S. and the Soviet Union could retain the basic ABM Treaty prohibitions on deployment, at least for the near term, primarily as a way to reassure Moscow. But a future DST treaty should clearly state that after a deployment decision has been made, each side will be free to build strategic defenses after two years of talks on how to make the transition stable.

CONCLUSION

The Soviets can be expected to continue demanding clarifications of the restraints imposed by the ABM Treaty. This will be done by asking that a new protocol be added to the ABM Treaty stating that the new "clarifications" will be binding in perpetuity. Now the ABM Treaty requires only six months' notice before each side can withdraw.

The continuing dispute with the Soviets on the ABM Treaty can serve U.S. interests because it will reinforce, in unmistakable terms, the U.S. argument that the Treaty is ambiguous. This is certainly the case with the ABM Treaty's language for limiting testing on "future systems," which the Soviets themselves have argued in DST are ambiguous.

Engaging the Soviets in this dispute should strengthen the U.S. hand in the negotiations by:

1) Providing a forum for the U.S. to defend the "broad" interpretation of the ABM Treaty. As the Soviets seek to clarify the Treaty's restraints on SDI testing, the U.S. side can argue how the "broad" interpretation is the legally correct interpretation of the Treaty's provision.

2) Defending the soundness of the U.S. space testing initiatives as providing a more verifiable regime than either the "broad" or "narrow" interpretations. This is so because the U.S. proposal does not require the verification of satellite sensors in space, which are impossible to verify. Also, by conducting ABM tests in space only from a limited number of designated satellites, the sides would avoid the problem of defining prohibited space tests, which is a problem in the existing ABM Treaty.

One key to getting the Soviets to accept U.S. positions will be to continue SDI research, development and testing programs on schedule. Another key will be to win the public debate, particularly with the Congress, which has restricted SDI activities to the "narrow" interpretation. The importance of a plan that could lead to deployment of an effective defense cannot be overstated. The innovative architectural aspects of the *Brilliant Pebbles* concept offers the greatest hope for an effective defense in the foreseeable future, and it should receive the highest national priority.

Presidential leadership will be essential to communicate, at the highest level, that the purpose of DST is to make SDI deployable. This will require that George Bush continue to give vocal support to SDI and confront the Soviets when they attempt to restrict the SDI program unduly through the arms control process.

With such presidential leadership and a robust SDI program, it is nearly certain that the Soviets eventually will negotiate seriously. They understand better than the U.S. the value of defenses; they have far more deployed strategic air defenses and missile defenses than does the U.S. Defending Moscow is the world's only deployed ABM system. If SDI is successful, it will be very much in the Soviet interest to cooperate with the U.S. as it moves toward deploying strategic defenses. The Soviets will dispute this point until the very last minute of the START negotiations because they still believe they can halt SDI through arms control; eventually they will agree that the deployment of robust defense is in their interest and that the deployment of such defenses on both sides can be conducted in a predictable manner.

Finally, a DST Treaty could be completed sooner than a START Treaty because there are fewer outstanding technical issues to resolve. From the U.S. perspective, it would be preferable to complete a DST Treaty first. This would foil Soviet attempts to "link" DST to START in a way that creates an artificial choice for the U.S. between SDI and START.

The U.S. should continue to insist that it will not accept linkage of any form between START and DST. At the same time, the U.S. should emphasize that it is prepared to deal with Soviet concerns to assure that SDI testing will not constitute a covert deployment. This is the purpose of the U.S. space testing proposal and the various U.S.-proposed predictability measures. Agreement on testing also will reduce concerns in the U.S. Senate that SDI is an obstacle to START.

Patience and steadfastness of purpose are essential if the U.S. is to achieve its objectives in the DST negotiations. The purpose all along has been to create a new environment, through negotiations, for a more stable and safer world. If SDI is deployed under the auspices of DST, the end result will be increased security along with a greater opportunity for reducing both U.S. and Soviet nuclear arsenals.

Conclusion

Baker Spring

George Bush declared in a February 7 speech at the Lawrence Livermore Laboratory in California: "In the 1990s, strategic defense makes much more sense that ever before, in my view."[1]

A quick survey of the global military landscape reveals the truth of Bush's statement. The Soviet Union continues to build its strategic arsenal, despite *perestroika* and *glasnost*, and increasing internal instability in the Soviet Union, while missiles and missile technologies proliferate in the Third World. This means there is greater need than ever for direct defense against ballistic missiles. America no longer can afford to ignore the changing nature of the military threat and to delay progress on the SDI program. To do so exposes the U.S. to new dangers in the next century. And to do so wastes a critically important opportunity to reduce the half-century-long vulnerability to nuclear attack.

To prepare the way for deployment of strategic defenses, Bush will have to make the SDI program his own. Ronald Reagan started SDI, but Bush will have to finish the job. Bush should build on the progress made in SDI by the Reagan Administration by articulating clear and specific goals for the program. Absent clear directions from Bush, the program will suffer from charges that it lacks political and military purpose and utility. Bush must give this direction and make it clear to the American people that "strategic defense makes much more sense than ever before." The reasons:

1) The Soviet strategic modernization effort continues unabated. Moscow continues to modernize its strategic nuclear weaponry. Whatever the Soviet Union's economic, political, cultural, and moral impoverishment, Soviet investment continues in strategic nuclear weaponry

1 George Bush, "Remarks By the President to Employees of the Lawrence Livermore National Laboratory," February 7, 1990, p. 2.

that makes the U.S.S.R. a military superpower and a mortal threat to the U.S. and its allies. SDI gives America and its allies the means to defend themselves against this threat.

2) Instability in the Soviet Union could raise the risk of nuclear attack. Political instability in the U.S.S.R. calls into question the ability of the Soviet government to control its nuclear weapons. Without strategic defenses, the U.S. and its allies are hostage to threats posed by those who might get their hands on the Soviet aresenal, or portions of it. The existing U.S. policy of deterrence based on offensive nuclear retaliation is premised on two assumptions. First, that the Soviet leadership is in full control of its nuclear arsenal. Second, that the Soviet leadership, or those with access to the Soviet nuclear arsenal, are rational actors. In the 1990s, both these assumptions may be called into question, thereby also calling into question the wisdom of a U.S. policy relying exclusively on the threat of offensive nuclear retaliation to deter war.

3) Increasing numbers of Third World nations are obtaining ballistic missiles. The end of the Cold War is destroying the bipolar military order of the post-World War II era. One indication of this is the proliferation of ballistic missiles and missile technologies to the nations of the Third World. The missile defense systems developed by the SDI program will allow the U.S. and its allies to defend themselves against missiles launched by countries other than the Soviet Union, including India, Iran, Iraq, Libya, and Syria.

A FOURTEEN-POINT ACTION PLAN FOR SDI

The authors of this study have outlined a plan that could ensure the long-term success of the SDI program and that could allow it to address the emerging military threats posed by the 1990s and beyond. These proposals enable the Bush Administration to give specific meaning to the general vision for the SDI program articulated by Ronald Reagan. This will answer those critics of SDI who charge that the program is directionless and lacking purpose.

This plan proposes a fourteen-point action plan for Bush to make SDI his program. He should:

1) Honor his campaign pledge to decide in his first term whether to deploy SDI.

U.S. progress on researching and developing missile defense technologies has been extraordinary. A postponement of a decision to deploy a defense system cannot be justified by an alleged lack of technological progress. Enough has been made to allow the Bush Administration to propose an SDI architecture during his first term.

2) Select from a range of options an SDI architecture for a near-term deployment.

The Administration will have enough data and test results by 1992 to choose a "Phase I" SDI architecture for initial deployment later in the decade. Options for Phase I range from a relatively small-scale deployment of *Brilliant Pebbles*, a revolutionary new space-based defense interceptor system, to a large-scale ground- and space-based system also employing *Brilliant Pebbles*.

3) Establish new goals for SDIO beyond a deployment decision.

The Strategic Defense Initiative Organization's (SDIO's) current mandate extends only to determining the feasibility of missile defenses. A decision to deploy SDI will signal the successful completion of SDIO's current mission. As a deployment decision approaches, it will be appropriate that SDIO establish new goals for itself. These should include building and deploying the strategic defense system proposed by Bush for near-term deployment and continuing research on more advanced technologies such as lasers for a later, more comprehensive system.

4) Reorganize SDIO to reflect its new goals.

To meet its new goals, SDIO will have to change the way it is organized. SDIO should plan to divide its existing offices that supervise research and development on missile defense technologies into two management teams. The first team should be dedicated solely to building and deploying the SDI system chosen by Bush for near-term deployment and delivering it to the military, which will operate it after it is built. The second team should continue to research and develop more advanced technologies for inclusion in later phases of an SDI deployment. Some of these technologies are ground-based laser weapons, space-based laser weapons, and neutral particle beam sensors and weapons. SDIO can start planning this reorganization now.

5) Integrate SDIO fully into the Pentagon bureaucracy.

SDIO so far been an independent entity in the Pentagon bureacracy with the SDIO Director reporting directly to the Secretary of Defense. SDIO's independent status may now isolate the organization and impede to future progress. SDIO should be put under a new Assistant Secretary of Defense whose office will be created by merging the existing offices of the Deputy Director for Strategic and Theater

Nuclear Forces and the Principal Deputy Under Secretary of Defense for Acquisition. This will give SDI an advocate inside the Pentagon bureaucracy and enable SDIO better to clear hurdles inherent in the Pentagon's acquisition process.

6) Preserve the highly-skilled SDI team.

It is important that SDIO protect the highly skilled scientists and engineers and others working on SDI, those most important to the success of the program, from defense budget cuts. It is becoming clear that the success of the SDI program is dependent on SDIO's ability to deploy a missile defense system in the 1990s. The near-term programs are more important because advanced technology programs are not likely to be sustained absent the deployment of near-term systems. Thus, if the SDI program is faced with budget reductions in the future, SDIO should allocate the remaining funds to those scientists and engineers working on near-term programs such as *Brilliant Pebbles*, the Exoatmospheric Reentry vehicle Interceptor Subsystem (ERIS).

7) Develop a near-term strategy that relies on strategic defense to increase the likelihood that U.S. offensive nuclear forces can survive an enemy attack.

The existing U.S. strategy relies on offensive nuclear weapons to deter nuclear war. This requires that the U.S. strategic arsenal survive an attack by the Soviet Union and then threaten retaliation against Soviet military and leadership targets. Offensive weapons deter by making it clear to the Soviets that the cost of a strike against the U.S. will be higher than any gain. In the near term, the deployment of strategic defenses can enhance the existing policy of deterrence by protecting the offensive retaliatory force against a preemptive strike by the Soviet Union.

8) Establish a near-term strategy that fully protects the U.S. and its allies against missile strikes by lesser military powers.

The proliferation of ballistic missiles and missile technologies around the world will be a major development this decade. Many of the countries trying to obtain ballistic missiles are also trying to obtain nuclear and chemical weapons, if they do not already have such weapons. These include India, Iran, Iraq, Libya, and Syria. None of these, however, is likely to amass missile arsenals as large as the Kremlin's. The U.S. should develop a strategy calling for a direct defense against limited attacks. This strategy should seek to intercept and destroy any missile launched against the U.S. or its allies by hostile powers worldwide.

9) Develop a long-term U.S. strategy that embodies the concept of "defensive deterrence."

As successive deployments make strategic defenses more capable, U.S. strategy should be altered to deter war by relying as much as possible on increasingly effective strategic defenses employing increasingly sophisticated technologies. The U.S. must recognize that the existing policy of deterrence through the threat of offensive nuclear weapon retaliation contradicts the national goal of survival, should deterrence fail. Offensive deterrence bets the very existence of the nation on the assumption that deterrence will never fail. This is likely to become increasingly untenable and risky as Third World countries obtain nuclear missiles and as the Soviet Union faces the possibility of disintegration and even civil war. A policy of "defensive deterrence" seeks to deter an enemy attack through non-threatening defenses, and if that fails, to end hostilities on terms favorable to the U.S.

10) Continue to press for a separate Defense and Space Talks (DST) agreement of unlimited duration.

The U.S. should conclude a separate Defense and Space Talks treaty with Moscow that is separate from and of equal status to the Strategic Arms Reduction Talks (START) treaty and the 1972 Anti-Ballistic Missile (ABM) Treaty. This way future deployment of SDI will not be jeopardized by Soviet attempts to halt such a deployment by invoking these other agreements. A DST treaty should have no expiration date.

11) Use a DST treaty to achieve a "cooperative transition" to strategic defense deployments.

A DST treaty could be the legal framework ensuring that strategic stability is maintained as both the U.S. and the U.S.S.R. deploy strategic defenses. Mutual deployment of strategic defenses, especially when coupled with sharp reductions on both sides in offensive nuclear arsenals, will create a world that is militarily safer and more stable. The U.S. and the Soviet Union can use a future DST treaty to assure that deployments are predictable and non-threatening.

12) Ensure that the arms control talks protect the right to test SDI systems.

The Reagan Administration steadfastly resisted Soviet attempts to limit SDI testing. Reagan refused to accept restrictive interpretations of ambiguous language in the ABM Treaty. This was particularly clear when Reagan accepted the so-called broad interpretation of the ABM Treaty, under which the U.S. is allowed to test anti-missile weapons in space. Bush should continue this policy of resisting Soviet attempts to restrict SDI testing. Bush should press for DST treaty provisions that protect the right of both sides to engage in unfettered testing of strategic defenses.

13) In arms control negotiations protect the "right to deploy" strategic defense in the future.

Bush should continue to press in DST for the "right to deploy" strategic defenses in the future, after a period of discussions on strategic stability. During the Reagan Administration, the U.S. sought to preserve the ultimate right of both sides to deploy strategic defenses, even if it meant not being allowed to deploy them until a later date. The current intention of the Soviets is to prohibit an SDI deployment for the foreseeable future. While agreeing that discussions on strategic stability should take place before beginning to deploy defenses, Bush should not allow the Soviets to prohibit such a deployment indefinitely.

14) Conclude DST negotiations before a START treaty is signed.

The DST treaty text is only five percent of the length of the START text. If the Soviets press for completion of a START treaty before DST is completed, the U.S. could respond by saying that it is far easier to resolve the technical problems associated with DST than with START. This fact could be used to U.S. advantage in the DST negotiations because the Soviet wish to conclude quickly a START treaty will provide leverage to the U.S. in forcing concessions from Moscow in the DST negotiations.

Bush is working to make the SDI program his own. He is recognizing that arguments in favor of deploying defenses against ballistic missiles are growing stronger as events, unpredictable even just a year ago, continue to unfold. These events will require that Bush modify the objectives of the SDI program to reflect the new global military situation. With the continuing modernization of the Soviet strategic arsenal, increased instability in the Soviet Union, and the proliferation of ballistic missiles to the countries of the Third World, Bush is absolutely correct when he says, "in the 1990s, strategic defense makes much more sense than ever before."

Glossary

Alpha Chemical Laser. A laser that uses a chemical reaction of the compound hydrogen fluoride to produce pulses of light so intense that they could destroy huge objects, such as missiles.

ARGUS-135. A modified Boeing 707 advanced observation aircraft used in SDI tests.

Brilliant Pebbles. A plan to develop and deploy several thousand very small interceptors in space, each capable of tracking and destroying Soviet missiles with little guidance from a centralized command and control system.

Boost phase. The first phase of ballistic missile flight, during which it is powered by rocket engines. In this phase the missile and its warheads travel some 125 miles in three to five minutes.The boost phase is an ideal time to intercept enemy missiles because all their warheads are still on board.

Counterforce. The term applied to any weapon that is intended to destroy enemy nuclear weapons either through a preemptive first strike or a retaliatory strike.

Defense-in-Depth. The traditional military concept of a three-layered defense against enemy conventional attack which envisions absorbing, containing, and finally destroying the assault.

Defensive deterrence. A strategic concept in which a nuclear attack is deterred by providing a reliable defense system for the U.S.

Delta series. A series of SDI experiments to: 1) learn how sensors might differentiate warheads from decoys, 2) learn how a defensive weapon might home in on a rocket, and not its harmless plume, and 3) learn more about the background environment of space in which the SDI system would operate.

Flexible Response. A NATO military doctrine which spells out how nuclear weapons might be used to respond to a Soviet conventional attack.

Free-electron laser. A powerful light beam produced by first detaching electrons from their orbit around atomic nuclei and then accelerating them almost to the speed of light. As the electrons decelerate, their kinetic energy is transformed into radiation, or laser light, which could then be aimed through the atmosphere over tremendous distances to knock down ballistic missiles or warheads, provided the wavelength of the light is small enough. The FEL would be primarily a ground-based laser to destroy enemy missiles in the boost phase. Space-based versions are also under study.

Geosynchronous orbit. An orbit in which a satellite or space-based SDI system rotates with the earth and remains stationary relative to a fixed point on the planet's surface.

Homing Overlay Experiment (HOE). A successful SDI test on June 10, 1984, which proved that a missile could fly directly into the path of an incoming warhead and destroy it by impact.

Inertial measurement unit (IMU). The main component of a ballistic missile's guidance system.

Kinetic energy interceptors. A weapon that uses a non-explosive projectile moving at very high speed to destroy a target on impact.

Laser. The term stands for Light Amplification by the Stimulated Emission of Radiation. A laser weapon produces an intense beam of light for heating, melting, or vaporizing a target upon contact.

Layered architecture. An SDI deployment concept in which several types of defensive weapons are deployed in space and ground-based layers. Such a defensive system can then thwart a Soviet nuclear attack from minutes after it is launched to seconds before warheads hit their targets on the ground.

Limited Protection System. (LPS) A small-scale strategic defense system, such as one employing only ground-based weapons, as opposed to a full-scale layered architecture including space-based systems.

Midgetman. A single-warhead mobile intercontinental ballistic missile currently under development by the U.S. Air Force.

Neutral particle beams. An energy beam of neutral atoms possessing no net electric charge. The beam is created by a particle accelerator propelling neutral atoms at the speed of light (186,000 miles per second).

Particle beam. A stream of atoms or subatomic particles (electrons, protons or neutrons) accelerated to nearly the speed of light. A particle beam weapon would destroy a missile by damaging its guidance electronics, its sensors, melting its outside casing or blowing it up with high explosives.

Peacekeeper. A 10-warhead intercontinental ballistic missile deployed by the U.S. Air Force. Fifty are now placed in silos, which are planned for a redeployment on railroad cars stored in garrisons during peacetime.

Preferential defense. A tactic by which some missiles are defended and some are not. Since an enemy will not know which missiles are defended and which are not, they will not know ahead of time which missiles they can destroy.

Solid state phased array. A multi-directional radar, capable of switching rapidly from one target to another, which is used to predict the direction of ballistic missiles and provide early detection of a missile attack.

Soviet Defense Council. The main Soviet defense policy-making body.

Starmate. Space-based experiments conducted in September 1989 which explored methods for space-based SDI components to evade attack.

Throw-weight. The payload capacity of a ballistic missile.

Trident. The premier U.S. ballistic missile submarine.

Acronyms

ABM. Anti-ballistic missile. Seen most often in reference to the 1972 Anti-Ballistic Missile Treaty.

ACE. Atmospheric Compensation Experiment, which demonstrated that atmospheric distortions could be corrected for ground-based lasers being directed against a rocket in flight. The first ACE experiment held in conjunction with SDI was on September 27, 1985.

ALCM. Air-Launched Cruise Missile.

ALS. Advanced Launch System, a research and development program for a booster rocket capable of lifting over 100,000 pounds into orbit. ALS is a project of the Department of Defense and the National Aeronautics and Space Administration.

AOA. Airborne Optical Adjunct, the world's most advanced heat-seeking sensor. It is mounted on a modified Boeing 767 aircraft for warhead tracking tests.

ASAT. Anti-satellite weapons.

BSTS. Boost Surveillance and Tracking System, an SDI system for early detection and warning of a Soviet missile attack.

DAB. Defense Acquisition Board, a board of senior executives in the Department of Defense which makes recommendations to the Secretary of Defense on approving successive steps in the acquisition process for a particular weapons system. Chaired by the Undersecretary for Defense Acquisition.

DARPA. Defense Advanced Research Projects Agency, the central research facility to pursue innovative research ideas leading to systems with significant military utility.

DST. Defense and Space Talks, held in Geneva with representatives of the Soviet government. Begun in 1985, DST's primary focus is on questions related to deployment of strategic defenses and the future of the 1972 ABM Treaty.

ERIS. Exoatmospheric Reentry vehicle Interceptor Subsystem, a ground-based SDI interceptor for colliding with and destroying incoming warheads outside the atmosphere (altitude above 60 miles).

FLAGE. Flexible Lightweight Agile Experiment. This project helped to resolve guidance problems relating to non-nuclear intercept of warheads and tactical ballistic missiles inside the atmosphere. The FLAGE interceptor, meant for tactical-range missiles, used its built-in radar to intercept and destroy its target.

GBI. Ground-Based Interceptor, a kinetic energy missile system designed to intercept enemy warheads just before or as they enter the atmosphere.

GBL. Ground-Based Laser, for neutralizing enemy missiles at various stages of flight.

GBR. Ground-Based Radar, for tracking incoming warheads.

HEDI. High Endoatmospheric Defense Interceptor, a ground-based SDI interceptor for colliding with and destroying enemy warheads inside the atmosphere.

HOE. Homing Overlay Experiment. See glossary.

ICBM. Inter-continental ballistic missile. Any ballistic missile with a range of over 3,400 miles.

INF. Intermediate-range nuclear forces, or missiles with a range between 1,080 and 3,400 miles.

JCS. Joint Chiefs of Staff, consisting of the commanding heads of the U.S. Army, Air Force, Navy, and Marines. The JCS is the chief U.S. military command body.

LEAP. Lightweight Exoatmospheric Advanced Projectile, under development as a ground-based or space-based infrared-guided projectile to be launched from rail guns to kill missiles by impact.

LPS. Limited Protection System. See glossary.

MAD. Mutual Assured Destruction. Proponents of this doctrine contend that stability would be assured if both sides are completely vulnerable to full-scale nuclear attack.

MIRACL. Mid-Infrared Advanced Chemical Laser, a test laser that emits a beam in the middle of the infrared range of the electromagnetic spectrum. The beam is produced from a chemical reaction. In a test in August 1985, the laser destroyed a Titan II rocket on the ground that was pressurized to simulate flight.

MX. See Peacekeeper in glossary.

NASA. National Aeronautics and Space Administration, the U.S. government's agency for civilian space projects.

OSD. Office of the Secretary of Defense.

SBI. Space-Based Interceptor. The SBI deployment plan called for 200 satellites, each carrying ten interceptors, for a total of 2,000 interceptors. SBI has essentially been replaced by Brilliant Pebbles.

SDIO. Strategic Defense Initiative Organization, which has management responsibilities for the SDI program.

SSTS. Space Surveillance and Tracking System, a plan for numerous low-orbit satellites to track, monitor, and distinguish real warheads and decoys in space.

START. Strategic Arms Reduction Talks, which are being held in Geneva by the U.S. and the U.S.S.R. with the present goal of achieving a 50 percent reduction in strategic offensive forces.

USD/A. Undersecretary of Defense for Acquisition, who supervises the performance of the acquisitions process and directs the Pentagon's activities in acquisition policy, procedure and execution.

TOP SDI CONTRACTORS

Contractor	Prime Contracts ($ Millions)	Sub Contracts ($ Millions)	Total ($ Millions)
The Boeing Company	1,098.9	50.4	1,149.3
Lockheed Corporation	956.9	160.1	1,117.0
TRW Incorporated	553.1	240.6	793.7
Rockwell International Corporation	416.7	344.6	761.3
McDonnell Douglas Aerospace Group	683.7	54.4	738.1
Hughes Aircraft Company	207.0	419.1	626.1
Teledyne Incorporated	419.9	2.4	422.3
Massachusetts Institute of Technolgy	303.5	0.2	303.7
Martin Marietta Corporation	285.6	3.0	288.6
Aerojet-General Corporation	113.2	172.6	285.8
Grumman Corporation	215.0	33.0	248.0
Raytheon Company	206.7	35.5	242.2
LTV Aerospace and Defense Company	197.2	23.6	220.8

TOP SDI CONTRACTORS (continued)

Contractor	Prime Contracts ($ Millions)	Sub Contracts ($ Millions)	Total ($ Millions)
Science Application Interational Corporation	90.3	96.6	186.9
Los Alamos National Laboratory	180.6	0.7	181.3
Nichols Research Corporation	153.2	25.4	178.6
Lawrence Livermore National Laboratory	169.2	0.2	169.4
The BDM Corporation	121.0	10.4	131.4
General Research Corporation	127.0	0.2	127.2
AVCO-Everett Research Laboratory	121.0	0.0	121.0
Colsa Incorporated	120.7	0.045	120.7
Westinghouse Electric Corporation	72.8	40.6	113.4
Ball Corporation	82.5	15.9	98.4
Applied Physics Laboratory (Johns Hopkins University)	90.5	0.0	90.5
Kaman Aerospace Corporation	81.5	0.3	81.8

Source: Strategic Defense Initiative Organization, January 1990.

SDI CONTRACTS BY STATE

States	Prime Contracts ($ Millions)	Sub Contract ($ Millions)	Total ($ Millions)
California	3,848	1,607	5,455
Alabama	1,100	63	1,163
Washington	1,101	59	1,161
Massachussetts	970	148	1,118
New York	358	452	810
Texas	274	173	447
Colorado	399	33	431
New Mexico	404	10	414
Pennsylvania	303	105	408
Virginia	282	119	402
Maryland	255	53	308
Florida	81	199	279
Connecticut	81	77	158

SDI CONTRACTS BY STATE (continued)

States	Prime Contracts ($ Millions)	Sub Contract ($ Millions)	Total ($ Millions)
Missouri	38	98	136
New Jersey	45	81	125
Minnesota	65	10	76
Utah	67	7	75
Washington, D.C.	63	9	72
North Carolina	28	21	49
Arizona	33	15	48
Ohio	41	2	42
Tennessee	31	0.45	31
Georgia	29	189	29
Lousiana	28		28
Illinois	22	2	23
Indiana	21	0.98	21

Source: Strategic Defense Initiative Organization, January 1990.

The SDI Program: A Chronology

March 23, 1983:	**Reagan announces SDI program.** Ronald Reagan launches the SDI program in a televised address to the nation, saying, "I call upon those in the scientific community in our country, those who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete." In the address, Reagan announces his intention to commit the U.S. to a research program that will study the feasibility of defensive measures against ballistic missiles.
October 1983:	**Expert panels submit recommendations after studying strategic defenses.** The findings and recommendations of three studies ordered by the President are delivered. The Defense Technology Study, authored by a panel headed by James Fletcher, recommends a five-year program to determine the technical feasibility of future ballistic missile defenses and proposes $26 billion for this effort. The two Future Security Strategy Studies explore the strategy and policy implications of a strategic defense. The studies conclude that effective U.S. defense systems could offer a new, more stable and

secure basis for managing the U.S. strategic relationship with the Soviet Union.

January 1984: **SDIO opens its doors.** The Strategic Defense Initiative Organization (SDIO) is created to undertake a "comprehensive program to develop the key technologies associated with concepts for defense against ballistic missiles."

March 1984: **NATO allies briefed on SDI program.** Secretary of Defense Caspar Weinberger briefs North Atlantic Treaty Organization (NATO) Defense Ministers on SDI at the Nuclear Planning Group Ministerial Meeting in Cesme, Turkey.

April 15, 1984: **Air Force General appointed SDIO's first Director.** Lt. General James A. Abrahamson becomes the first Director of SDIO.

June 10, 1984: **Mock ballistic missile warhead destroyed in space.** The Homing Overlay Experiment (HOE) successfully intercepts and destroys a mock ballistic missile warhead in the midcourse phase of its flight. This non-nuclear intercept is the first such experiment demonstrating the homing guidance system and the potential of kinetic energy weapons to destroy ballistic missiles and their warheads by colliding with them at great speeds.

February 20, 1985: **Criteria for SDI deployment established.** In an address to the Philadelphia World Affairs Council, Special Advisor to the President Paul Nitze outlines and analyzes U.S. government criteria for judging the feasibility of strategic defenses. Nitze said that an SDI system should be survivable against enemy attack and "cost-effective at the margins," meaning that each unit of defense would cost less than what the Soviets would have to spend on offense to overwhelm it.

March 18, 1985: **Allies invited to participate in SDI research.** Secretary of Defense Weinberger invites eighteen allied governments to participate in the SDI program. Weinberger's purpose was to strengthen both SDI and Western security by taking advantage of allied excellence in research areas relevant to SDI.

September 6, 1985: **Chemical laser demonstrates ability to destroy missile booster.** A ground-based, directed energy experiment using the Mid-Infrared Advanced Chemical Laser (MIRACL) device is conducted at the White Sands Missile Range in New Mexico. The target, a Titan booster rigged to simulate a thrusting booster, is successfully destroyed by the laser. This is the first time in the SDI program that a laser destroys a ballistic missile's booster. It proves that liquid propellant ballistic missile are vulnerable to attack by lasers.

September 27, 1985: **Laser successfully tracks rocket in flight.** The SDIO conducts the first successful demonstration of the ability to track a sounding rocket in space with a low-power, ground-based laser after adjusting the beam for atmospheric distortion. Using a low-power laser, the sounding rocket is tracked by a laser beam director at the

U.S. Air Force Maui Optical Site in Hawaii, which is a laser test facility. This is the first time a laser beam, adjusted for atmospheric distortion for an SDI test, is fired from the ground into space.

October 4, 1985: **Soviet strategic defense program described.** The Departments of State and Defense jointly issue a report, "Soviet Strategic Defense Programs," which documents the extent of Soviet activities in all aspects of strategic defense, including passive defense, air defense, and both traditional and advanced technologies for defense against ballistic missiles. The first-of-its-kind report maintained that Soviet research, development, and deployment of strategic defense has long been far more extensive than those of the U.S.

December 1985: **Expert panel delivers recommendations for creating command and control systems for SDI.** The Eastport Study Group, formed by the Pentagon "to devise an appropriate computational/communications response to the [strategic defense battle management] problem and make recommendations for a research and technology development program implement the response," issues its report to SDIO Director Abrahamson. The report concludes that "computing resources and battle management software for strategic defense systems are within the capabilities of the hardware and software technologies that could be developed within the next several years." The report describes battle management and command, control and communications as the "paramount strategic defense problem" to be resolved. SDIO formulates plans to implement the study group's recommendations.

December 6, 1985: **British join SDI research effort.** The U.S. and the Britain sign a Memorandum of Understanding on British participation in SDI research. This is the first agreement with an ally on SDI participation, following Secretary Weinberger's March 18 invitation.

February 26, 1986: **Reagan reaffirms support for SDI program.** In a televised address to the nation, Reagan reports that "We're pushing forward our highly promising Strategic Defense Initiative – a security shield that may one day protect us and our allies from nuclear attack, whether launched by deliberate calculation, freak accident or the isolated impulse of a madman. Isn't it better to use our talents and technology to build systems that destroy missiles, not people?"

March 27, 1986: **Germans join SDI research effort.** The U.S. and the Federal Republic of Germany sign a Memorandum of Understanding on the terms of West German participation in SDI research.

April-June 1986: **Tests conducted on anti-tactical missile system.** A series of Flexible Lightweight Agile Guided Experiments (FLAGE) are conducted at the White Sands Missile Range in New Mexico. These kinetic energy experiments demonstrate that guidance technologies for intercepting a warhead both in and beyond the atmosphere can work. FLAGE is designed to intercept and destroy shorter-range (tactical) missiles with ranges of up to 3,400 miles.

May 6, 1986: **Israelis join SDI research effort.** The governments of the United States and Israel sign a Memorandum of Understanding on the terms of Israeli participation in SDI research.

September 5, 1986: **Data collected on ballistic missile rocket plumes.** A U.S. Delta rocket with sensors on board tests U.S. capability to detect, identify and track enemy missiles in space. In the "Delta 180" experiment, two rockets were sent into orbit atop a Delta booster. Using sensors, each rocket observed the other's maneuver. By locating the booster relative to the plume, one rocket was able to intercept and destroy the other at a closing speed of 6,500 miles per hour. As a result, U.S. scientists were able to collect reliable data on how to track the rocket plumes of enemy missiles.

September 19, 1986: **Italians join SDI research effort.** The U.S. and Italy sign a Memorandum of Understanding on the terms of Italian participation in SDI research.

May 21, 1987: **Lance short-range missile successfully intercepted in flight.** A Flexible Lightweight Agile Guided Experiment (FLAGE) follow-on test is conducted at the White Sands Missile Range in New Mexico. The successful intercept demonstrates that a missile interceptor can be made accurate enough to destroy tactical ballistic missiles within the atmosphere. The 12-

foot FLAGE vehicle uses its fast and accurate millimeter-wave radar to lock onto the target, a U.S. Army Lance short-range missile. The onboard computer fires some 216 rocket motors, each the size of a shotgun shell, in a collar behind the radar to move the speeding vehicle in the correct direction. The intercept takes place at an altitude of 12,000 feet.

July 21, 1987: **Japanese join SDI research effort.** The U.S. and Japan sign a Memorandum of Understanding on the terms of Japanese participation in SDI research.

September 18, 1987: **Weinberger approves recommendation for proceeding to the second stage of research and development for near-term SDI systems.** Upon the recommendation of Defense Secretary Caspar Weinberger, the Defense Acquisition Board (DAB) rules that selected SDI concepts and technologies can now enter the second stage of the DAB's defense acquisition process, otherwise known as the "Demonstration and Validation" phase. This step is the first SDI "milestone review," which is a normal step in the Pentagon for evaluating progress in weapons development and deciding which weapons will be further tested and eventually built.

February 8, 1988: **Advanced observation experiment conducted.** The "Delta 181" experiment was a test of the technologies that could be used in monitoring missiles in space. A Delta rocket was launched from Cape Canaveral with a payload of sensors and test objects. The sensor module deploys fourteen test objects and, using an assortment of active and passive sensing instruments, characterizes the objects in a variety of space environments. The data gathered from this complex, unmanned orbital space mission will aid in the design of sensors for a strategic defense system.

March 23, 1988 **Fifth anniversary of SDI: Construction begun on SDI test facility.** The official groundbreaking for the construction of SDI's National Test Facility (NTF) is held. The NTF will be the lead facility in a nationwide network for testing the future command, control and communication (C^3) for an SDI system, primarily through computer simulation.

February 9, 1989: **Bush reaffirms support for the SDI program.** George Bush announces to a Joint Session of Congress that he will "vigorously pursue the Strategic Defense Initiative."

March 24, 1989: **Satellite launched to record data on missile launches.** The Delta Star spacecraft, a sensor satellite, is launched from Cape Canaveral carrying a laser radar and seven imaging sensors. Several sounding rockets, used for observation in the Earth's atmosphere, are launched during the course of the experiment, enabling Delta Star's sensors to collect data characterizing their exhaust plumes that could later be used in constructing sensors for missile interceptors.

April 10, 1989: **High-powered test laser "fired" for first time.** The Alpha Chemical Laser produces a high-power beam for the first time when fired in its ground test facility at San Juan Capistrano, California. This milestone in the space-based, chemical laser program will be used to judge the technical capability of the technology, computational methods, and fabrication processes necessary for manufacturing chemical lasers at the power levels required for strategic defense. Chemical space-based lasers could be deployed in later stages of a strategic defense system.

April 25, 1989: **Cheney says SDI research to emphasize technologies suitable for near-term deployment.** Secretary of Defense Richard Cheney testifies before the House Armed Services Committee and says, "The goal of the Strategic Defense Initiative remains unchanged. We will continue to pursue the general framework of both space- and ground-based defenses while providing flexibility to adjust the specific deployment schedule as evolving technology is tested and proven. A restructured program would continue toward deployment of a system that will meet the requirements of Phase I by focusing on evaluating the potential of the most rapidly advancing technologies such as Brilliant Pebbles."

June 1989: **Electromagnetic gun tested.** Several tests on the Thunderbolt Electromagnetic Launcher (a "gun" that "shoots" projectiles through electromagnetic conductivity) are successfully conducted. Of the twelve shots launched on this system, one projectile weighing 110 grams is propelled to a speed of 2.7 miles (4.3 kilometers) per second.

July 13, 1989: **Particle beam system tested in space.** SDIO successfully conducts the first test in space of a neutral particle beam accelerator, referred to as Beam Experiment Aboard Rocket (BEAR). A neutral particle beam system is a candidate for follow-on phases of a strategic defense system, either to facilitate the capability of sensors to discriminate between targets and decoys, or as a weapon to destroy attacking ballistic missiles and their reentry vehicles.

September 1989: **Expert panel says "Brilliant Pebbles" proposal merits continuing research.** The Jason study group, a committee of prominent scientists and academics, endorses continued research on small, lightweight, and very accurate interceptors for defense against ballistic missiles, dubbed "Brilliant Pebbles."

September 20, 1989: **DSB sees no fundamental flaws with "Brilliant Pebbles" concept.** In a study of the "Brilliant Pebbles" concept, the Pentagon's Defense Science Board (DSB) finds no fundamental flaws and pronounces the idea "innovative." It predicts that two years of continued research would resolve such remaining technical issues as launch requirements and establishing the communications system.

January 26, 1990: **Endoatmospheric interceptor tested.** SDIO conducts the first in a series of interceptor technology experiments called Kinetic Kill Vehicle Integrated Technology Experiments, or "KITE", at the White Sands Missile Range in New Mexico. A ground-based interceptor for intercepting missiles inside the atmosphere (the endoatmospheric defense interceptor, or "HEDI") is launched to test the flight vehicle's design in the performance and separation of the rocket boosters, kill vehicle staging, and the functioning of the warhead.

February 14, 1990: **Two laser experiment satellites launched into orbit.** SDIO launches two satellites from Cape Canaveral into orbit to conduct tests over several months on ground-based lasers. Referred to as the Relay Mirror Experiment and the Low-powered Atmospheric Compensation Experiment (RME/LACE), the experiments are to test the ability to "shoot" laser beams into space from a ground facility with high accuracy. The RME satellite will reflect the laser beam back to a receiving facility on earth. The LACE satellite will measure the extent to which the earth's atmosphere distorts the laser beam as it is shot into space. If successful, these tests will demonstrate the ability of ground-based laser beams to shoot down attacking missiles.

SDI and Arms Control: A Chronology

January 23, 1984: **Reagan issues report on Soviet violations of arms control treaties.** Ronald Reagan's first report to Congress on "Soviet Noncompliance with Arms Control Agreements" finds that: 1) the large phased-array radar under construction at Krasnoyarsk in Soviet Siberia is a violation of legal obligations under the 1972 Anti-Ballistic Missile (ABM) Treaty; and 2) this and other activities related to developing and testing missile defense systems suggest that the U.S.S.R. may be preparing an illegal ABM defense of its national territory.

March 12, 1985: **Arms control negotiations begin in Geneva.** The U.S. and the Soviet Union begin the Nuclear and Space Talks (NST) negotiations in Geneva, the umbrella negotiations on nuclear arms and strategic defenses. In the Defense and Space Talks (DST) forum on strategic defenses, the U.S. seeks to: 1) discuss the possibility of both sides making a transition from deterrence based solely on the threat of nuclear retaliation toward increased reliance on non-threatening defenses, whether ground- or space-based, against ballistic missiles; and 2) reverse the erosion of the ABM Treaty, caused by Soviet violations and actions inconsistent with the letter and spirit of the agreement. The

Soviets seek, in DST, a comprehensive ban on research, development, testing and deployment of "space-strike arms." The Soviets attempt to kill the SDI program while retaining their own robust research and development on advanced strategic defenses.

October 11, 1985: **Reagan Administration adopts the "broad" interpretation of the ABM Treaty.** Reagan states that the "broad" interpretation of the ABM Treaty is fully justified. But he also directs that, as a matter of policy, the SDI program should continue according to a more restrictive interpretation. Under the "broad" interpretation, anti-ballistic missile systems that are "based on other physical principles" (i.e., other than ABM interceptor missiles, ABM launchers and ABM radars), and including components capable of substituting for ABM interceptor missiles, ABM launchers or ABM radars, may be developed and tested but not deployed, regardless of whether they are based on Earth, in the air, or in space. The ABM Treaty establishes different restrictions for systems in existence in 1972 from those not contemplated at that time. The "broad" interpretation arose from a review of the ABM Treaty's restrictions because of ambiguities in the definition of future systems, including the term "other physical principles." Under the more restrictive interpretation, development and testing of ABM systems based on other physical principles are allowed only for nonmobile or "fixed" land-based ABM systems and components.

October 14, 1985: **Shultz says that SDI testing will be conducted in accordance with the "narrow" interpretation of the ABM Treaty.** Addressing a North Atlantic Assembly meeting in San Francisco, Secretary of State George Shultz says the SDI program "is and will continue to be consistent with the ABM Treaty."

November 1, 1985: **U.S. offers new proposal at DST negotiations.** The U.S. tables a new proposal at the DST negotiations. The U.S.: 1) is committed to the SDI program as permitted by, and in compliance with, the 1972 ABM Treaty; 2) seeks a Soviet commitment to explore jointly how a cooperative transition could be accomplished should new defensive technologies prove possible; and 3) proposes that the U.S.S.R. join in an "open laboratories" arrangement under which both sides would provide information on each other's strategic defense research programs and provide facilities for visiting associated research organizations and laboratories.

January 15, 1986: **Gorbachev proposes to eliminate nuclear weapons.** Soviet General Secretary Mikhail Gorbachev announces a proposal to eliminate nuclear weapons in fifteen years. The plan restates several old Soviet proposals, including one in which both sides would eliminate offensive nuclear weapons if research, development and testing of space-based missile defense systems were banned.

July 25, 1986: **Reagan letter proposes not deploying strategic defenses until 1991.** In a letter to Gorbachev, Reagan proposes that both sides agree not to deploy advanced strategic defenses until at least 1991. Thereafter, if either side wished to deploy, it would present a plan for sharing the benefits of strategic defenses and eliminating ballistic missiles. The plan would be subject to negotiation for two years. If at the end of that time, both sides were unable to reach agreement, each would be free to deploy defenses after giving six months' notice.

August 6, 1986: **Reagan declares SDI "no bargaining chip."** In remarks at a Washington briefing on SDI, Reagan asserts, "SDI is no bargaining chip, it is the path to a safe and more secure future... it's the number of offensive missiles that needs to be reduced, not efforts to find a way to defend mankind against these deadly weapons."

September 22, 1986: **Reagan reiterates his proposal to delay strategic defenses deployments until 1991.** Speaking to the U.N. General Assembly, Reagan says that if the U.S. and U.S.S.R. can agree on radical reductions in strategic offensive weapons, the U.S. is prepared to sign an agreement with the U.S.S.R. on research, development, testing, and deployment of strategic defenses. This agreement would stipulate that: 1) both sides "would agree to confine themselves, through 1991, to research, development and testing, which is permitted by the ABM Treaty, to determine whether advanced systems of strategic defense are technically feasible;" 2) "if, after 1991, either side should decide to deploy such a system, that side would be obliged to offer a plan for sharing the benefits of strategic defense and for eliminating offensive ballistic missiles;" and, 3) "If the two sides can't agree after two years of negotiation, either side would be free to deploy an advanced strategic defensive system, after giving six months notice to the other."

October 11-12, 1986: **Soviet efforts to cripple SDI prevents agreement at Reykjavik summit.** At a meeting in Reykjavik, Iceland, Reagan and Gorbachev come close to an agreement for significant reductions of offensive ballistic missiles. However, Soviet efforts to cripple SDI prevent agreement. In response to the Soviet proposal that the U.S. provide a ten-year commitment not to withdraw from the ABM Treaty, the U.S. offers to accept such a commitment through 1996, during which research, development and testing, which are permitted by the ABM Treaty, would continue. U.S. acceptance is contingent upon: 1) a 50 percent reduction in strategic offensive forces of the U.S. and the U.S.S.R. by 1991; 2) elimination by 1996 of all U.S. and Soviet offensive ballistic missiles; and 3) agreement that either side could deploy advanced strategic defenses after 1996, unless both sides agreed otherwise. Gorbachev, however, tried in effect to amend the ABM Treaty by banning testing of space-based "elements" of a missile defense system outside of laboratories. This proposal was likely offered with the intention of incorporating it into the ABM Treaty as a protocol. Agreeing to this Soviet proposal would have killed the U.S. SDI program.

November 5-6, 1986: **Shevardnadze offers to clarify what kinds of SDI tests are permitted and prohibited by ABM Treaty.** At meetings between Secretary of State George Shultz and Soviet Foreign Minister Eduard Shevardnadze in Vienna, the U.S.S.R. proposes special talks to negotiate what would be permitted and prohibited under the ABM Treaty.

November 7, 1986: **Soviets propose U.S. and U.S.S.R. not withdraw from ABM Treaty for ten years.** This proposal at the Geneva NST negotiations was the formal Soviet response to the earlier Reagan letter (July 25, 1986) proposing that both sides not deploy strategic defenses until 1991.

January 15, 1987: **Round VII of DST negotiations begins.** The U.S. begins Round VII of the NST negotiations in Geneva with its proposals on DST already on the table. During these talks the U.S. proposed: 1) a mutual commitment, through 1996, not to withdraw from the ABM Treaty, and during that period to observe all ABM Treaty provisions while allowing the continuation of research, development, and testing of SDI systems as permitted by the ABM Treaty; 2) mutual commitment not to withdraw from the ABM Treaty through 1996 contingent upon 50 percent reductions in strategic offensive arms by the end of 1991 and the total elimination of all remaining U.S. and Soviet offensive ballistic missiles by the end of 1996; 3) acknowledgment that either side shall be free to deploy advanced strategic defenses after 1996 if it so chooses, unless the parties agree otherwise; 4) the right to withdraw from the ABM Treaty for reasons of supreme national interests or material breach would not be forfeited by the above commitment; and 5) all of the above positions to be incorporated in a new treaty.

April 15, 1987: **Shultz offers new DST proposal.** During meetings with Gorbachev and Shevardnadze in Moscow, Secretary Shultz makes a new U.S. DST proposal insisting that: 1) both the U.S. and the U.S.S.R. would commit through 1994 not to withdraw from the ABM Treaty; 2) this commitment would be contingent on implementation of agreed START reductions of long-range nuclear forces – or 50 percent cuts to equal levels of 1,600 strategic nuclear delivery vehicles and 6,000 warheads, with appropriate sublimits on each; 3) the agreement would not alter the sovereign rights of the parties under customary international law to withdraw from it in the event of material breach of the agreement or if it endangered their supreme national interests; 4) after 1994, either side could deploy defensive systems of its choosing, unless mutually agreed otherwise. To build mutual confidence by further enhancing predictability in the area of strategic defense, and in response to stated Soviet concerns, the U.S. also proposes that the U.S. and the U.S.S.R. annually exchange data on their planned strategic defense activities. In addition, the U.S. seeks reciprocal U.S. and Soviet briefings on their respective strategic defense programs and visits to associated research facilities, as proposed in the U.S. Open Laboratories Initiative of November 1, 1985. The U.S. also proposes establishing mutually agreed procedures for observing each side's testing of strategic defense technologies and systems.

July 29, 1987: **Soviets propose limiting ABM research to laboratory.** The Soviets propose a draft DST agreement at Geneva limiting ABM research and development to laboratories on Earth and permitting some research in space so long as it is not on ABM systems. Moscow still seeks to impose additional constraints on the U.S. SDI program far beyond those contained in the ABM Treaty and to tie reductions of strategic offensive nuclear weapons to U.S. acceptance of measures designed to cripple SDI.

September 1987: **Soviets reverse themselves on ABM research in space.** In the DST negotiations in Geneva, Moscow amends its July proposal, thus acknowledging the right of both sides to conduct ABM research in space.

November 30, 1987: **Gorbachev admits that Soviets conduct research on strategic defenses.** In the first public admission by the Soviets that they are engaged in research similar to the SDI program, Gorbachev says during a televised interview: "Practically, the Soviet Union is doing all that the U.S. is doing, and I guess we are engaged in research, basic research, which relates to those aspects which are covered by SDI in the U.S."

December 7-10, 1987: Gorbachev and Reagan agree at summit to future framework for DST negotiations. Reagan and Gorbachev agree at a summit in Washington to instruct their delegations in Geneva to work out an agreement that would commit both nations to observe the ABM Treaty as signed in 1972. They also instructed that both sides should be permitted to conduct research, development, and testing "as required," which is permitted by the ABM Treaty, and not to withdraw from the ABM Treaty for a specified period. Further, the two leaders agreed that: 1) intensive discussions of strategic stability shall begin not later than three years before the end of the specified period. At that time, in the event the sides have not agreed otherwise, each side will be free to decide its own course of action on deployment; 2) such an agreement must have the same legal status as the START treaty on strategic offensive arms, the ABM Treaty and other similar legally binding agreements; and 3) both sides will discuss ways to ensure predictability in the

U.S.-Soviet strategic relationship and to reduce the risk of nuclear war.

January 15, 1988: **Soviets offer draft treaty that is inconsistent with Washington Summit agreement.** The U.S.S.R. presents a draft START treaty protocol on DST issues. This draft is not consistent with the Washington Summit Joint Statement of December 10, 1987. The Soviets continue to maintain a position on the ABM Treaty that is more restrictive than that agreed to when the treaty was signed in 1972. In the draft protocol, Moscow proposes that: 1) both sides should observe the ABM Treaty, as signed in 1972, while conducting their research, development and testing "as required," of those ABM systems which are permitted by the ABM Treaty; 2) both sides not withdraw from the ABM Treaty for the duration of this protocol, which is ten years; 3) negotiations on strengthening strategic stability will begin no later than three years before the end of the term of the protocol, and that parties will discuss how reductions in strategic offensive arms will effect their respective positions on ABM systems; 4) in the event both sides have not agreed otherwise, each will decide on further actions with respect to the ABM Treaty and the START Treaty after the protocol expires; 5) entry into force simultaneously with the START treaty for duration of ten years and that the START treaty ceases to be in force if either party violates the ABM Treaty or protocol regarding that Treaty; and 6) the U.S. and U.S.S.R. exchange information on certain devices launched into space, and that both sides agree to undertake inspections of certain sites and facilities at which illegal activities are suspected.

January 22, 1988: **U.S. offers DST proposal that reflects Reagan-Gorbachev agreement at the Washington Summit.** The U.S. presents a draft DST treaty, which is consistent with the Joint Statement issued at the conclusion of the Washington Summit. Washington proposes that: 1) a DST agreement would commit both sides to observe the ABM Treaty, as signed in 1972, while conducting their research, development, and testing as required for a specified period of time; 2) intensive discussions of strategic stability will begin no later than three years before the end of the specified period, after which, in the event the sides have not agreed otherwise, each side will be free to decide its course of action; 3) entry into force contingent upon entry into force of START treaty, DST treaty would be of unlimited duration with "specified period" of nonwithdrawal from the ABM Treaty to be negotiated, continued observance of the ABM Treaty through that period and until either party chooses a different course of action, after which either party is free to choose to deploy strategic missile defenses that are prohibited by the ABM Treaty upon giving the other party six months written notice of its intention to do so; 4) the sides shall discuss ways to ensure predictability in the development of the U.S.-Soviet strategic relationship under conditions of strategic stability, to reduce the risk of nuclear war; 5) confidence-building measures to provide predictability for each side regarding the strategic defense programs of the other be included as an integral part of the DST treaty in the form of a protocol; and, 6) predictability measures would include an annual exchange of data on planned strategic defense activities, reciprocal briefings on respective strategic defense efforts, visits to associated research facilities, and establishment of procedures for reciprocal observation of strategic defense testing.

March 17, 1988: **U.S. proposes establishing "predictability measures" on research.** At the DST negotiations in Geneva, the U.S. proposes a protocol to enhance predictability in the development and testing of strategic defense technologies. As U.S. Chief Negotiator at the DST negotiations Henry Cooper stated later: "We [the U.S.] wish to assure predictability – not only now, and in the near future, but also into the more distant future when advancing technologies may enable effective defenses to play an increased role in the strategic forces of both sides."

Sept. 22-23, 1989: **Shevardnadze says that the U.S.S.R. will no longer insist that both sides agree not to withdraw from the ABM Treaty for a specified period.** Secretary of State James Baker and Soviet Foreign Minister Eduard Shevardnadze meet in Jackson Hole, Wyoming, to discuss arms control. Shevardnadze announces that: 1) Moscow is no longer insisting upon a non-withdrawal period for the ABM Treaty; 2) the

U.S.S.R. will tear down the illegal Krasnoyarsk radar in Siberia; and 3) a START treaty can be signed and ratified prior to the completion of the DST negotiations, but that the Soviet Union reserves the right to withdraw from a future START treaty if the U.S. violates or abrogates the ABM Treaty. Baker invites the Soviets to send a team of Soviet experts to visit two U.S. laboratories conducting SDI research.

December 1989: **U.S. offers draft treaty that reflects Soviet announcements at Wyoming meeting.** The U.S. gives the Soviet DST delegation a draft treaty proposal reflecting agreements made at Jackson Hole, Wyoming. This draft treaty, however, contains earlier U.S. positions, such as seeking a cooperative transition to the deployment of strategic defenses so that stability can be assured. It still seeks, for example, a cooperative transition to the deployment of strategic defenses so that stability can be assured.

December 14, 1989: **Soviets visit two SDI research facilities.** Ten Soviet experts led by Ambassador Yuri Nazarkin, head of the Delegation to the Nuclear and Space Talks, visit the TRW Corporation's ALPHA laser facility at San Juan Capistrano, California, and the Beam Experiment Aboard Rocket (BEAR) neutral particle beam facility at Los Alamos National Laboratory in New Mexico.

February 8, 1990: **Shevardnadze announces that Soviets will not require language limiting SDI in a future**

START agreement. Shevardnadze announces to Baker in Moscow that the Soviets will not demand explicit language in a START agreement establishing their right to withdraw from START if the U.S. either violates or abrogates the ABM Treaty. The announcement represents a step by Moscow toward de-linking the START and DST negotiations.

Ballistic Missile Arsenals of Third World Countries Hostile to The U.S.

AFGHANISTAN

FROG-7	Range: 43 miles Outside assistance: Soviet Union[1] Warhead deployment: conventional
Scud-B	Range: 185 miles Outside assistance: Soviet Union Warhead deployment: conventional

CUBA

FROG-7	Range: 43 miles Outside assistance: Soviet Union Warhead deployment: conventional

1 The Soviet Union provided both the FROG-7 and the Scud-B missiles directly to Afghanistan, Iraq, Libya, and North Korea, and the FROG-7 to Cuba.

IRAN

Oghab	Range: 25 miles Outside assistance: China[2] Warhead deployment: conventional, chemical[3]
Shahin-2	Range: 70 miles Outside assistance: China Warhead deployment: conventional, chemical
Nazeat	Range: 70 miles Outside assistance: China Warhead deployment: conventional, chemical
Scud-B	Range: 185 miles Outside assistance: North Korea (Soviet design)[4] Warhead deployment: conventional, chemical

IRAQ

FROG-7	Range: 43 miles Outside assistance: Soviet Union Warhead deployment: conventional, chemical[5]

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2 The Chinese provided Iran with the plans and technical assistance to manufacture the Oghab, Shahin-2, and Nazeat missiles.
3 It is believed by experts on the Middle East that Iran possesses chemical weapons, which could be placed on missiles as warheads.
4 According to the International Institute for Strategic Studies in London, North Korea has built Scud-B missiles by reverse engineering the original Soviet design.
5 Iraq is known to possess chemical weapons, thus it is assumed that some of their missiles are armed with chemical warheads. While Iraq is suspected of trying to build nuclear weapons, it is not thought to have such weapons now.

Scud-B	Range: 185 miles Outside assistance: Soviet Union Warhead deployment: conventional, chemical
Astros	Range: 42 miles Outside assistance: Brazil[6] Warhead deployment: conventional, chemical
al-Hussayn	Range: 370 miles Outside assistance: Argentina, Brazil, East Germany, Egypt, Soviet Union, West Germany, and the United States.[7] Warhead deployment: conventional, chemical
al- Abbas	Range: 550 miles Outside assistance: Argentina, Brazil, East Germany, Egypt, Soviet Union, West Germany, and the United States. Warhead deployment: conventional, chemical

LIBYA

FROG-7	Range: 43 miles Outside assistance: Soviet Union Warhead deployment: conventional[8]
Scud-B	Range: 185 miles Outside assistance: Soviet Union Warhead deployment: conventional

6 The International Institute for Strategic Studies in London reports that Brazil provided these missiles to Iraq directly.
7 Varying degrees of technical assistance from a wide variety of sources has been provided to Iraq in support of developing ballistic missiles.
8 It is widely reported in 1989 and 1990 that Libya was on the verge of producing chemical weapons that could be deployed on its missiles, but a fire at its production facility may have delayed actual production.

NORTH KOREA

FROG-7	Range: 43 miles Outside assistance: Soviet Union Warhead deployment: conventional
Scud-B	Range: 185 miles Outside assistance: Soviet Union (reverse engineering) Warhead deployment: conventional

SOUTH YEMEN

FROG-7	Range: 43 miles Outside assistance: Soviet Union[9] Warhead deployment: conventional
SS-21	Range: 75 miles Outside assistance: Soviet Union Warhead deployment: conventional
Scud-B	Range: 185 miles Outside assistance: Soviet Union Warhead deployment: conventional

SYRIA

FROG-7	Range: 43 miles Outside assistance: Soviet Union Warhead deployment: conventional, chemical[10]

9 The Soviet Union provided the FROG-7, SS-21, and Scud-B missiles to both South Yemen and Syria directly.

10 It is widely believed that Syria possesses chemical weapons, which could be placed on missiles as chemical warheads.

SS-21	Range: 75 miles Outside assistance: Soviet Union Warhead deployment: conventional, chemical
Scud-B	Range: 185 miles Outside assistance: Soviet Union Warhead deployment: conventional, chemical

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CRITICAL ISSUES

SDI At The Turning Point: Readying Strategic Defenses for the 1990s and Beyond

The Strategic Defense Initiative (SDI), the missile defense program started by Ronald Reagan in March 1983, is at a turning point. A decision whether to deploy strategic defenses is around the corner. If George Bush plans a go-ahead with SDI, he must begin preparations now. He will have to not only protect the program from congressional budget cuts, but develop a convincing plan that can justify increased spending on deployment at a time when the defense budget is otherwise being cut.

SDI has shown impressive progress. Successful research and testing have enabled Pentagon officials to identify which technologies are the best candidates for near-term deployment in this decade. The Strategic Defense Initiative Organization (SDIO), the managing office of SDI, also has a good idea of what the "architecture" or construction blueprint of a first-phase SDI system will look like. It is time to make good on this progress.

To assist in this, the Heritage Foundation has assembled a panel of experts to assess what the Bush Administration can and must do to guarantee the long-term success of the SDI program. This study is designed to set a realistic agenda for the SDI program for the next several years, and to give the program the direction it needs to become a full-fledged system in the arsenal of the United States. It points the way for the Bush Administration to assign specific goals to the SDI program, and thereby give clear definition to a project that until now has been an elaborate feasibility study.

The days of asking whether SDI is workable are over. The Bush Administration needs to get down to the business of building the country's first nationwide defense against the horror of nuclear war.

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