Star Wars: The President's Strategic Defense Initiative

A Case Study by Ray Caldwell

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"STAR WARS"

THE PRESIDENT'S STRATEGIC DEFENSE INITIATIVE

A Review of the Literature

by

Ray L. Caldwell

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"The beauty of the Star Wars defense system is that everyone can discuss it with authority because no one, including the people in charge, has any idea of what it is."

Art Buchwald

"STAR WARS"

The President's Strategic Defense Initiative

SUMMARY

On March 23, 1983, President Reagan set in motion a research program to determine whether an effective, non-nuclear ballistic missile defense could be developed and deployed within the next 20-30 years. This Strategic Defense Initiative (SDI) grew out of concern over the stability -- even the morality -- of nuclear deterrence, fueled by Soviet conduct and weapons programs and the failure of arms control to reduce nuclear armaments. While the President originally portrayed strategic defense as a possible substitute for nuclear deterrence, the Administration has more recently pictured it as a less than "leak-proof" but still potentially effective means of complementing and strengthening nuclear deterrence, while reducing reliance on nuclear weapons.

Strategic defense would be a layered defense which could involve space-based systems, "pop-up" weapons deployed on warning of an attack, and/or ground-based systems. Research currently is focussing on four space-based technologies: lasers, particle beams, missiles and "rail guns." SDI is projected to cost some $26 billion over the first six years. The ultimate price tag of a deployed system, if feasible, is the subject of considerable controversy. Estimates range from $60 billion to over $1 trillion.

Opponents of SDI contend that leak-proof ballistic missile defense is technologically unachievable and that there is no such thing as a "leaky" but effective strategic defense. No matter how sophisticated, they argue, such a system could be underflown (by cruise missiles, bombers, etc.), outfoxed (by Soviet countermeasures), and overwhelmed (by a proliferation of Soviet offensive weaponry). It would be astronomically costly and ultimately unsuccessful. SDI's supporters respond that a leak-proof defense is not necessary in order to strengthen deterrence and stability. An 80% effective, 3- or 4-layer system, which they consider potentially achievable, would allow through 1% or less of Soviet warheads, thus greatly adding to Soviet uncertainty and significantly reducing the likelihood of a Soviet first-strike. SDI's supporters contend that an effective space-based defense would require fewer, lighter and cheaper weapons systems than the opposition calculates, and that Soviet countermeasures would be much more difficult and expensive than the opposition believes. As for the problem of low-flying systems, SDI advocates charge that this threat already exists and must be met through more effective air defenses in any case.

In politico-strategic terms, the critics argue that movement toward ballistic missile defense would be fundamentally destabilizing, because the Soviets would consider it an attempt

by the U.S. to attain strategic superiority and a first-strike capability. It would fuel a further escalation of the arms race, as the Soviets attempted to develop the capability to overwhelm the defense, it would likely be the death of arms control, and it could invite Soviet preemption. Allied governments, for their part, have expressed concern that ballistic missile defense would decouple European security from American defenses. They fear that it would make Europe more vulnerable, inter alia because of the threat of low-flying systems, and are concerned that SDI may be symptomatic of a "Fortress America" mentality which would be prepared to leave Europe to fend for itself.

Advocates of SDI emphasize that the program is a research effort which will take years to reach fruition, and that this extended period will permit full airing of all political and strategic implications, which would of course be considered in any final decisions. The supporters believe SDI is necessary and prudent in view of the Soviet Union's own longstanding strategic defense programs. They also stress that a dialogue with Moscow is underway and will continue, aimed precisely at preserving stablity and avoiding any misunderstanding now and during any delicate "transition" stage to a ballistic missile defense. They underscore the President's commitment to conduct SDI in accordance with U.S. treaty obligations and in a constructive arms control environment, and they have raised the possibility of actually sharing technology and phasing mutual deployments of any defense system. As for Allied unease about decoupling, SDI supporters emphasize that NATO strategy and the U.S. commitment to Europe remain unchanged, that the U.S. will move ahead on SDI in close consultation with the Allies, and that any development or deployment of a strategic defense would be carried out in a way that would strengthen transatlantic, and not just U.S., security.

Public exchanges have thus already set out the main lines of the strategic defense debate; these basic issues are likely to be replayed and refined for some time to come. But at this juncture the debate provides no clear idea how or whether these differences will be resolved, or what strategic defense decisions will ultimately be taken by this and future administrations. It has underscored that strategic defense is an extremely complex, not to mention emotional issue. It combines futuristic technological questions with the overarching political and strategic considerations that have engaged our best technical minds and elected policymakers for generations. We are left to wonder, however, whether deterrence in the 21st century will be based on technologies and concepts which are unrecognizable to us today, or if it will instead continue to be predicated on the verities with which we have lived for the past forty years.

Ray L. Caldwell

"Wouldn't it be better to
defend lives than avenge them?"
Ronald Reagan

On March 23, 1983, President Reagan addressed the nation in support of his defense program. In concluding his speech, the President surprised both the country and the world by making perhaps the most significant and far-reaching proposal of his presidency: he vowed to initiate an effort to determine whether the longstanding strategy of deterrence based on offensive nuclear weapons could be replaced with an effective defense against ballistic missiles. Specifically, the President said:

> "Let me share with you a vision of the future which offers hope. It is that we embark on a program to counter the awesome Soviet missile threat with measures that are defensive...What if free people could live secure in the knowledge that their security did not rest upon the threat of instant U.S. retaliation to deter a Soviet attack, that we could intercept and destroy strategic ballistic missiles before they reached our own soil or that of our Allies? It will take years, probably decades, of effort on many fronts...But isn't it worth every investment necessary to free the world from the threat of nuclear war? ...I am directing a comprehensive and intensive effort to define a long-term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles."*

It is not clear precisely what brought the President to announce such a revolutionary initiative at this particular time. Some have suggested that the proposal was intended essentially to sugar-coat the bitter pill that was the central message of his address -- continued high levels of defense spending and, particularly, funding for the controversial MX missile program.** It certainly is clear that the initiative had not been fully staffed out within the Executive Branch and that its timing was in good measure the product of the President's own, apparently deeply-felt, personal concern.

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*"Peace and National Security," President Reagan's address to the nation, March 23, 1983.

** See, for example, Ben Bova, Assured Survival: Putting the Star Wars Defense in Perspective, and Jonathan B. Stein, From H-Bomb to Star Wars: The Politics of Strategic Decisionmaking.

This concern had been prompted by a number of mutually reinforcing developments, some of them recent and others which had been gestating for years. The President had voiced preoccupation with nuclear deterrence during the 1980 presidential campaign; his concern apparently was deepened by his assessment of evolving political realities once in office. He chaired monthly meetings with the Joint Chiefs of Staff, who repeatedly expressed their discomfort over the vulnerability of U.S. ground-based missile sites. He also held private exchanges with strategic defense advocates, such as scientist Edward Teller and General (ret) Daniel Graham, the leader of the privately initiated "High Frontier" ballistic missile defense effort.* The net effect was to sharpen the President's interest in possible alternatives to nuclear deterrence, or at least in ways to make the existing nuclear equation less threatening.

The Changing Strategic Environment**

> "...safety will be the sturdy child of terror and survival the twin brother of annihilation."
> Winston Churchill

From the immediate post-World War II period until the late 1950s, the United States enjoyed massive strategic superiority. Indeed, the Soviet Union possessed no significant capability to strike the United States. The prevailing strategic doctrine was based on "massive retaliation," emphasizing nuclear over conventional forces, and the issue of linking or "coupling" the U.S. strategic deterrent to the European theater was relatively

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*Because of General Graham's involvement in sparking the President's interest in strategic defense, and in view of the similarities between the basic structure of General Graham's High Frontier missile defense and the layered defense being examined within SDI, these two concepts are sometimes thought to be one and the same. In fact, there are important differences between them, including High Frontier's emphasis on existing, off-the-shelf technologies and the significantly smaller price tag General Graham ascribes to his proposed system. The President's choice of SDI appears to represent skepticism on his part concerning High Frontier's claim to be able to use existing technologies for effective strategic defense. A full treatment of High Frontier's approach is contained in General Graham's books, We Must Defend America: A New Strategy for National Survival, and High Frontier: There is a Defense Against Nuclear War.

**See strategic chronology at Appendix 1.

unproblematical, in view of the clear and credible U.S. advantage. This situation was sometimes seen as one in which Soviet conventional superiority held Western Europe hostage, while U.S. strategic superiority deterred Soviet aggression by holding Soviet targets hostage.

In the late 1950s, however, the Soviets developed an effective intercontinental strike capability, and the U.S. was faced with the fact that it could no longer threaten massive strategic retaliation as a deterrent without risking significant Soviet counter-strikes on U.S. cities. At the same time, the Soviet Union deployed intermediate-range ballistic missiles against Western Europe, making the continent a nuclear, as well as a conventional, hostage. Under these circumstances, the coupling of European security to U.S. strategic forces and the problem of maintaining the umbrella of extended deterrence over Europe became much more difficult, both practically and theoretically.

Doctrinally, under Defense Secretary Robert McNamara, the U.S. then moved in the mid-1960s from massive retaliation to "mutual assured destruction" (MAD) at the strategic level and "flexible response" at the European theater level. MAD acknowledged the fact of U.S. strategic vulnerability and sought to develop a doctrine of stable deterrence based on the mutual vulnerability of the two superpowers, thus emphasizing the primacy of offensive weapons and viewing the development of defensive capabilities as potentially destabilizing. Flexible response, for its part, was an attempt to maintain coupling in the face of the changed strategic equation by combining conventional and nuclear defense options. Implicit in this doctrine was a new and major emphasis on the need to strengthen conventional forces, which were vital to the credibility of flexible response.

Beginning at the end of the 1960s, the Soviet Union achieved nuclear parity (and has since gone on to develop superiority in some categories of strategic weaponry). This has raised questions about the viability of the MAD and flexible response doctrines, including the survivability of elements of the U.S. strategic force and the ability of the United States to provide extended deterrence on behalf of its friends and allies. This led to an effort to adapt strategy to new force realities and the U.S. began, notably under Secretary of Defense James Schlesinger, to develop the concept and capability of limited nuclear options. The deployment of Pershing II and Ground Launched Cruise Missiles in Western Europe, which began in late 1983, can be seen both as a successful effort to strengthen coupling and as an expression of the desire to develop limited nuclear options.

Nonetheless, concern has persisted about the credibility of nuclear deterrence, in view of the dramatically altered strategic environment.

The President has made clear his recognition that nuclear deterrence has worked and he may well also accept that, in the last analysis, there may be no alternative to it. But he obviously has been deeply impressed by the paradoxes and potential dangers of mutual vulnerability and of deterrence based on on the threat of nuclear retaliation. He also appears to have proposed an investigation of ballistic missile defense as a possible alternative by other considerations which bear directly on the strategic equation, particularly:

-- the continuing Soviet military buildup in both conventional and nuclear arms, going far beyond any apparently legitimate self-defense need, which reinforces already deep concerns about Soviet aims;

-- frustration with the inability of the arms control process to produce agreements which would significantly reduce the nuclear threat (particularly the Soviet first-strike threat) through substantial and verifiable reductions in offensive nuclear weaponry;

-- the combination of the growing Soviet capability to project power and an increasing inclination on Moscow's part to do so (Afghanistan, SS-20 deployments and threats against Western Europe, activities in conflictive regions of the Third World);

-- heightened awareness of nuclear neuralgia in the West (the nuclear freeze movement in the United States, demonstrations in Western Europe against INF deployments), and a consequent questioning of Western democracies' ability to sustain public support for the maintenance of nuclear deterrence over the long term; and

-- an appreciation of the technological advances which have been made since the 1972 U.S.-Soviet Antiballistic Missile (ABM) Treaty and the possibility that they have now made effective, non-nuclear strategic defense possible.

The Strategic Defense Initiative (SDI): What Is It?*

"...we must seek another means of deterring war; it is both militarily and morally necessary."
Ronald Reagan

"...every time strategists have tried to maneuver away from dependence on massive nuclear destruction, they have come right back to that policy, like a ball on a rubber band."
Ben Bova**

SDI is a broad research program which brings together formerly diffuse anti-missile programs under one umbrella. Its purpose is to identify ways to exploit recent advances in ballistic missile defense technologies that have potential for strengthening deterrence and lowering the level of nuclear forces.*** A number of different concepts, involving a wide range of technologies, are being examined.

This research is now focussing on a "layered" defense containing different types of weapons which could destroy attacking warheads during the boost (3-5 minutes), mid-flight (20 minutes) and terminal (2-3 minutes) stages of flight. Such a defense would consist of space-based weapons, "pop-up" systems (weapons deployed into space, perhaps from submerged submarines, upon warning of an impending attack), and ground-based systems, or some combination of the three. The results of the research program hopefully will "provide to a future president and Congress the technical knowledge necessary to support a decision in the early 1990s on whether to develop and deploy such advanced defensive systems." SDI's price tag over the next six years is

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*This summary description is drawn from numerous public documents released by the Administration, including particularly The President's Strategic Defense Initiative, The White House, January 1985, and statements by Administration spokesmen.

**President, National Space Institute.

***The President's original formulation held out the possibility that ballistic missile defense could actually replace nuclear deterrence entirely. Subsequent statements by many Administration spokesmen, however, have been more nuanced, portraying SDI as a possible means of complementing and strengthening nuclear deterrence and of reducing (but not eliminating) the need for nuclear weaponry. The official White House document explaining SDI takes this latter approach, while holding out the abolition of nuclear weapons as a desirable long-term objective.

some $26 billion. It is not clear how much it would cost to actually develop and deploy a system, if one is feasible, and this question is the source of considerable controversy.*

At this early stage in the life of SDI, researchers reportedly are devoting particular attention to four types of space-based defensive weapons systems and technologies, two of them so-called "directed energy weapons" (lasers and particle beams) and two of them "kinetic kill weapons" (missiles and rail guns).

Satellite-borne lasers would shoot a beam of light at a missile during its boost phase (once it emerges from the atmosphere) and in mid-flight. Lasers are effective over extremely long distances and their emissions, though deflected by the atmosphere, are not affected in any meaningful way by the earth's gravitational or magnetic field. The laser beam, moving at the speed of light, would rapidly burn a hole through the missile's thin metal skin or soften the metal sufficiently that it would rupture, causing the missile to disintegrate.

Nonetheless, countermeasures could significantly reduce lasers' effectiveness. Two of the three types of lasers now under development -- gasdynamic and chemical lasers -- are non-nuclear; the third, Edward Teller's x-ray lasers, though more effective because of their shorter wavelength, would have to be powered by a small nuclear explosion, thus raising the serious political questions which have always attended any notion of placing nuclear bombs in orbit.

Particle beams would contain neutral particles which had been brought to a speed of some 60,000 miles per second by an airborne accelerator. Such a beam would be lethal to missiles in any of the three stages of flight and would not be absorbed by a cloud of gas or a special coating, or reflected by a shiny surface, as a laser beam might be. A particle beam could shock-heat the inner workings of a warhead or a missile much more rapidly than a laser. But a particle beam accelerator requires enormous amounts of electrical energy and might have to be nuclear-powered.

Missiles proposed for use in space-based defense would not require nuclear warheads. It is thought they could be guided accurately enough to destroy their targets either with conventional explosives or by direct impact. They also could be quite small (perhaps less than 2 feet long) and light (perhaps 30-50 pounds), thus facilitating handling and transportation to satellite-based stations.

Rail guns for use in a space-based defense would be long, narrow pieces of hardware the length of several football fields.

Weighing 100 tons or more, they would hang in the sky like giant electrical catapults and would fire darts weighing a few pounds each at great velocity (50,000 miles per hour). Like a particle accelerator, a rail gun uses electromagnetic forces to move objects, and requires a massive electrical power source. The weight of the guns themselves also would raise serious deployment problems, given the existing capacity of the space shuttle (about 30 tons).

The President has directed that research on these and other technologies under SDI be carried out in a manner fully consistent with all U.S. treaty obligations, including those contained in the ABM Treaty. In pursuing SDI, the U.S. "is striving to fashion a future environment that serves the security interests of the U.S. and its allies, as well as the Soviet Union. Consequently, should it prove possible to develop a highly capable defense against ballistic missiles, (the United States) would envision parallel U.S. and Soviet deployments with the outcome being enhanced mutual security and international stability."*

The Technical Debate: Science Fact or Science Fiction

"There is very little question that we can build a very highly effective defense against ballistic missiles some day."
Gen James Abrahamson

"Every dollar spent on defense can be neutralized by five cents worth of offense."
Gen. Robert Bowman

Although it is often extremely difficult to determine exactly where arguments over technological capabilities, present and future, leave off and where the discussion of political desirability takes up, the purely technical debate over ballistic missile defense generally focusses on three related areas: (1) effectiveness, (2) survivability, and (3) cost.

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*The President stated during the 1984 presidential campaign that he would be prepared at the proper time to consider sharing strategic defense technology with the Soviet Union. Since then, White House spokesmen, recognizing the implications of providing highly sensitive, state-of-the-art technology to Moscow, reportedly have backed away somewhat from the President's statement. Nonetheless, the formal White House document's assertion concerning "parallel U.S. and Soviet deployments..." implies not only a sharing of technology but a coordinated phasing of any deployments as well.

Among the most outspoken critics of SDI within the scientific community are the Union of Concerned Scientists, Stanford University's Center for International Security and Arms Control, and Congress's Office of Technology Assessment. Spokesmen for these organizations have stated flatly that no conceivable technology could provide a leak-proof ballistic missile defense. They have then gone on to raise a multitude of detailed questions about the capacity of existing or foreseeable technologies to provide even an acceptably "leaky" shield against missile attack.

These scientists doubt that a space-based defense would ever be able effectively to attack missiles during their boost phase. This is absolutely vital to any strategic defense, because the boost phase is the only time warheads could be disabled while they are still concentrated aboard the missile, and before they are dispersed, greatly complicating interception.* These critics believe that profound technological uncertainties about the capabilities of lasers and particle beams, combined with the absolute certainty of Soviet countermeasures, probably make effective boost-phase attack impossible.

Many countermeasures are possible and technologically feasible, they contend, such as proliferating offensive missiles and warheads in an attempt to overwhelm the defense and adding countless decoys, which would be deployed during mid-flight or reentry. During the boost phase, missiles could be spun or coated to diffuse a laser's effectiveness. Even more fundamentally, the opposition argues that, with existing technology and without a significant loss in missile payload, the boost phase itself could be shortened dramatically -- from 3-5 minutes to as little as 50 seconds. This would permit engine burn, which is essential to detection and attack by lasers and particle beams, to occur entirely within the atmosphere, where these weapons are not effective.

Critics of the program state that a "pop-up" system is unworkable because there simply would not be sufficient time, upon warning of an attack, to deploy it, while the energy demands of a permanently space-based system would be insatiable (one estimate places these requirements at 60% of total current U.S. electrical power consumption). Moreover, the total weight of the hundreds of satellites and weapons systems that would have to be lifted into space far exceeds existing or programmed space shuttle capabilities. They also believe that any space-based

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*For a detailed presentation of this critique, see The Fallacy of Star Wars, Union of Concerned Scientists, and The Reagan Strategic Defense Initiative: A Technical, Political and Arms Control Assessment, Drell, Farley, and Holloway.

system could easily be underflown by cruise missiles, bombers and "depressed trajectory" ballistic missiles, all of which could attack the United States and its allies through the atmosphere itself, and thus below the effective "floor" of space-based weapons.

In addition, they argue that this system would depend on technologies which are over the horizon and may never be perfected, particularly with regard to the highly sophisticated sensors that would be required and the computers which would have to be capable of making millions of calculations and decisions in a matter of seconds. Finally they have emphasized that even if such a defensive system could be constructed it could not be tested in its entirety, and we would thus have to trust that it would function properly the first time.

As far as survivability is concerned, opponents of SDI have pointed to the extreme delicacy of the precision instruments involved and the resulting fragility of the system and its vulnerability to attack. Space-based weapons could easily malfunction with uncertain and possibly portentous consequences. On the other hand, the Soviets could blind the system with a "precursor" attack on the satellites themselves, either from ground-based missiles or from orbiting satellites.

Finally, as the critics see it, the demands of attempting to meet the requirements of effectiveness and survivability would drive the cost of a strategic defense system into astronomical sums of money (estimates go as high as $1 trillion). This, they say, is money better spent on other defense and societal needs, particularly since even such a vast investment cannot (in their view) produce an effective defense in any case. They also maintain that an inescapable dilemma of any such effort -- and one that would inevitably drive the cost higher and higher -- is that offensive weapons are and will continue to be significantly cheaper than defensive systems. In other words, critics of SDI second Nobel laureate Hans Bethe's contention that "...all envisaged ballistic missile defense schemes are ruinously expensive and could not protect the United States from utter destruction because they could be readily overwhelmed or outfoxed at much less cost."

In response to the arguments of their opponents, supporters of SDI are generally quick to acknowledge that a leak-proof shield probably is unattainable. But, they add, a strategic defense can be effective, i.e., it can strengthen deterrence, even if it is not perfect, because it can serve dramatically to reduce the possibility of a nuclear first-strike. They point

out, for example, that a defense consisting of three or four layers, each of which is 80% effective, would only allow through on the order of one warhead for every 100 launched -- or less. Without dismissing the destruction this smaller number of warheads would cause, they argue that such an 80% effective defense (which they consider technically achievable) would deter an adversary from launching a first-strike because, faced with such a loss rate, he could not count on disarming the U.S.'s retaliatory capability. As a result the strategic defense system would also serve to decrease the value of nuclear weapons generally.

SDI advocates view the critics' estimates of energy requirements, the weight of systems to be placed in orbit, the number of satellites required for an effective defense, and the cost to be highly exaggerated, while they view the opposition's prognosis for sensor, computer, laser and particle beam technology as too conservative.* As for Soviet countermeasures, SDI supporters contend they would not be as easily accomplished, as cheap, or as effective as the critics say. And the cost of building more offensive weapons in an attempt to overwhelm the defense would not in fact be cheaper than the cost of the defensive systems themselves. Rapid-boost offensive missiles, for their part, would be extremely costly, would in fact significantly reduce payload, and would take the Soviet Union years to develop.

As far as Soviet ability to underfly a space-based defense is concerned, SDI advocates respond that this threat, which already exists, simply underscores the need to develop appropriate defenses. Effective air defense systems, which the United States, unlike the Soviet Union, has largely ignored for decades, would complement space-based systems.

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*Robert Jastrow asserts, for example, that an effective two-layer defense could be built within 10 years for about $60 billion dollars. It would consist inter alia of some 100 satellites, each carrying 150 interceptors, for boost-phase defense, and ground-based interceptors for terminal defense. See "Defense in Space is Not Star Wars," Zbigniew Brzezinski, Robert Jastrow and Max Kampelman, New York Times Magazine, January 27, 1985.

The Political/Strategic Debate: SDI -- Threat or Promise?

"The President's initiative is a major contribution to arms control and stability."
Zbigniew Brzezinski

"There is considerable doubt as to whether any of the possible (SDI) outcomes could be stabilizing.."
Admiral James Eberle*

Those who believe that effective ballistic missile defense is technically impossible or highly problematical are predictably also among the most outspoken opponents of SDI on political and strategic grounds. Certainly, a space-based defense which could not be counted on to work effectively would at best be no improvement over the present state of affairs, and at worst could be highly destabilizing. On the other hand, those who believe strategic defense is now within our grasp, because of technological advances, are among those most strongly supportive of SDI on its politico-strategic merits. But this debate also transcends the purely technical and is, to some extent, independent of considerations of technological feasibility.

Opponents of SDI are deeply concerned that movement toward strategic defense will inevitably be viewed by the Soviet Union as highly provocative. Critics point to the public warnings of Soviet civilian and military leaders and spokesmen for the Soviet scientific community.** The Kremlin has repeatedly declared that it will not be placed in a position of "strategic inferiority" and would accelerate strategic weapons programs in response to the "threatening imbalance" caused by unilateral U.S. development of a ballistic missile defense.

Just the existence of a concerted research program, SDI opponents argue, would be sufficient to precipitate significant growth in the Soviet strategic arsenal. Here, SDI's opponents draw a parallel with the late 1960s, when Soviet ABM advances triggered U.S. development of multiple, independently-targeted reentry vehicles (MIRVs), a step which could not be undone by the ABM Treaty and which is now generally viewed as having been

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*Director, Royal Institute for International Affairs, London.

**See, for example, A Space-Based Anti-Missile System with Directed Energy Weapons: Strategic, Legal and Political Implications, Committee of Soviet Scientists for Peace, Against Nuclear War, Moscow, 1984.

unfortunate and destabilizing.* Such a Soviet buildup might be concentrated on systems which could underfly space-based defenses, such as cruise missiles. But, SDI opponents continue, it would inevitably extend to intercontinental systems as well, in order to prepare the Soviet Union to try to overwhelm a space-based shield if necessary.

The critics maintain that any space-based system, whatever its level of effectiveness, would be much more useful in tandem with a first-strike by the country that possessed it -- that is, as a shield against a retaliatory strike -- than it would be against a first-strike by the other side. Thus, whatever U.S. intentions are, the Soviet Union would view the development of a space-based defense as a grave threat and would respond in a potentially dangerous manner.

In this context, the late developmental and early deployment stages (the "transition" period) would be particularly hazardous, because of the built-in incentive for the other side to preempt, either by a nuclear first-strike before the defense is fully in place or through an attack on the space system itself, which could escalate. Former Defense Secretary Harold Brown has gone so far as to label any strategic defense an "inducement to surprise attack." His colleague, James Schlesinger, has used similar language. Schlesinger has gone on to contend that if the objective is substantially to reduce the number of Soviet warheads that could strike the U.S. and its allies, it would be far easier and cheaper to secure that goal through arms control, even considering that process's admittedly modest accomplishments.**

The opposition also argues that the complexity of any space-based system, and the time constraints under which it would operate, would remove national command authority from the President of the United States and place it instead in a highly sophisticated computer system. Even if space weapons were non-nuclear this would make the strategic situation even more hair-triggered than it is now, necessitating a "launch-on-warning" doctrine and removing human judgment and sensibilities from these life-and-death decisions.

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*An expression of concern over the destabilizing effect of MIRVs is contained in the Scowcroft Commission's recommendation that the U.S. move from large, MIRV'd missiles to small, mobile, single-warhead systems ("Midgetman"). Former Secretary of State Henry Kissinger has also spoken out eloquently concerning the negative effect of MIRVs on strategic stability.

**Washington Post, December 18, 1984.

Finally, SDI's critics believe that strategic defense would have grave consequences for arms control, which they view as an essential complementary means of strengthening stability. They point to the frontal challenge which SDI poses to the ABM Treaty, and they charge that as many as seven other agreements, including the Outer Space Treaty, might also be violated by the development of a space-based defense. In the superheated environment likely to be brought about by such developments, together with an inevitable push-pull, offensive-defensive arms competition, they believe any meaningful arms control would suffer a serious, perhaps mortal, blow. Indeed, four prestigious Americans have written that the consummation of the President's initiative would destroy the arms control process.*

In sum, the opposition believes that politico-strategic realities have not changed fundamentally since the ABM debate of the late 1960s and early 1970s, which led to tight constraints on defensive systems through the ABM Treaty. In their view, defensive measures are as politically dangerous as they are technically problematical, and thus should not be developed.

Supporters of SDI, however, consider this an apocalyptical vision which is out of touch with current realities. General James Abrahamson has charged that the critics disagree "because for a lifetime they have been dedicated to another idea (i.e., MAD) and they are not very willing to accept another thought process."

SDI advocates argue that they are fully aware of the hazards, as demonstrated by the President in his own 1983 speech, when he stated: "I clearly recognize that defensive systems have limitations and raise certain problems and ambiguities. If paired with offensive systems, they can be viewed as fostering an aggressive policy, and no one wants that." SDI is, after all, a research program which will last a number of years before any basic conclusions can be reached about the feasibility of strategic defense. This will allow plenty of time to examine carefully all of the political and strategic questions which attach to ballistic missile defense. The supporters consider it important to underscore that weapons technologies being examined are basically non-nuclear, and that space-based systems, in their view, are not suitable to offensive use because they cannot effectively attack targets on the ground. At the same time, pro-SDI forces add, some basic facts must be kept clearly in mind as we proceed with SDI and debate the attendant issues.

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*See "The President's Choice: Star Wars or Arms Control," Kennan, McNamara, Bundy and Smith, Foreign Affairs, Winter, 1984/1985.

First, the Soviet Union has been pursuing ballistic missile defense much longer and more intensively than the United States. Moscow has pushed hard at the limits of the ABM Treaty and, in some cases (such as the Krasnoyarsk phased-array radar), has violated that Treaty. Under these circumstances, and given the possibility of an eventual Soviet ABM "break-out," it would be irresponsible of the United States not to fully examine emerging defensive technologies.

Moreover, they argue, the United States is fully cognizant of the important role which arms control must play and has explicitly recognized this role in connection with SDI.* In contrast to the Soviet effort, the President has directed that SDI be conducted in strict compliance with all U.S. treaty obligations.** If it is necessary to move beyond research, the issue would be taken up in advance with the Soviet Union, including through the Standing Consultative Commission in Geneva and established, formal reviews of existing agreements, including the ABM Treaty, which is reexamined every five years. Moreover, as far as arms control generally is concerned, SDI advocates insist that an effective strategic defense can serve to reduce the value of nuclear weapons and thus contribute significantly to arms control agreements which would substantially lower the level of nuclear armaments.***

Finally, SDI supporters contend that the opposition seems to assume that the program will proceed in a negotiating vacuum between the United States and the Soviet Union. In fact, the existence of SDI, they say, was central to bringing the Soviets back to negotiations in Geneva, and those talks include

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*The official White House public document on SDI states inter alia that any "deployments of defensive systems would most usefully be done in the context of a cooperative, equitable and verifiable arms control environment that regulates the offensive and defensive deployments of the U.S. and the Soviet Union."

**The ABM Treaty states that "each party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based or mobile land-based." The Treaty thus does not prohibit research.

***The President summed up this view in an address to the National Space Club on March 30, 1985, when he stated that "by making these missiles less effective, we make these weapons more negotiable."

discussions of space and strategic defense. As the President has made clear, it has been the intention of the U.S. all along to engage the Soviet Union in such a dialogue, in an effort to preserve stability and manage any political strains or misunderstandings which SDI might generate.

As noted earlier, with regard to actually sharing defensive technology with the Soviets, the record is not entirely clear, although the official White House release on SDI implies both a sharing of technology and even a mutual and simultaneous phasing of any deployments. SDI spokesmen have generally expressed understanding of the delicacy of this aspect of SDI and of the problems which it presents. Program supporter Ben Bova certainly went much farther than others would be willing to go when he advocated the "multilateralization" of strategic defense and the placing of a space-based shield under the control of a supranational organization. However, his contention that ballistic missile defense, to be stabilizing, would have to be mutual underscores a potential dilemma with which thoughtful people on both sides of the issue are grappling. It also echoes the basic concern for stability which Mr. Reagan has stated and which official U.S. public documents and statements on SDI have reiterated.

The Political/Strategic Debate: Impact on NATO

"We will ensure that...allied as well as U.S. security... would be enhanced."
Ronald Reagan

SDI "has the makings of a major Alliance crisis..."
William G. Hyland*

An important element in the debate over whether SDI contributes to stability concerns the effect of ballistic missile defense on the Atlantic Alliance. When the President first broached SDI over two years ago, the Alliance was in the final phase of implementing the 1979 decision on INF modernization and arms control. The energies of all of the NATO governments were therefore focussed on INF and they remained so until deployments

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*Ben Bova, Assured Survival: Putting the Star Wars Defense in Perspective.

**Editor, Foreign Affairs, and former Deputy National Security Adviser.

began at the end of 1983. Strategic defense has steadily moved to the top of the transatlantic agenda, however, and has become an increasingly important issue in the public debate within Europe, and in the European security dialogue with Washington. Allied leaders have by now had a good deal to say about SDI, and their reactions have ranged from public statements of muted support laced with concern to reportedly sharp private expressions of alarm.* The essence of their reaction, as stated by British Prime Minister Thatcher before and during her December 1984 visit to Washington, is that they consider SDI research all right, in view of the Soviet Union's own program, but oppose development and deployment of a ballistic missile defense in any basing mode.**

The same technical reservations which have been voiced in the U.S. have been raised in European capitals as well. But the overarching concern in Western Europe is that a ballistic missile defense would decouple Europe from the United States and leave the continent vulnerable to Soviet attack or intimidation. Many European leaders have seconded home-grown criticisms in the United States that the "transition" period to a strategic defense would be highly unstable and dangerous, and they feel particularly exposed to any resulting Soviet aggressiveness.

In a sense, European criticisms paradoxically represent a concern that a U.S. ballistic missile defense would actually work. But the European reaction is much more complex than that, incorporating a number of interrelated judgments and conclusions, such as:

-- concern that questioning the "morality" of nuclear deterrence and holding out the possibility of actually scrapping it, as the President has done, will only play into the hands of the unilateral disarmament movements and undermine needed public support for nuclear deterrence, which will continue to be essential;

-- fear that SDI is symptomatic of a new American isolationism and would serve to create a "Fortress America" which would be inclined to let Europe fend for itself and thus push Europe toward dangerous military vulnerability and political accommodation with the Soviet Union;

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*See The Strategic Defense Initiative and United States Alliance Strategy, Gallis, Lowenthal, and Smith, Congressional Research Service, February 1, 1985.

**Washington Post, January 5/February 21, 1985.

-- concern that attention to strategic defense would reduce the resources and energies devoted to other, tried and true forms of deterrence, conventional and nuclear. This, in their view, could result in a dramatic worsening of the military balance in Europe;

-- conviction that while strategic defense might be a "fix" for American strategic needs, it would not and could not extend to Europe, particularly in view of the problem of weapons which can underfly space-based systems. These low-flying weapons, such as cruise missiles, bombers, and short-range missiles, are a particular threat to Europe, especially in view of the shorter flight times involved; and

-- the suspicion that, if an effective ballistic missile defense were achieved by the U.S., the Soviets would somehow acquire it or steal it for themselves, thus making British and French nuclear forces irrelevant;*

Thus, European leaders generally view "Star Wars" in instrumental terms -- as a useful trump card for negotiating nuclear arms reductions with the Soviet Union rather than as a prospective means of strengthening stability and transatlantic security. If SDI is not negotiable, they worry, it might only fuel the "arms race."

In response to these concerns, U.S. civilian and military leaders have emphasized that SDI is an important part of the effort to ensure transatlantic defense, and that it does not indicate any weakening of the U.S. security commitment to Europe. This effort includes an offer by Defense Secretary Weinberger of European participation in SDI research, made at the March meeting of NATO's Nuclear Planning Group. This proposal clearly interests a number of European leaders, but it has not yet produced any concrete results, nor has it apparently quieted European concerns about the program generally.)

In response to specific Allied concerns, Washington has reaffirmed the "inextricable linkage" between U.S. and European security and that the strategy of flexible response remains valid. Administration spokesmen have also pointedly assured European leaders that SDI research will extend to technologies with potential against shorter range ballistic missiles. As for

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*The British and French, for this reason, are particularly sensitive with regard to SDI, and have been the most outspoken in questioning the program. British Foreign Minister Howe recently asked rhetorically whether it is a "Maginot Line in space," and French President Mitterrand has labeled it "overarmament."

low-flying systems generally, more effective air defense within Europe has been a high U.S. and Alliance priority for a number of years now.

The President assured Margaret Thatcher last December that any movement beyond research into development and deployment "would have to be a matter for negotiation (with the Allies)." This is a point repeatedly made in Administration statements and, reportedly, in close private consultations with the Allies. Such reassurances are also embodied in the President's commitment that "in the event of any future decision to deploy defensive systems -- a decision in which consultations with our Allies will play an important part -- Allied, as well as U.S. security against aggression would be enhanced."

Conclusion

As these arguments and counter-arguments concerning the technological and politico-strategic implications of SDI suggest, criticisms of SDI have sparked exchanges which tend quickly to become arcane and confusing, and which sometimes appear to be driven more by the philosophical proclivities of the adversaries than by a dispassionate assessment of the data.* Indeed, much of the debate centers on disputes over which data are to be believed and, where the basic data are not at issue, on radically different (and sometimes equally plausible) interpretations of the same body of information. A particularly disconcerting aspect of the debate is the attempt of some participants to use "classified studies" as the deus ex machina to resolve the issue in their favor. Veiled and unsubstantiated references to classified documents, which can be summoned up to support one side or the other but whose substance can never be cited except in the most general way, only serve to make an already dense and difficult debate even harder to penetrate.

The debate on neither the technical nor the political issues involved in SDI thus does not appear at this stage to be conclusive. The advantage is clearly with those who hold that we simply do not know enough and that prudence calls for more research. In fact, even the opponents of SDI generally support continued research, if only as a hedge against the Soviet Union's own continuing missile defense research activities. The crunch

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*The flavor of these exchanges is perhaps best conveyed in "Star Wars and the Scientists, Robert Jastrow and Critics," Commentary, March 1985.

is likely to come if and when research leads to development decisions, and Congress is asked to approve funding, probably at significantly increased levels, for that purpose. In this sense, the charges and counter-charges levelled thus far are but the initial skirmishing in what may prove to be a lengthy battle for the hearts and minds of policymakers and those in Congress who hold the purse string.

A Strategic Chronology: Some Important Dates

October 3, 1942	First successful test of V-2 rocket at Peenemunde, Germany.
September 8, 1944	First V-2 missiles fired at southern England.
July 16, 1945	The first atomic bomb is exploded at Alamogordo, New Mexico.
August 6, 1945	Hiroshima is destroyed by an atomic bomb dropped from the B-29 Enola Gay.
August 9, 1945	Nagasaki is severely damaged by an atomic bomb dropped from B-29 Bock's Car.
June 1947	DoD Study, "Operational Requirements for Guided Missiles," draws the conclusion that long-range ballistic missiles are not feasible. This conconclusion is based on the assumption that nuclear weapons will always be too large to be carried by ballistic missiles. The Soviet Union, as a result, gains a significant lead in the development of large rocket boosters.
August 29, 1949	The Soviet Union explodes its first atomic bomb.
Late 1940s - Late 1950s	U.S. strategic superiority over the Soviet Union forms the basis for a strategy of "massive retaliation" to deter Soviet aggression.
October 3, 1952	Great Britain detonates its first atomic bomb.
November 1, 1952	The United States explodes the first hydrogen bomb at Eniwetok atoll.
August 12, 1953	The Soviet Union explodes its first deliverable hydrogen bomb.
March 1, 1954	The United States explodes a deliverable hydrogen bomb at Bikini atoll.
May 15, 1957	Great Britain detonates its first hydrogen bomb in a test near Christmas Island.

August 1957	The Soviet Union test-flies its first ICBM, an SS-6. The United States initiates a crash program to catch up.
October 4, 1957	The Soviet Union launches the world's first artificial satellite, Sputnik I.
January 31, 1958	The U.S. launches its first satellite, Explorer I.
October 31, 1958	The United States and the Soviet Union agree informally to a moratorium on nuclear tests. The moratorium lasts almost 3 years, but is broken suddenly in 1961 when the Soviet Union resumes testing without warning.
December 23, 1958	The first American ICBM, an Atlas C, completes a full-range test flight of 4000 miles.
Late 1950s - Late 1960s	The development of Soviet intercontinental nuclear strike capability brings reassessment of massive retaliation and its replacement by Mutual Assured Destruction (MAD) and flexible response.
February 13, 1960	France successfully tests its first atomic bomb in Western Algeria.
July 20, 1960	The nuclear submarine George Washington successfully launches a Polaris SLBM while submerged. By November 1960 George Washington initiates its first operational cruise carrying 16 Polaris missiles -- and becomes the world's first ballistic missile-carrying submarine.
February 1, 1961	First flight test of Minuteman ICBM conducted; the missile is operational by early 1963.
April 12, 1961	Yuri Gagarin is the first human to fly in space.
September 1, 1961	The Soviet Union resumes nuclear testing in the atmosphere, ending the informal moratorium on testing.
February 20, 1962	John Glenn becomes the first American to orbit the earth.

October 1962	The Cuban Missile Crisis takes place.
September 1963	The United States Senate ratifies the Limited Test Ban Treaty (LTBT).
1964-1968	The USAF tests an Antisatellite Weapons System (ASAT) on Johnston Island. (After 16 tests the program is terminated, partly because the 1967 Outer Space Treaty eases the threat of Soviet orbital nuclear bombs and partly because a nuclear explosion in space would damage friendly satellites as well as hostile ones.)
October 16, 1964	The PRC explodes its first atomic bomb.
January 27, 1967	Sixty-three nations sign the Outer Space Treaty, which inter alia prohibits placing of "weapons of mass destruction" in space. These are understood to include nuclear, chemical, biological and radiation weapons.
June 17, 1967	The PRC explodes its first hydrogen bomb.
November 3, 1967	Defense Secretary McNamara announces that the Soviet Union is testing a fractional orbital bombardment system (FOBS). Although within the letter of the Outer Space Treaty, FOBS can loft a nuclear weahead into partial orbit and then drop it on a target.
December 1967	NATO formally adopts the strategic concept of flexible response, based on a flexible and balanced range of responses, conventional and nuclear, to all levels of aggression or threats of aggression.
1968	The Soviet Union begins testing an orbital antisatellite weapon. This is a "killer" satellite with a conventional warhead launched by a modified SS-9 rocket.
August 24, 1968	France explodes its first hydrogen bomb in the south Pacific.
March 5, 1970	The Nuclear Nonproliferation Treaty (NPT) goes into effect, after having been ratified by 43 nations.

May 26, 1972 — The U.S. and Soviet Union sign the SALT I agreement and the ABM Treaty in the Kremlin's Great Hall.

SALT I freezes the number of ICBMs and SLBMs each side can possess to the levels in operation or under construction as of 1972. SALT I does not cover bombers or the number of warheads each missile may carry.

The ABM Treaty limits both nations to deploying no more than 200 ABM missiles, which would be designed to intecept attacking ballistic missiles. Both also agree not to develop a nationwide missile defense, but to concentrate their efforts on "point defense" of one specific site. (The United States soon abandoned its ABM program altogether as ineffective against a determined missile attack, while the Soviets continued with theirs.)

May 18, 1974 — India detonates an atomic bomb.

1977 — The Soviet Union begins deploying SS-20 missiles targeted against Western Europe. In response, Western European governments ask the U.S. to upgrade NATO's own missile capabilities and the Carter Administration subsequently makes a commitment to deploy 108 Pershing II and 464 Ground Launched Cruise Missiles (GLCMs), in accordance with NATO's 1979 dual decision on Intermediate Range Nuclear Force (INF) modernization and arms control (see below).

June 18, 1979 — The U.S. and Soviet Union sign the SALT II agreement.

SALT II sets limits on the total number of nuclear delivery systems (i.e. missiles and bombers) and on the number of individual warheads each missile can carry. With the invasion of Afghanistan, President Carter withdraws the treaty from Senate consideration, although eacn side subsequently pledges to abide by its terms if the other does so.

December 12, 1979	NATO decides to carry out the deployment of 108 Pershing II and 464 Ground Launched Cruise Missiles if arms control negotiations do not result in the removal of the Soviet SS-20 threat to Western Europe.
March 19, 1981	DoD announces that the Soviet Union has orbited an "operational" antisatellite weapon.
December 1, 1981	INF negotiations between the U.S. and the Soviet Union begin in Geneva.
1981-1983	Anti-nuclear sentiment grows in the United States and Western Europe (e.g., the Nuclear Freeze Movement in the U.S., the Campaign for Nuclear Disarmament (CND) in the UK, and the "Greens" in the FRG).
June 1982	START talks between the U.S. and the Soviet Union begin in Geneva.
March 23, 1983	President Reagan delivers the address to the nation in which he proposes a Strategic Defense Initiative (SDI) aimed at determining whether defense against ballistic missiles is feasible, and establishing such a defense if it is.
May 3, 1983	U.S. Roman Catholic Bishops approve a Pastoral Letter opposing nuclear war and going far toward opposition to nuclear deterrence itself.
May 4, 1983	The U.S. House of Representatives passes, by a vote of 278-149, a non-binding nuclear freeze resolution. (In October the Senate rejects a similar resolution.)
November/ December 1983	INF deployments begin in Western Europe. The Soviets subsequently break off the START and INF talks, stating in the latter case that they will not be prepared to resume the negotiations until the deployed INF missiles are removed from Western Europe.
October 28, 1983	NATO Defense Ministers, meeting at Montebello in Canada, agree to reduce NATO's nuclear stockpile by 1400 weapons, in accordance with a commitment contained in the 1979 dual decision on INF modernization and arms control.

November 30, 1983	President Reagan approves an SDI research program to develop a space-based missile defense which could be deployed in the late 20th or early 21st century.
January 21, 1984	The USAF launches its first ASAT weapon in a southern California test.
March 21, 1984	The Union of Concerned Scientists issues a report claiming that a space-based defense to protect the civilian population is "unattainable," although a "modest" defense of missile silo fields is feasible.
March 27, 1984	LTG James Abrahamson is named to head the SDI program, which is funded at $1.98 billion for FY 1985, with a total price tag over five years estimated to be some $26 billion.
March 12, 1985	U.S.-Soviet negotiations on strategic and intermediate-range nuclear weapons and space/strategic defense issues begin in Geneva.

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