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THINKING ABOUT SDI

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FOREIGN POLICY INSTITUTE
SCHOOL OF ADVANCED INTERNATIONAL STUDIES
THE JOHNS HOPKINS UNIVERSITY
WASHINGTON, D.C.

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1. The Nature of SDI
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3. SDI and Arms Control

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1.
THE NATURE OF SDI

President Reagan was true to his word at the November Geneva summit with General Secretary Gorbachev. He refused to agree to any cutback or limitation regarding his Strategic Defense Initiative (SDI). Commentary since the summit suggests that President Reagan views SDI—not an agreement with the Soviets reducing offensive nuclear arms—as his principal legacy to future generations dealing with the problem of nuclear weapons.

Yet while the president's own commitment to SDI seems to have grown, the case for SDI has not correspondingly increased in coherence or persuasiveness. Although Congress has generally supported the program, it has done so reluctantly. The Gramm-Rudman legislation will severely test the depth of this support. The outcome will depend largely on how the public comes to view SDI. At present there is substantial public uncertainty as to whether SDI is worth having—particularly if it comes at the cost of a U.S.-Soviet agreement reducing offensive nuclear weapons. The debate during the next year could well be critical.

Commentary suggests that Reagan views SDI as his principal legacy to future generations dealing with the problem of nuclear weapons.

To date, much of the debate has focused on whether or not greater reliance on defenses against nuclear missiles would strengthen U.S. security and reduce the risk or consequences of nuclear war. Although this is the question that must be resolved before actual deployment of such defenses, that decision is years, if not decades, away. For now, this "ultimate" question is simply too hard; it requires too much information not now available and will be affected by too many events not now foreseen.

There are other important decisions, however, that must be made in the interim. The public needs to focus on the questions that must be answered before these near-term decisions can be made. This paper will address these questions and suggest some preliminary answers. It begins by providing some background on the current SDI effort—where SDI fits into the current U.S.-Soviet nuclear standoff, how U.S. planners hope to use SDI technology, and what can be known already about the defensive systems that are likely to result from SDI research.

The paper then examines the arguments for and against SDI. As to the critics, most of their arguments are directed against the actual deployment of defensive

systems. They offer little guidance for making near-term decisions on SDI. The claims of SDI supporters provide somewhat greater assistance. They focus quite properly on SDI's potential contribution to correcting deficiencies in current U.S. nuclear strategy and in the forces designed to implement that strategy. This potential contribution, although considerably more modest than many SDI supporters claim, nonetheless justifies a significant research effort and one that should be given some measure of priority. The nature of this potential contribution also suggests a number of guidelines for structuring the near-term SDI effort.

As for arms control, over the near term U.S. treaty obligations and negotiating objectives are more the allies than the enemies of SDI. SDI need not frustrate the effort to negotiate reductions in the level of Soviet strategic forces. In the near term the potential conflict between the SDI effort and the Anti-Ballistic Missile (ABM) Treaty ought to be manageable. Over the longer term the ABM treaty may serve as the critical vehicle for making a stable transition to greater reliance on defenses.

As originally conceived, SDI was a five-year, $26 billion research program to investigate alternative technologies that might provide a defense against ballistic missiles.

HOW IT ALL BEGAN

It was President Reagan's speech of March 23, 1983, that made SDI a central feature of the administration's nuclear policy. At the end of a speech primarily devoted to arguing against cuts in his proposed defense budget, President Reagan offered an alternative to the traditional approach to dealing with the threat posed by Soviet power—and, particularly, the threat posed by Soviet nuclear weapons. He described this traditional approach as "deterrence of aggression through the promise of retaliation."

This approach is based on the expectation that a large portion of the strategic offensive nuclear systems deployed by both superpowers—including land-based intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and a much smaller number of long-range bombers—will survive a nuclear attack. (See Tables 1 and 2 on pages 28, 29, and 30 for a breakdown of Soviet and U.S. strategic systems.) Further, although the Soviets have extensive air defenses designed to shoot down U.S. bombers, neither side presently has any credible defense against the ballistic missiles of the other. Thus, both sides are confident that a large portion of their strategic nuclear forces can survive a nuclear first strike and then be launched in an effective retaliatory second strike, inflicting an "unacceptable" level of damage on the territory, military forces, economy, and population of the other side. It is the very prospect of such assured retaliatory capability that, even in crisis, is supposed to deter each side from launching a strategic nuclear attack.

In his March speech President Reagan sought to make a clean break from the past and to offer an alternative to this approach. The human spirit, he said, must be capable of "rising above dealing with other nations and human beings by threatening their existence." He proposed "a program to counter the awesome Soviet missile threat with measures that are defensive," so that U.S. security would rest not upon "the threat of instant U.S. retaliation to deter a Soviet attack" but on the United States' ability to "intercept and

destroy strategic ballistic missiles before they reached our own soil or that of our allies.

As a first step, President Reagan directed that a long-term research and development program be defined for achieving this capability. His goal was nothing if not ambitious: to use "the very strengths in technology that spawned our great industrial base" to render nuclear weapons "impotent and obsolete." The current SDI effort was configured in response to this directive. As originally conceived, it was a five-year, $26 billion research program designed to investigate alternative technologies that might provide a defense against ballistic missiles. Congress subsequently reduced funding for the early years of the program, however, raising the prospect that the program will have to be either cut back or funded beyond five years. The assumption is that at the conclusion of this program the United States will have the necessary technical information to determine whether a defense against ballistic missiles is feasible and whether it is worth pursuing.

The prospect of a major U.S. effort in ballistic missile defense has presented the Soviets with something for which they may be willing to pay.

SDI was soon to be acclaimed as a brilliant political and diplomatic success. Politically, it largely stole the thunder of the political Left, and particularly the nuclear freeze movement, on the nuclear issue. It put President Reagan firmly on record as favoring the total elimination of nuclear weapons and wanting to rid the world of the nuclear nightmare. This objective would be achieved, not by giving in to the temptation of unilateral disarmament or by negotiating unenforceable arms-control agreements with the nation's principal adversary, but by turning to the genie of Western technology. Perhaps owing to the remarkable special effects of the *Star Wars* trilogy or the artists' conceptions of SDI on the network evening news, the plan appeared to many Americans as a plausible alternative to reliance on the threat of nuclear retaliation.

Diplomatically, SDI was a major factor in the Soviet decision in January 1985 to return to the negotiating table after having walked out of the Strategic Arms Reduction Talks (START) late in 1983. The Soviet return was in part a tacit recognition of the failure of their bare-knuckle effort to halt the deployment of U.S. intermediate-range nuclear missiles in Europe. Yet it seems clear that the return was also motivated by a desire to launch a propaganda attack on SDI. This required the posture of a reasonable, peace-loving Soviet Union. A return to the bargaining table was a necessary precondition to such a posture—the admission ticket to the subsequent "propaganda wars."

Further, it seems clear that SDI has created substantial negotiating capital for the United States. To date, the Soviets have been unwilling to agree to significant cuts in force levels. Since the Soviets have an overall numerical advantage over the United States in strategic nuclear delivery systems (2,508 to 1,907 in 1985), reductions to parity at lower force levels would require greater reductions by the Soviets than by the United States. The Soviet Union has generally been reluctant to consider such reductions. However, the prospect of a major U.S. effort in ballistic missile defense, even if years away, has given the Soviets something to be concerned about—and something for which they may be willing to pay, in terms of asymmetrical reductions in the level of offensive forces.

THE CURRENT CONCEPT

The SDI concept currently being considered by U.S. defense planners involves a complex system of from four to seven layers of defensive weapons that would engage Soviet ballistic missiles and the nuclear warheads these carry at various points in their progress from launch to target. The complete flight of a ballistic missile lasts only twenty-five to thirty minutes. The first three to four minutes after launch are known as the boost phase, during which time all the warheads are atop the missile as it moves up through and then beyond the earth's atmosphere to over 100 miles above the earth. At this point the warheads, along with decoys and other "penetration aids," separate from the missile. Once separated, the warheads actually coast to their targets in what is called a ballistic trajectory, continuing upward to a point well over 500 miles above the earth and then moving back downward until they begin to reenter the earth's atmosphere. This is the midcourse phase of the warheads' flight and lasts around twenty minutes. During the third phase, the reentry phase, the warheads move down through the earth's atmosphere toward their targets in just a couple of minutes.

Critical to the effectiveness of the system of strategic defense is the boost-phase intercept.

The problems presented in each of the three phases vary substantially. Critical to the effectiveness of the system of strategic defense is the boost-phase intercept, or the ability to attack and destroy a ballistic missile after it breaks through the earth's atmosphere but before the warheads have separated. Destruction of the missile at this point would render ineffective all the warheads it carried—which currently could be anywhere from 1 to 10. The task would be technically demanding, however, involving a roughly contemporaneous attack on well over 2,000 ballistic missiles, given an all-out Soviet attack at current approximate force levels. Within the first three to four minutes after launch, the launch would have to be detected, the missiles tracked, and a successful attack made on each missile. For the attack on the ballistic missiles U.S. defense planners are considering "tens" of large satellites carrying directed-energy weapons (laser and particle-beam weapons). These would be coupled with "hundreds" of smaller satellites carrying kinetic-energy weapons, each firing high-speed, nonnuclear homing projectiles that would destroy the ballistic missiles on impact.

During the midcourse phase, time would be less of a constraint, since the warheads would coast for perhaps twenty minutes. However, the warheads would be moving along scattered among decoys and other devices designed to disguise them. A midcourse attack would demand a system that could track the objects, discriminate between the true warheads and the decoys, and then attack the warheads themselves. Without a successful boost-phase attack the numbers involved would be impressive—perhaps 10,000 warheads and a much larger number of decoys. To detect, track, and discriminate among these objects would pose a substantial challenge in terms of both sensors and computer data-processing/battle-management capability. For attack on the warheads during the midcourse phase, planners are looking at space-based directed-energy and kinetic-energy weapons combined with clouds of small pellets or aerosols dispensed in space to help discriminate between the warheads and the decoys. One scenario uses directed-energy weapons to help distinguish between warheads and decoys, with kinetic-energy weapons attacking the warheads.

Potential problems during the reentry phase are in many ways more familiar, having been addressed in detail during the ABM debate of the 1960s. The earth's atmosphere acts as a sieve to strain out the decoys, which either burn up or lag behind the true warheads. The technical problems in this phase would involve tracking and intercepting the fast-moving warheads at a safe distance from their targets. Planners are examining a system of ground-based radars and two types of ground-launched rocket interceptors. One interceptor would attack incoming warheads above the earth's atmosphere (an exo-atmospheric attack, in which the problem of discrimination from decoys would still remain). The other interceptor would attack the warheads after they had entered the atmosphere (an endo-atmospheric attack).

Such defensive systems themselves present a problem in that they too would be subject to attack or "suppression." There is particular concern about the vulnerability of the space-based satellite systems, which could be attacked by antisatellite (ASAT) systems. This danger might introduce new instabilities into the U.S.-Soviet strategic nuclear relationship and tempt either side during a crisis to launch a preemptive attack against the other's satellite systems. It is for this reason (as well as possibly lower cost) that U.S. defense planners are also looking at systems that would be deployed in space only shortly before their actual use (the so-called pop-up systems) or, alternatively, that would rely more heavily on ground-based components. This latter type of system might include fairly exotic ground-based lasers coupled with orbiting mirrors that would retarget their beams. Systems involving these technologies, however, probably could not be deployed in substantial numbers for twenty to thirty years.

There is particular concern about the vulnerability of the space-based satellite systems, which could be attacked by ASAT systems.

A second problem of these defensive systems is their vulnerability to countermeasures designed to reduce their effectiveness. These include steps to harden or otherwise modify the outer shell of the ballistic missiles against attack; deployment of fast-burn boosters, which would shorten the time between launch and dispersal of the warheads; greater use of penetration aids to help the warheads reach their targets; and simple proliferation of missiles and warheads to overwhelm any defensive system by sheer numbers. To the extent that it is easier and less costly for one side to field effective countermeasures than it is for the other to increase the capacity or effectiveness of the defensive system itself, the defense would be at a distinct disadvantage.

It is certainly too soon to draw much in the way of conclusions about the effectiveness of any of these technologies or the feasibility of the overall concept. Yet, because of the nature of the task that the system is to perform and the kinds of concepts that the performance of this task would necessarily require, there are some things that can be said about any ballistic missile defense system that is likely to emerge from the SDI effort.

CHARACTERISTICS OF THE SYSTEM

SDI Is Truly a System. SDI is not what is usually thought of as a typical nuclear weapons program. Its research is directed not toward a single weapon system, such as a new bomber or ballistic missile, but rather toward a series of different weapons linked by computer to form an integrated, multilayered defense

capability. It is a "weapons system" in the true sense of the term. In this respect it is less like the MX missile and more like an antisubmarine warfare or air-defense system—linking sensors that would detect the targets with computers that would distinguish and track them; requiring different kinds of weapons to attack the targets in different ways; and necessitating a command, control, and communication (C^3) system to coordinate the attack.

Full Deployment Is a Long Way Off. It generally takes from ten to fifteen years to develop and deploy an individual weapon system. Because basic research on the applicable technologies is still required and a complex, interrelated system of weapons is involved, ballistic missile defense will require substantially more time. Indeed, it is a fair assumption that it will be twenty to thirty years before either the United States or the Soviet Union could complete deployment of a ballistic missile defense system based on the concept currently envisioned by the U.S. defense planners.

Each side will have ample time to modify its force structure and defense plans in response to the prospect of a ballistic missile defense system developed and deployed by the other side.

Each Side Will Have Ample Time to Plan and Respond. Consequently, each side will have ample time in which to modify its force structure and defense plans in response to the prospect of a ballistic missile defense system developed and deployed by the other side. This response could involve deployment of additional offensive weapons to overwhelm the defense system by sheer numbers, or the use of countermeasures or changes in tactics to reduce the effectiveness of that system. The more technologically sophisticated the response, of course, the less ample the available time would be. The development and deployment of new offensive systems designed with a particular defensive system in mind would require substantial lead time. Yet, less ambitious alternatives are likely to be available. Generally, therefore, there is much time for both sides to plan and respond.

All Components Will Not Be Fully Developed at the Same Time. The technologies being examined in the SDI program are at different levels of maturity. Presumably, this means that some parts of a ballistic missile defense system could be ready for development and deployment before others. For instance, interception of incoming warheads during the reentry phase was already being studied in the 1960s, and one might expect that either side could deploy a substantial system for this purpose at the near end of the twenty- to thirty-year period described above—and probably sooner. Indeed, the Soviets still maintain, and are in the process of modernizing, their ABM system around Moscow. By contrast, the directed-energy technologies mentioned in connection with boost-phase and midcourse intercept are less well developed and could be deployed in substantial numbers only at the latter end of that twenty- to thirty-year period. The computer software and data-processing/battle-management capability necessary for a fully effective system may indeed appear only after the weapons for actually knocking out the missiles or warheads have been developed.

Both Sides Will Have the Option to Deploy Imperfect Systems. For the foregoing reason, both sides will have to consider whether they want to develop and deploy pieces of an overall defense system as particular technologies or capabilities mature. A land-based defense against incoming warheads during the reentry phase is an obvious example. A boost-phase intercept system using kinetic-energy weapons giving substantial (but less than total) effectiveness against

ballistic missiles is another. Even with the combined capability of both systems, however, the decision to develop and deploy such imperfect systems would not be easy to make. The current concept of U.S. defense planners assumes that each layer of defense would "leak" missiles or warheads into the next, but with ever-decreasing numbers getting through each layer. Assuming a 10,000-warhead attack and a four-layer defense system, for example, a 75 percent effectiveness at each level would be required in order to reduce the attacking force to less than 50 warheads (which would still be enough to cause massive damage). At a 75 percent level of effectiveness, however, a two-layer defense (a boost phase and reentry phase) would leave an attacking force of about 600 warheads. Thus, both sides will have to decide whether development and deployment of such imperfect systems is desirable.

SDI Involves Two Distinct Concepts. In a sense the SDI effort suggests two different concepts. One entails the use of primarily ground-based systems in the reentry phase to protect specific targets of great importance (so-called site defense). The other puts greater emphasis on space-based systems that would attack the warheads (or missiles) earlier in the flight path and provide protection to large areas of the country (population or area defense). These concepts involve very different technologies and would have substantially different consequences for the relationship between the nuclear forces of the two sides.

Even at its best, a ballistic missile defense system offers only a partial solution to the threat posed by Soviet nuclear weapons.

Even If SDI Works, the Air-Breathing Threat Would Remain. Even at its best, a ballistic missile defense system offers only a partial solution to the threat posed by Soviet nuclear weapons. The SDI effort announced by President Reagan, and the concept now being pursued by U.S. defense planners, does not purport to deal with the threat of strategic bombers or cruise missiles. These weapons are generically called the air-breathing threat because, unlike ballistic missiles, they never leave the earth's atmosphere. Even with an effective ballistic missile defense, the United States would still face a threat from Soviet air-breathing systems. The development and deployment of defenses against these systems is generally not limited by any U.S.-Soviet arms-control agreement. The Soviets, for their part, have put a substantial effort into developing and deploying such defenses. The United States, however, has not made any comparable effort.

Policy Consequences May Outstrip SDI's Actual Capability. It is hard to recall a research effort that has generated political and policy fallout comparable to that associated with SDI. The SDI effort has in some measure undercut support for the United States' existing nuclear strategy at the same time that the country is decades away from an effective alternative to it. It has touched off a passionate political debate and threatens to provoke significant Soviet strategy and force posture changes before U.S. defense planners have concluded that a defensive system is even feasible, much less desirable. The result has been destabilizing in and of itself. This may suggest the need to lower the decibel level of the SDI debate. It may also suggest that both sides should forbear from overemphasizing the results of whatever demonstration experiments are conducted as part of the SDI effort. The gap between such experiments and an operational system is too enormous.

2.
GUIDANCE FOR NEAR-TERM DECISIONS

The U.S. public and its elected officials should focus for the present on the near-term decisions that must be made with respect to SDI: (1) Do the potential benefits of greater reliance on defensive systems justify more than a modest or token SDI research effort? (2) If so, what priority should that effort be accorded? (3) How should that effort be structured? (4) Can that effort be accommodated within the United States' existing treaty obligations and with its goal of negotiating substantial reductions in the number of offensive nuclear weapons maintained by the Soviets? One may look to the arguments of SDI critics for guidance. To a large extent, however, these arguments are directed toward the ultimate question of whether deployment of a ballistic missile defense system is in the U.S. interest. As shown below, while these arguments provide some useful criteria for making this ultimate decision, they are less useful as guidance for making near-term decisions.

The problems presented by ballistic missile defense are basically engineering problems, not problems of physics.

THE ARGUMENTS OF THE CRITICS

The System Will Not Work. One particularly unhelpful consideration in making near-term decisions on SDI is whether or not ballistic missile defense will "work." The SDI effort is, after all, a research program, justified precisely on the premise that substantial technical uncertainties must be resolved before any judgment can be made as to the feasibility of effective defense against ballistic missiles. To require proof of feasibility as a precondition for a research program is to put the cart before the horse.

This consideration might be a more forceful argument if it could be shown that ballistic missile defense would require a capability that the laws of physics simply will not permit or that is plainly beyond the nation's current engineering capability. Yet, so far at least, this does not appear to be the case. The problems are basically engineering problems, not problems of physics, and there is a substantial body of opinion that says they can be solved. Consequently, the only question is the particular manner, schedule, and cost of solution. These seem appropriate matters for inquiry, not prejudgment.

A variant of the "it won't work" argument is the claim that further work on SDI is a waste of money because it is simply far easier and cheaper to develop measures to defeat a ballistic missile defense system than it is to build one.

The United States should expect the USSR to protest any initiative that offers the prospect of improving U.S. relative military or political posture.

If true, this would be a serious objection to actual deployment of such a system. However, it seems wholly appropriate at this point to pursue a research program that would have as one of its tasks the exploration of this issue.

Finally, it is somewhat misleading to talk at all in terms of whether ballistic missile defense will work. As already noted, the concept of ballistic missile defense currently under consideration involves not a single weapon but a series of weapons using potentially different technologies. Some of these technologies (such as that required to intercept warheads during the reentry phase) involve much less uncertainty than others (such as the more exotic laser and directed-energy technologies). There is a tendency, on the part of those who argue that ballistic missile defense will not work, to point to the uncertainties associated with these latter technologies or to the monumental data-processing/battle-management capability required for a perfect defense against an all-out Soviet attack. This ignores, of course, the less uncertain prospects of some of the more conventional technologies involved and the option of deploying less-than-perfect systems.

The System Will Cost Too Much. In the same way that it is premature to prejudge the feasibility of a defense against ballistic missiles, it is also too soon to abandon the SDI effort on the grounds that actual deployment of such a defense would simply cost too much. The concept of "too much" suggests a judgment of capability weighed against cost. In order to make this judgment, one must know what the system could do, and that requires completion of the research effort. Further, estimates of cost much beyond order-of-magnitude calculations may be just too speculative at this time. All that should be asked for now is that, given other budgetary priorities, there be some reasonable proportionality between the amount of money spent on SDI and what that effort could potentially contribute to U.S. national security.

The Soviets Will Be Furious. It is also not helpful in making near-term decisions to focus on the official Soviet reaction to the SDI effort. This is largely because that reaction is so predictable. The United States should expect its principal adversary to protest any initiative that offers the prospect of improving the United States' relative military or political posture, especially in the all-important arena of strategic nuclear weapons. This is in fact what the Soviets have always done, whether the initiative was the MX, the development of cruise missiles, or the deployment of U.S. intermediate-range missiles in Europe. Why should anything different be expected regarding SDI?

It might be another matter if the U.S. SDI effort posed such a clear and present danger to real Soviet security interests as to risk provoking a hasty or ill-considered Soviet response. The amicable conclusion of the Geneva summit, considering President Reagan's unrelenting firmness on SDI, suggests that the Soviets do not presently view the U.S. effort in this light. As noted earlier, the development and deployment of even an imperfect ballistic missile defense system is sufficiently far off to allow the Soviets time to plan, and respond, accordingly.

Finally, some may argue that the United States should not pursue a research program on SDI for fear of provoking a comparable or even more ambitious Soviet effort. There is, however, substantial evidence that the Soviet Union is already making a comparable research effort. While the U.S. effort may cause

the Soviets to expand somewhat their own research program, there is no guarantee that a discontinuation or scaling back on the U.S. side would cause the Soviets to discontinue or scale back their program. To the contrary, the Soviets have traditionally been more defense oriented in their military planning than has the United States, having made, for example, a much greater commitment to air defense and civil defense. Continued research on ballistic missile defense, regardless of the U.S. effort, would be more consistent with this history.

SDI Will Destroy Arms Control. Critics also contend that the SDI effort will destroy the arms-control process between the United States and the Soviet Union. More specifically, they argue that the negotiation of substantial reductions in the level of strategic offensive forces cannot be achieved so long as the United States does not forgo its SDI effort. The merits of this argument are addressed later in this paper. Two points, however, should be noted here. The agenda of the arms-control process is broader than the issue of U.S. and Soviet strategic offensive weapons. Even given the arms-control logjam supposedly introduced by SDI, there is evidence that a U.S.-Soviet agreement on intermediate-range nuclear systems in Europe and Asia might be possible. The Stockholm talks on confidence-building measures continue, as do contacts on chemical weapons. More importantly, however, arms control is not an end in itself. It is only one means of dealing with the problem posed by Soviet possession of nuclear weapons. If greater reliance on defensive systems is a better way of dealing with this problem, then it might be sensibly chosen, even at the expense of negotiated restraints on strategic nuclear weapons.

Arms control is not an end in itself and is only one means of dealing with the problem posed by Soviet nuclear weapons.

Although the arguments of SDI critics offer little guidance for making near-term decisions on SDI, they do suggest a number of factors that would have to be considered before any ballistic missile defense system would actually be deployed. These include: How effective would the system be against a Soviet attack? What would the system cost? How would funding for ballistic missile defense affect other U.S. defense and domestic programs? How susceptible would the system be to Soviet countermeasures or to direct Soviet attack? How likely would the Soviets be to deploy such a system—whether or not the United States did? One objective of any SDI effort must be to put U.S. decision-makers in the position of being able to answer these questions.

THE ARGUMENTS OF THE SUPPORTERS

On the more immediate question of whether the potential benefits of greater reliance on defensive systems justify more than a token SDI effort, and what priority any such effort should be given, the arguments of SDI supporters provide some relevant guidance. They focus on what a ballistic missile defense system would contribute to U.S. nuclear strategy and force posture. By analyzing these arguments, some judgments can be made about the nature and significance of the contribution that can plausibly be expected from ballistic missile defense. If the potential contribution is significant, it is probably justifiable to proceed with a substantial research effort and afford it some measure of priority.

SDI Will Free the United States from the Threat of Nuclear War. President Reagan initially described the objective of what became the SDI effort as the

ability to render nuclear weapons "impotent and obsolete." As recently as the State of the Union speech on February 4, 1986, he asserted that "[a] security shield can one day render nuclear weapons obsolete and free mankind from the prison of nuclear terror." Supporters of SDI have used the same image, sponsoring advertisements in cartoon form that show an American family smiling under a rainbow-like "peace shield" protecting it from nuclear attack.

These are images of great political power and appeal. They respond to real concern, which has increased as the nuclear arsenals of the two sides have grown, about the potential consequences of a failure in the current system of "deterrence through promise of retaliation." What if the prospect of an assured retaliatory strike by the United States was not sufficient to deter a Soviet first strike? The promise of the peace shield is that it would free the United States from the consequences of nuclear attack; that it would return to the United States control over its own national survival; that the United States would no longer be dependent upon the "deterrence calculation" of the Soviet Union and upon Soviet forbearance from using its nuclear arsenal.

A unilateral U.S. deployment of an effective ballistic missile defense system could, at least theoretically, provide some kind of superiority.

The problem is that the current SDI effort does not promise all these things. It does not seek a defense against the Soviet air-breathing threat. Further, to the extent the peace shield provided only an imperfect defense against ballistic missiles, the nuclear threat would remain substantial indeed. If the justification for SDI rested solely on the promise of rendering nuclear weapons "impotent and obsolete," the implausibility of that promise might lead one to question the size of, and the priority already accorded to, the SDI program. A substantial SDI effort, particularly in light of Gramm-Rudman, requires a much more realistic rationale.

SDI Will Restore U.S. Strategic Nuclear Superiority. Some SDI supporters find this rationale in the contention that the deployment of a ballistic missile defense might restore U.S. strategic nuclear superiority. They hearken back to a time in the late 1940s and early 1950s, when the United States had either a nuclear monopoly or, once the Soviets acquired nuclear weapons, a clear numerical advantage in long-range bombers that were then the only means of delivering those weapons. Although President Reagan has disavowed any intention of seeking U.S. strategic nuclear superiority, it is still fair to ask whether SDI offers any realistic prospect of a return to anything like the former U.S. advantage—and of what this new superiority would consist.

(i) A Unilateral U.S. Deployment

A unilateral U.S. deployment of an effective ballistic missile defense system could, at least theoretically, provide some kind of superiority. For example, it might allow the United States to contemplate launching a limited strategic nuclear attack with some confidence that the remainder of its nuclear arsenal would deter the Soviets from all-out retaliation—and that any more limited Soviet response could be handled by the U.S. ballistic missile defense system (coupled with some enhanced air-defense capability). Regardless of whether the United States would ever take such an action, the capability to do so could result in at least a perceived margin of superiority for the United States in the strategic arena.

However, even assuming that the United States could achieve anything near the kind of system effectiveness that this scenario would require, it is unlikely that the Soviets would permit such a unilateral U.S. deployment. The Soviets have already stated that they would view any U.S. deployment as an effort to convert strategic offensive forces into first-strike weapons and that they would not permit such a result. The better assumption, therefore, is that any deployment of even a marginally effective ballistic missile defense system is likely to be two-sided, with systems deployed by both the United States and the Soviet Union. Would a two-sided deployment permit a return to U.S. strategic nuclear superiority? Although it might be contended that the Soviets would be unable to deploy a ballistic missile defense system in the first place (or one of any significant effectiveness), history suggests that, while it may take an enormous effort, the Soviets could ultimately develop and deploy a passable system—even a system of considerable technical sophistication. The United States might enjoy a substantial head start, which could translate into a temporary U.S. advantage, but it is likely that the Soviets would eventually catch up.

Any deployment of even a marginally effective ballistic missile defense system is likely to be two-sided, with deployment by both the U.S. and USSR.

(ii) A More Effective U.S. System

A possible source of a more permanent, if less substantial, U.S. advantage would be a U.S. system more effective than that deployed by the Soviets, whether by virtue of superior U.S. technology or differences in the geography and environment of the two countries. If this greater effectiveness could be maintained, it could offer the prospect of a permanent margin of U.S. superiority. Some SDI supporters argue that one of the deficiencies in the current U.S. strategic posture is that the Soviets have greater war-fighting capability. The concern is that a greater Soviet investment in air defense, civil defense, and offensive weapons able to successfully attack U.S. strategic nuclear forces has put the USSR in a position to survive a U.S.-Soviet nuclear exchange with substantially less damage and fewer casualties. This would permit the Soviets, the argument continues, to credibly threaten the use of their nuclear weapons in time of crisis. It can be argued that a more effective U.S. system of ballistic missile defense would not only correct this imbalance but also shift the advantage in the direction of the United States. Presumably, this would permit the United States to threaten more credibly the use of its own nuclear weapons in time of crisis. Yet substantial uncertainties remain.

U.S. ability to contemplate realistically a more effective ballistic missile defense system will depend on the progress of U.S. and Soviet technology over the next five to fifteen years, the timing of deployment decisions, and the specifics of the systems deployed. The numbers of warheads deployed by the two sides on their ballistic missiles are so large (about 8,000 by the United States and over 9,000 by the Soviet Union) that the U.S. system would have to be quite effective before any marginal advantage would have any real significance. If the U.S. system allowed 1,000 warheads to leak through, could it credibly threaten with its strategic nuclear weapons? Even if the U.S. system is twice as effective as the Soviet system, is the United States in any better position simply because 1,000 warheads leak through its system while 2,000 leak through the Soviet's?

(iii) More Emphasis on Air-Breathing Systems

A margin of U.S. strategic superiority might alternatively be based on a renewed emphasis on bombers and cruise missiles, which ballistic missile defense would inspire. This would seemingly tend to favor the United States. This country currently does have a modest lead in the number of heavy bombers (about 241 U.S. B-52G and B-52H aircraft to 170 Soviet Bears and Bisons) and plans to add 100 B-1B bombers by about 1990. The United States is also conceded to have a lead in long-range nuclear-armed cruise missiles for deployment on bomber aircraft, submarines, and surface ships.

The U.S. lead in cruise missiles may be only a head start, not a permanent advantage.

There are a number of reasons, however, to think that the prospect of any permanent U.S. advantage—much less, superiority—based on this rationale is illusory. The Soviets are producing a new variant of one bomber (the Bear H) and are building another (the Blackjack). Deployment of the latter is expected in quantities comparable to the B-1B, although at a somewhat slower rate (with a deployment of perhaps 40 to 50 aircraft by 1990). Further, if medium-range bombers are included in the comparison, any U.S. advantage shifts decisively toward the Soviets, with 500 Soviet Badgers, Blinders, and Backfires outnumbering the 56 U.S. FB-111As. Thus, to the extent medium-range bombers—particularly Backfires—are considered to be strategic systems, any U.S. bomber advantage is unreal. So far as cruise missiles are concerned, the Soviets appear to have comparable programs underway. The Soviets also have a roughly comparable, if not greater, number of platforms on which to deploy cruise missiles. Thus, the U.S. lead in cruise missiles may be only a head start, not a permanent advantage.

(iv) More Emphasis on SLBMs

A different argument for U.S. strategic superiority might be made based on the superiority of the U.S. SLBM force. If it could be shown that the trajectories or other flight characteristics of SLBMs and their warheads make these missiles less susceptible than ICBMs to ballistic missile defense, the U.S. quantitative lead in the number of warheads in its SLBM force (5,728 to 2,892 as of 1985) could provide some measure of advantage. This lead is, however, in large part due to the earlier U.S. effort to equip its SLBMs with multiple independently targetable reentry vehicles (MIRVs). A Soviet SLBM MIRVing program is proceeding apace. Thus, this U.S. advantage may be only a temporary lead.

U.S. submarines are, however, much harder to detect than their Soviet counterparts, are generally deployed more flexibly, and operate at greater distances from the U.S. homeland. Thus, they may be deployed nearer the Soviet Union, decreasing their time to target when compared to Soviet ICBMs or even SLBMs. To the extent that this reduced flight time (and perhaps lower trajectory) makes them harder to detect, track, and kill (at least by area- or population-defense systems), the United States might have some claim to a qualitative strategic superiority. This advantage would be enhanced by the deployment of the D-5 missile, which will have substantial capability against Soviet land-based missiles and other hard targets. Counterbalancing any advantage over Soviet SLBMs, however, is the relatively higher proportion of major U.S. cities located on its ocean coasts.

(v) Summary

Regarding deployment of ballistic missile defenses by both the United States and the Soviet Union, any supposed margin of U.S. strategic nuclear superiority appears at present to be only a matter of speculation. One would be hard pressed to justify a substantial SDI effort on this basis alone—assuming, President Reagan notwithstanding, that the United States did want to pursue such superiority. Further research and analysis may provide greater insight into the possibility of such a margin of U.S. superiority.

SDI Will Enhance Extended Deterrence. A margin of strategic nuclear superiority would not be an end in itself. Rather, it would be a means to enhance the security of the United States and its allies. Historically, the United States has used its strategic nuclear weapons not only to deter Soviet nuclear attack but also to deter a conventional attack by Soviet army and air-force units on U.S. allies in Europe and Asia. The United States has declared that if the Soviets launched such a conventional attack (one that many analysts believe would meet with quick success), the United States would consider responding with nuclear weapons—tactical nuclear weapons first, but including also the possibility of strategic nuclear weapons launched against the territory of the Soviet Union. For this "extended deterrence" strategy to be effective, the U.S. threat to use its nuclear arsenal must have some credibility. The question is whether deployment of ballistic missile defenses would enhance or reduce the credibility of this threat and, with it, extended deterrence.

The question is whether deployment of ballistic missile defenses would enhance the credibility of the U.S. threat to use nuclear weapons.

As already discussed, a unilateral U.S. deployment of an effective ballistic missile defense system (coupled with enhanced air-defense capability) might help the United States to threaten credibly a limited use of strategic nuclear weapons in response to Soviet conventional attack. The balance of the U.S. strategic arsenal would deter all-out Soviet retaliation, and U.S. defense systems would handle any more limited response. As already pointed out, however, a unilateral U.S. deployment is not likely.

It is also hard to see how any margin of superiority that the United States might acquire under a two-sided deployment could contribute much to enhancing extended deterrence. A substantially more effective U.S. system offering comparatively greater protection of U.S. population and territory might arguably enhance the credibility of the U.S. nuclear threat. However, the number of Soviet nuclear warheads deployed is now so high that, unless that system was very effective indeed, the number of warheads likely to penetrate a Soviet attack would still be large enough to render the credibility of the United States' threat somewhat suspect.

Even if the U.S. and Soviet systems achieved roughly comparable and fairly high levels of effectiveness, it is possible that the systems would differ in their effectiveness against certain kinds of attacks (for example, against close-in SLBMs) that would favor the United States. This might enhance the credibility of a U.S. threat to respond with these kinds of attacks in the event of a conventional Soviet attack. At this point, however, such possibilities are quite speculative.

Ballistic missile defenses might, indeed, erode the credibility of the U.S. threat. If the U.S. system was fairly effective against low-level strategic nuclear attacks

but became relatively ineffective above a certain threshold, this might make *less* credible a U.S. threat to use strategic nuclear weapons for extended deterrence. For the size of the U.S. attack to be effective, it would have to be so substantial that it would in all likelihood inspire an all-out Soviet retaliation that U.S. defenses could not handle.

In sum, ballistic missile defense does not appear to offer the prospect of a major breakthrough that would enhance the U.S. ability to use nuclear weapons to deter conventional attacks and thereby contribute to extended deterrence. It may increase somewhat the credibility of the U.S. threat, but the precise manner and extent of this contribution is quite speculative. While the issue warrants further research and analysis, as yet it appears to be an uncertain basis of support for the SDI effort.

Ballistic missile defense might ease the problem of the potential vulnerability of the U.S. ICBM force and other high-priority targets.

SDI Will Improve Crisis Stability. The concept of crisis stability offers a separate rationale for the SDI effort. Although not part of the justification offered by the president in his March 1983 speech, it was part of his speech to the European Parliament in early May 1985. In that speech President Reagan characterized the Soviet nuclear forces as "clearly designed to strike first, and thus disarm their adversary," thereby "undermining stability and the basis for mutual deterrence." He reviewed three alternative responses. The first would be to press the Soviets to reduce these forces through equitable, verifiable arms-control measures—an effort already being made at the negotiations in Geneva. The second would be to step up the United States' own modernization efforts to keep pace with Soviet deployments. As to this alternative, President Reagan said: "Even if this course could be sustained by the West, it would produce a less stable strategic balance than the one we have today." Instead, the president proposed "to offset the continued Soviet offensive build-up in destabilizing weapons by developing defenses against these weapons."

This is a rationale for the SDI effort that is consistent with its scope—defense against Soviet ballistic missiles. The rationale is a part of the overall goal of improving crisis stability. In a simplified form, this means eliminating any military advantage to being the side that initiates a nuclear attack. Conversely, it means having confidence in the ability of one's own nuclear forces to survive such a first strike and to execute a devastating retaliatory second strike on the other side.

Ballistic missile defense potentially could enhance crisis stability in several ways. First, it could ease the problem of the potential vulnerability of the U.S. ICBM force and other high-priority targets. In the 1970s the Soviets deployed ICBMs (the SS-17, SS-18, and SS-19) much greater in size than their U.S. counterparts. When MIRVed or fitted with multiple nuclear warheads capable of hitting separate and distinct targets, these Soviet missiles carried 4, 10, and 6 warheads, respectively. Concern developed that with improvements in the accuracy of these MIRVed ICBMs, the Soviets would, in time of crisis, be tempted to launch a preemptive attack against high-priority civil and military targets, including the U.S. ICBM force.

Over the last decade a debate has raged over the plausibility of this preemptive attack scenario and how serious a problem ICBM vulnerability is for the overall

U.S. strategic nuclear force. The Scowcroft Commission report in 1983 suggested that the concern about ICBM vulnerability was overblown. That being said, it still persists as a problem, though of arguable dimensions.

The Carter administration sought to solve this problem by deploying the MX missile in a survivable basing mode, called the racetrack. However, the Reagan administration rejected this approach. It attempted to find its own survivable basing mode for the MX, including dense pack. Technical, environmental, or political problems intervened, however, until the search was finally abandoned. SDI, by contrast, offered a solution to ICBM vulnerability that seemed environmentally sound (President Reagan has continually emphasized that the system would be nonnuclear), politically acceptable (passing as it artfully does as a way to render nuclear weapons "impotent and obsolete"), and technically feasible. Of all the capabilities that are part of the current SDI effort, a site-defense system attacking incoming warheads in the reentry phase seems to be the most appropriate for defense of U.S. ICBM fields. It also involves the least technical risk and could be available for earliest deployment.

A site-defense system attacking incoming warheads in the reentry phase seems to be the most appropriate capability for defense of U.S. ICBM fields.

The Soviets may also be interested in a site-defense system to defend their own ICBMs. The deployment of the MX missile into old Minuteman silos, and of the D-5 missile into U.S. ballistic missile submarines, will vastly improve U.S. capability to destroy Soviet ICBMs. Since the Soviet Union has a much more significant investment in its fixed land-based systems than the United States does (6,420 warheads to 2,126 in 1985, and vastly greater throwweight), the deployment of a defense for fixed ICBMs may be more important to the Soviets. Indeed, it might be asked why the United States should encourage a system that will serve to defend a Soviet investment in the very weapons that give the United States greatest concern. The answer may be crisis stability. Because they are the most accurate, the most reliable, and the most vulnerable, ICBMs are both the best Soviet first-strike weapon and the one—because of their vulnerability—they would be most likely to use. Thus, the United States may have some interest in letting the Soviets reduce the vulnerability of these systems, at the same time that the United States reduces the vulnerability of its own, so as to reduce the incentives for a Soviet first strike with these weapons.

Other aspects of the SDI effort providing not just site defense but also broader area or population defense (such as systems for boost-phase or midcourse intercept) could also contribute to crisis stability. They could complicate a Soviet first strike by denying the Soviets confidence that they could succeed in destroying the targets of their choosing. Further, to the extent that these defenses are effective against ballistic missiles, they create some incentive to both sides to move toward aircraft and cruise missiles. Because these weapons take so much longer to reach their targets, they are less suitable as first-strike weapons. Finally, imperfect area defenses of modest effectiveness also may deter small nuclear attacks. Neither side would run the risk of such attacks if they could not be effective. Yet a larger attack would run the risk of provoking greater (and unacceptable) retaliation. Thus, area defenses might "raise the nuclear threshold" and decrease the likelihood of resort to strategic nuclear weapons (although, as has been discussed, this will erode the credibility of extended deterrence).

Three caveats should be observed. First, it may be argued that the instability caused by Soviet land-based ballistic missiles will gradually disappear. With their new SS-24 and SS-25, the Soviets appear to be moving away from silo-based missiles toward mobile missiles, which are less vulnerable. It may be further argued that mobile Soviet ICBMs will of necessity be smaller, of lower throwweight, and therefore less threatening to the United States. While these trends are to be encouraged, they will not eliminate the threat to U.S. ICBMs. Further, it is likely to be politically more difficult for the United States to deploy mobile ICBMs than for the Soviets. Even should it deploy mobile ICBMs, the United States might still need to deploy the defense systems for them. Second, it seems unlikely that ballistic missile defenses will achieve such effectiveness as to render ballistic missiles obsolete. Thus, while greater emphasis may be placed on air-breathing systems, ballistic missiles are likely to continue for some time to be the backbone of the weapons inventory of the two sides. Third, if area defenses achieve too much effectiveness, they may begin to threaten crisis stability. Either side may lose confidence that it would retain enough capability after a first strike to conduct effective retaliation. This, in turn, might generate renewed pressure for a first strike.

Even without any other justification the U.S. would need some sort of SDI research effort simply because of the existing Soviet program.

In sum, crisis stability seems to offer the most concrete and plausible rationale for the SDI effort. Even this is somewhat problematic, however, and seems to favor technologies for site defense over the more exotic space-based technologies for area or population defense.

SDI Will Limit Damage If Deterrence Fails. A very straightforward argument on behalf of ballistic missile defense is that it would save U.S. lives in the event that "deterrence through promise of retaliation" fails and nuclear war starts. This would appear of itself to be an almost unassailable argument for pursuing SDI, and particularly the population-defense elements, so long as it did not increase the likelihood of a failure of deterrence or enhance the incentives of either side to launch a first strike. That consideration aside, the ultimate decision to deploy such a system would turn on a simple judgment that the number of lives potentially saved justified the cost of the system. Yet this rationale need not stand alone. Their potential contribution to crisis stability already provides a plausible and persuasive rationale for pursuing a significant SDI research effort in area-defense technologies. The prospect that these technologies would reduce the loss of life in the event of nuclear war provides an additional reason for pursuing that effort.

SDI Will Protect the United States Against Nuclear Accident. It can be argued that even a very imperfect ballistic missile defense system could provide some protection in the event of an accidental Soviet launch of a small number of ballistic missiles. This rationale alone probably would not justify much of an SDI research effort. However, there is certainly no reason why the effort that is made should not have as part of its charter investigation of thin defenses for handling accidental attacks.

The United States Needs to Hedge Against a Soviet Breakthrough. Even without any other justification the United States would need some sort of SDI research effort simply because of the existing Soviet program. A Soviet breakthrough in ballistic missile defense technology, which enabled it to deploy unilaterally

even an imperfect system significantly in advance of the United States, would run the risk of affording the Soviets a margin of superiority in the strategic nuclear arena.

TENTATIVE NEAR-TERM GUIDELINES

Based on the preceding discussion it seems fair to say that SDI promises much less than some of the claims made on its behalf. As presently conceived, it does not offer in the foreseeable future a realistic prospect of rendering nuclear weapons "impotent and obsolete." Such an ambitious goal would require that the program be expanded to include research into improving the technology for, and prospects of, defense against bombers and particularly cruise missiles.

Nevertheless, three separate arguments in support of SDI, when taken together, seem to justify a significant ballistic missile defense effort given corresponding priority. These arguments focus on SDI's potential contribution to: (1) crisis stability, (2) limitation of damage to the U.S. territory and population in the event of nuclear war (even if a peace shield is a somewhat unrealistic objective), and (3) protection against an accidental Soviet launch of ballistic missiles. It is in these arguments that guidance can be found for making near-term decisions on SDI.

Research is needed into the way likely U.S. and Soviet systems and technologies would respond to different kinds of offensive forces and attack scenarios.

Given the crisis stability rationale (the argument for reduced vulnerability of U.S. ICBMs, in particular), the technologies supporting site defense should probably have priority. Area-defense technologies should be pursued that would limit damage and protect against accidental launches. The payoff in the medium term from these technologies, however, may be small.

The SDI effort should examine potential differences in effectiveness between possible U.S. and Soviet ballistic missile defense systems. It should in particular consider any inherent factors, geographical or other, that may suggest permanent differences in performance in the systems of the two sides. Research is also needed into the way likely U.S. and Soviet systems and technologies would respond to different kinds of offensive forces and attack scenarios (such as close-in SLBM attack). It may be that a basis for a margin of U.S. superiority can be found here.

U.S. defense planners must understand clearly the potential vulnerabilities of, and countermeasures against, various ballistic missile defense systems. The SDI effort should include a vigorous "red team" approach to studying the vulnerability of such systems to attack as well as possible Soviet responses, including likely countermeasures and the cost of such countermeasures. Finally, the United States must monitor Soviet efforts in this field so as to be able to plan and respond effectively.

3.
SDI AND ARMS CONTROL

If a significant SDI research effort seems justified and entitled to some measure of priority, the remaining near-term issue is the relationship between that effort and arms control. This issue has two parts: (1) Is an SDI research effort consistent with the United States' declared objective of negotiating substantial reductions in the numbers of strategic nuclear weapons deployed by the Soviet Union? and (2) Can a significant SDI research effort be conducted consistent with the terms of the ABM treaty?

SDI NEED NOT NIX REDUCTIONS

There is ample precedent for limiting offensive forces pursuant to an agreement of relatively short duration.

SDI critics strongly argue that negotiations with the Soviets on strategic offensive forces will remain deadlocked until the United States gives up its SDI effort. Since one response to a ballistic missile defense is to overwhelm it by deploying additional numbers of offensive weapons, these critics argue that the Soviets will resist any further limitation or reduction in offensive weapons in order to preserve this option in the event the United States should deploy such a defense. This is certainly the position the Soviets have taken to date in the Geneva negotiations. But must it be so?

Because deployment of even an imperfect defense against ballistic missiles is from one to two decades away, is there any reason that the United States and the Soviet Union could not agree now to further interim restraints and even substantial reductions in offensive forces? The interim agreement limiting strategic offensive arms, which was part of the 1972 SALT I agreement, was to remain in effect for only five years. The SALT II treaty, signed on June 18, 1979, was to remain in force only through December 31, 1985. There is ample precedent, therefore, for limiting offensive forces pursuant to an agreement of relatively short duration. At the expiration of such an agreement each side would still have time to respond, if it chose, to the other's greater reliance on defensive systems with deployment of additional offensive weapons.

The feasibility of such a short-duration agreement is enhanced by the provisions of the Anti-Ballistic Missile Treaty, signed by the United States and the Soviet Union in 1972. These provisions keep the parties from moving very far toward deployment of substantial ballistic missile defenses. They deal somewhat differently, however, with ballistic missile defense systems (or components of

such systems) that are deployed in a fixed, land-based mode and those that are deployed in some other mode (such as basing in space).

As to fixed, land-based systems or components (such as are envisioned for site defense and attacking warheads in the reentry phase), Article III of the ABM treaty prohibits deployment except at two sites—one centered on each side's national capital and one centered on an ICBM field. The number of launchers and radars that may be located at each site is constrained. (A protocol signed two years after the treaty limits the parties to deployment at only one of the two sites at any one time.) Development and testing of these systems or components is permitted under Article IV, as long as this is done within certain agreed test ranges and provided that a total of no more than 15 launchers are present at these test ranges. However, even though development and testing are permitted, deployment of a substantial system would still require up to ten years, even if deployment restrictions were lifted. As to systems or components in other deployment modes, Article V provides that the parties shall not "develop, test or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based." Thus, not only is deployment totally banned, but so are the development and testing that would be essential if a system of any consequence was to be deployed in anything less than fifteen years or so.

The parties could agree that no notice of withdrawal from the ABM treaty may be given while the agreement on offensive arms remains in effect.

Thus, in addition to the protection of a one- to two-decade period before the technology and engineering would permit actual deployment of ballistic missile defenses, as long as the provisions of the ABM treaty continue to have effect, both parties will be precluded during the period of any short-duration agreement on offensive weapons from deploying such defenses to any signficant extent or from moving to a point from which such deployment could be accomplished in short order. The parties would have a period of at least ten years—and for other than fixed, land-based systems and components, perhaps much longer—in which to adjust their forces even if the ABM treaty was abrogated on the same day as the offensive arms agreement expired.

What the Soviets presumably would want to avoid is a situation in which they would be bound by a short-duration agreement on offensive arms while the United States withdrew from the constraints of the ABM treaty. The ABM treaty is of indefinite duration—it has no expiration date. However, Article XV provides that either party has the right to withdraw from the treaty on six months prior notice "if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests." The parties could agree as part of the agreement on offensive arms to amend this provision (pursuant to Article XIV) to increase the advance notice period to a period roughly equivalent to the duration of the offensive arms agreement. Alternatively, they could provide that no notice may be given while the agreement on offensive arms remains in effect. If the Soviets remained concerned about the adequacy of the time to respond to any U.S. withdrawal from the ABM treaty, the notice provision could be further amended to provide that, even after notice, withdrawal could not occur for one or two years thereafter.

The risk of this approach, particularly for the United States, is that it prevents either party from escaping the limitations of the ABM treaty even if confronted

with substantial cheating by the other side. Further, the United States in particular would probably want a provision permitting the parties to withdraw from the ABM treaty if the Soviets either failed to abide by the agreement on offensive arms or if they formally withdrew from that agreement. This would permit the United States to respond to a Soviet offensive buildup with ballistic missile defense.

A possible accommodation of these competing perspectives might be as follows:

—The ABM treaty would be amended to extend by a modest amount the notice period of the current withdrawal provision (for instance, to one or two years).
—The ABM treaty would be further amended to provide that either party could immediately withdraw from that treaty in the event that the other party gave notice of withdrawal from the agreement on offensive arms.
—The agreement on offensive arms would be written with a withdrawal provision modeled upon Article XV of the ABM treaty and include a one- or two-year notice period.
—In addition, the agreement on offensive arms would also provide that either party could immediately withdraw in the event that the other party gave notice of withdrawal from the ABM treaty.

A way can be found to give the kind of assurances required to permit a short-duration agreement on offensive arms, even while the SDI research effort continues.

The particular mechanism of accommodation aside, the point is that a way can be found to give the kind of assurances required to permit a short-duration agreement on offensive arms, even while the SDI research effort continues. Linking such an agreement to the ABM treaty might also provide the face-saving formula required to permit General Secretary Gorbachev to accept the agreement, notwithstanding his prior insistence on the abandonment of SDI as a precondition to such an agreement.

It is certainly true that even the possibility of an ultimate shift to deployment of ballistic missile defenses may make both sides less enthusiastic about deep reductions in offensive force levels. In addition, it would undoubtedly have some effect on force structure decisions. Defense Secretary Weinberger is on record (in his report on Soviet violations of arms-control agreements, given to President Reagan prior to the Geneva summit) as saying that even a "probable" Soviet area ballistic missile defense would require an increase in the number of U.S. offensive forces and the ability of these to penetrate Soviet defenses. This concern may in part be behind his reluctance to dismantle Poseidon submarines as their Trident replacements become operational, since ballistic missile submarines take so long to build. This concern may push both sides to retain more obsolete systems in their inventory rather than to retire them. Nevertheless, both sides have reason to be confident that they could respond promptly to a collapse of the ABM treaty with an increase in offensive forces—the United States, through proliferation of cruise missiles; the Soviet Union, through ICBMs (since it is rarely without some ICBM in production). In short, some offensive arms agreement, though perhaps more modest in scope than initially sought by either side, should still be achievable.

Indeed, such an agreement may even be attractive to the Soviets. Some 74 percent of the people interviewed in an opinion poll taken in the United States

last November said that they would "rather have the United States and the Soviet Union agree to reduce their nuclear arsenals than for the United States to develop space weapons." Although the Soviets to date have insisted that the United States give up SDI as a precondition to any agreement on offensive weapons, these poll results suggest the possibility of a more subtle approach. The Soviets might conclude that an agreement entailing substantial reductions in offensive force levels would undercut political support in the United States for SDI. Further, as the expiration date of the agreement approached, the Soviets could create substantial negotiating leverage by offering to extend the agreement in return for a U.S. commitment not to withdraw from the ABM treaty. The United States would have an incentive to accept this arrangement so as not to forfeit the reduced levels of offensive forces.

In the near term the potential conflict between the SDI effort and the ABM treaty ought to be manageable.

The foregoing may suggest to the most avid proponent of SDI that it would be a mistake for the United States to agree to a new arms-control agreement on offensive arms precisely because it might threaten the U.S. commitment to ballistic missile defense. Yet in the same way that arms control is not an end in itself, neither is ballistic missile defense. To the extent that the principal rationale for the SDI effort is crisis stability, its primary purpose is to deal with the threat posed by Soviet ICBMs. To the extent this threat can be sufficiently reduced by negotiated arms-control agreements, U.S. national-security objectives might thereby be achieved without the cost and risks of ballistic missile defense.

THE ABM TREATY NEED NOT NIX SDI

A significant issue in the SDI debate has been whether the SDI effort can be pursued consistent with the terms of the ABM treaty. In the near term the potential conflict between the SDI effort and the ABM treaty ought to be manageable.

It seems clear that all phases of the system of ballistic missile defense currently envisioned by U.S. force planners are subject to the ABM treaty. Article II of the treaty defines an ABM system to mean "a system to counter strategic ballistic missiles or their elements in flight trajectory." Nothing in the treaty or in the agreed statements or common understandings defines what is meant by "elements" of the ballistic missile or "in flight trajectory." Absent some basis for giving these terms a more limited or specialized meaning, Article II would seem to include as an ABM system any system that counters strategic ballistic missiles or their warheads at any point in their flight path—from boost phase, through midcourse, to reentry.

It is worth noting that two kinds of systems are excluded from the definition of ABM system and, thus, are apparently not covered by the treaty. First, the definition is limited to systems to counter strategic ballistic missiles. This would suggest that the treaty does not cover systems to counter tactical ballistic missiles. Second, the ballistic missile must be countered "in flight trajectory." This would suggest, theoretically, that a satellite system designed to attack strategic ballistic missiles in their silos prior to launch would not be covered by the treaty. Both exclusions represent potential avenues for circumventing

the limitations of the treaty. A system to counter tactical ballistic missiles would seem to have inherent capability against strategic ballistic missiles; a satellite system capable of attacking strategic ballistic missiles in their silos, if coupled with appropriate detection and tracking capability, would also have "in flight" capability against those missiles.

Although all phases of the current concept of ballistic missile defense appear subject to the ABM treaty, it does not seem likely that treaty provisions will seriously constrain the SDI effort over the near term (the next three to five years). As argued earlier, crisis stability appears to be the most plausible and compelling rationale for the U.S. SDI effort, and that would seem to emphasize site defense of fixed, high-priority targets. To date, such defense has generally been viewed as the province of fixed, land-based systems. As already noted, Article IV of the ABM treaty permits the development and testing of those systems or their components, requiring only that the actual hardware be located at agreed test ranges and that no more than a total of 15 launchers be located at those ranges. It is not clear why these limitations would constrain the SDI effort on site defense in the near term.

Depending upon how it is understood, Article V at least arguably imposes some constraint upon the SDI effort.

A more difficult problem is posed by systems or components for area defense. These could involve space-based elements, and the parties agreed in Article V not to "develop, test or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based." Nowhere in the treaty or the agreed statements and common understandings are the terms "develop, test or deploy" defined. Assuming that they refer to what is a typical development cycle, so far as U.S. weapons systems are concerned, the language would appear to forbid what is called full-scale or engineering development—the development of a weapons system into an operational form that could be put into production for deployment in the field. The placing of the word "test" between "develop" and "deploy" presumably would mean that it is the testing of the operational system resulting from the development effort that is proscribed. Thus, the earliest point in the development cycle that would appear to be subject to Article V is full-scale or engineering development. For satellite systems this would probably not arise for up to ten years.

But there is a problem. Article V bars not only development and testing of ABM systems but also the components of those systems. Nowhere is the term "component" defined. Depending upon how it is understood, Article V at least arguably imposes some constraint upon the SDI effort—particularly demonstration tests of new satellite technologies.

Perhaps because of this concern, in October 1985 certain members of the Reagan administration advanced an interpretation of the ABM treaty that would have permitted development and testing of satellite systems. It relied on Agreed Statement D of the ABM treaty, which provided that "[i]n order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III," the parties agreed that "in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion . . . and agreement" pursuant to the provisions of the treaty.

Based on this agreed statement, it was contended that systems and components involving lasers, directed-energy weapons, and other exotic SDI technology were "based on other physical principles" for purposes of Agreed Statement D and were subject only to a limitation on deployment—not development or testing. In order to reach such a conclusion, however, the language of Article V—undertaking not to "develop, test or deploy" ABM systems or components that are "sea-based, air-based, space-based, or mobile land-based"—would have to be interpreted to be restricted to systems or components *not* based "on other physical principles." Nowhere in the text of Article V, the agreed statements, or the common understandings is there any suggestion of such a restriction, however. Further, it would have to be concluded that the provisions of Article III, restricting the parties to two sites for deploying ABM systems, *did* apply to systems or components based on "other physical principles." Otherwise, even the deployment of these systems would be unconstrained. Both articles are equally silent on whether they apply to systems and components based on "other physical principles," however, and there is no basis in their language for reading them differently on the point. There may be more basis of support, not yet made public, for this proposed interpretation in the negotiating record of the treaty. Nonetheless, the effort was premature and represented the wrong approach.

The ABM treaty could provide a vehicle for a negotiated transition to greater reliance on defensive systems.

The place to start in solving the problem of possible restraints on work involving ABM components is a detailed examination of the specifics of the SDI effort—of what steps are likely to raise questions about component development and testing. Such an examination is beyond the scope of this paper, but the approach should be one of dealing with particular issues, not a broadbrush reinterpretation of the treaty itself. This is because the ABM treaty is an ally of the U.S. SDI effort. It may be that the United States will conclude that development, testing, and deployment of space-based systems for area ballistic missile defense is not in the U.S. interest, whether because of cost or feasibility, or for other reasons. Should this be determined, it may be in the U.S. interest to use the provisions of Article V of the ABM treaty to forestall a Soviet effort in this area. The United States should not be creating loopholes that it is the Soviets who will exploit.

In the area of site defense the ABM treaty works even more clearly to the United States' near-term advantage. The recent joint report of the secretaries of defense and state on Soviet ballistic missile defense efforts suggests strongly that it is the Soviet Union, rather than the United States, that is in a better position to deploy large-scale land-based systems for ballistic missile defense. This advantage would be based on the use of the ABM complex around Moscow (which is being upgraded), the large Soviet network of early-warning radars, the development of rapidly deployable ABM components, and the ABM potential of the Soviet air-defense network (including the SA-10 and the SA-X-12). The United States has an interest in continuing to preclude such deployments, pending determination of its own interest in land-based ballistic missile defense. This is why it is important to press the Soviets hard about their deployment of the large phased-array radar at Krasnoyarsk, which appears to violate the provisions of Article VI of the ABM treaty requiring that early-warning radars be deployed only along the periphery of a party's national territory and that they be oriented outward.

Finally, the Reagan administration has indicated a preference for a negotiated transition to greater reliance on defensive systems. Without such a negotiated transition there is a risk that one side or the other will take actions in the area of defenses that would adversely affect crisis stability and seriously threaten the other side. The ABM treaty could provide the vehicle for this negotiated transition. The parties could negotiate relaxations in the provisions of the treaty to permit agreed upon development, testing, and deployment of ballistic missile defenses in a way that would not threaten stability. By a somewhat ironic twist, the parties would be seeking to foster stability by negotiating the relaxation of the very restraints that were originally viewed as the guarantors of such stability.

CONCLUSION

The SDI effort, the ABM treaty, and the U.S. effort to negotiate substantial reductions in the force levels of Soviet strategic nuclear forces—and, particularly, of Soviet land-based missiles—can be complementary tools for achieving largely common goals. SDI could provide either a technical solution for easing the problem posed by Soviet missiles, or it could furnish the United States with the negotiating capital for accomplishing the same result through arms control. In the interim the ABM treaty preserves the status quo in ballistic missile defense, pending the outcome of the United States' own research efforts. It will then offer a vehicle for making the transition to a defense-oriented world—should that indeed be the world the United States chooses.

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TABLE 1
SOVIET STRATEGIC SYSTEMS

SLBMs

System	Platforms	Missiles per Platform	Total Missiles	Warheads per Missile	Total Warheads	Yield per Warhead	Total Yield
Typhoon	3	20 (SS-N-20)	60	9	540	200KT	108 MT
D-IV	1	16 (SS-N-23)	16	9	144	200KT[e]	28.8MT
D-III	14	16 (SS-N-18)[b]	224	7	1,568	200KT	313.6MT
D-II	4	16 (SS-N-8)[c]	64	1	64	800KT	51.2MT
D-I	18	12 (SS-N-8)[c]	216	1	216	800KT	172.8MT
Y-II	1	12 (SS-N-17)	12	1	12	1MT	12 MT
Y-I	21	16 (SS-N-6)[d]	336	1	336	1MT	336 MT
H-III	1[a]	6 (SS-N-8)[c]	6	1	6	800KT	4.8MT
G-III	1[a]	6 (SXS-N-8)[c]	6	1	6	800KT	4.8MT
Total	64		940		2,892		1,032.0MT

ICBMs[f]

System	Total Missiles	Warheads per Missile	Total Warheads	Yield per Warhead	Total Yield
SS-11[g]	520	1	520	1MT	520MT
SS-13	60	1	60	750KT	45MT
SS-17[h]	150	4	600	750KT	450MT
SS-18[i]	308	10	3,080	500KT	1,540MT
SS-19[j]	360	6	2,160	550KT	1,188MT
Total	1,398		6,420		3,743MT

LONG-RANGE BOMBERS[k]

System	Platforms	Warheads per Platform	Total Warheads	Yield per Warhead	Total Yield
Bear (Tu-95)	125	2 ASM/4 AS-15 (ALCM)/2 Bombs	250/500/250	1MT/250KT/20MT[l]	5,375MT
Bison (Mya-4)	45	4 Bombs	180	20MT[m]	3,600MT
Total	170		1,180		8,975MT

Source: The Military Balance 1985-86 (London: The International Institute for Strategic Studies, 1985), 16, 21, 162-64.

Notes: This table reflects the figures as they existed on July 1, 1985. Abbreviations are as follows: MT = megaton, 1 million tons TNT equivalent; KT = kiloton, 1,000 tons TNT equivalent; ALCM = air-launched cruise missile(s); ASM = air-to-surface missile(s).

[a]This submarine is not included within SALT limits.

[b]Assumes all are SS-N-18 (Mod 3).

[c]Assumes all are SS-N-8 (Mod 2).

[d]Assumes all are SS-N-6 (Mod 1).

[e]Actual yield not available; assumed to be the same as SS-N-20.

[f]Up to 100 SS-X-24 missiles may be introduced into Soviet force structure.

[g]SS-11 (Mod 3) with 3 warheads of 100-300KT each. Up to 400 SS-11s and SS-13s may be replaced by the SS-X-25 mobile missile.

[h]Assumes all are SS-17 (Mod 1). Some may be SS-17 (Mod 2) with a single warhead of 6MT; some may be SS-17 (Mod 3) with 4 warheads of 20KT each. See *The Military Balance 1984-85*, 133.

[i]Assumes all are SS-18 (Mod 4).

[j]Assumes all are SS-19 (Mod 3).

[k]Blackjack strategic bomber under development.

[l]Assumes ASM is AS-3 of 1MT rather than AS-4 of 200KT; assumes 20MT bomb rather than 5MT or 50MT.

[m]Assumes 20MT bomb rather than 5MT or 50MT.

TABLE 2
U.S. STRATEGIC SYSTEMS

SLBMs

System	Platforms	Missiles per Platform	Total Missiles	Warheads per Missile	Total Warheads	Yield per Warhead	Total Yield
Poseidon	19	16 (C-3)	304	10	3,040	40KT	121.6MT
Poseidon	12	16 (C-4)	192	8	1,536	100KT	153.6MT
Trident	6	24 (C-4)[a]	144	8	1,152	100KT	115.2MT
Total	37		640		5,728		390.4MT

ICBMs

System	Total Missiles	Warheads per Missile	Total Warheads	Yield per Warhead	Total Yield
Titan II	26	1	26	9MT	234 MT
Minuteman II[b]	450	1	450	1.2MT	540 MT
Minuteman III (Mk12)	250	3	750	170KT	127.5MT
Minuteman III (Mk12A)	300	3	900	335KT	301.5MT
Total	1,026		2,126		1,203.0MT

LONG-RANGE BOMBERS[c]

System	Platforms	Warheads per Platform	Total Warheads	Yield per Warhead	Total Yield
B-52G	61	(nonnuclear)	—	—	—
B-52G	90	12 ALCM/4 SRAM/ 4 Bombs	1,080/360/ 360	200KT/170KT/ 1MT[d]	637.2MT
B-52H	90	4 SRAM/4 Bombs	360/360	170KT/1MT[d]	421.2MT
Total	241		2,520		1,058.4MT

Source: The Military Balance 1985-86 (London: The International Institute for Strategic Studies, 1985), 3, 6, 158-59.

Notes: This table reflects the figures as they existed on July 1, 1985. Abbreviations are as follows: MT = megaton, 1 million tons TNT equivalent; KT = kiloton, 1,000 tons TNT equivalent; ALCM = air-launched cruise missile(s); SRAM = short-range attack missile(s).

[a]The D-5 missile is due to begin deployment in 1989.

[b]Up to 48 are to be replaced with MX missiles of 10 warheads each, beginning late 1986.

[c]Deliveries of B-1B strategic bomber have begun.

[d]Assumes B-43 bomb load.

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