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How to Proceed with SDI— Realistic Priorities

—William J. Perry, Brent Scowcroft, Joseph S. Nye, Jr. & James A. Schear

THE Strategic Defense Initiative (SDI) has become one of the most controversial American defense programs of the postwar period. Virtually all issues related to arms control, alliance security, and Soviet-American strategic relations are now linked to SDI in one way or another. Yet the future of the program is very uncertain. Even before the Reykjavik summit and the Republican losses in the Senate, SDI faced growing opposition and hard budgetary choices. President Reagan will leave office long before the full potential of many key SDI technologies is known. Research on the strategic defense technologies is clearly in our national interest. How, then, should we manage the serious tensions that persist between SDI and our other policy objectives?

President Reagan has ordered an investigation of the prospects of a high-technology shield against ballistic missiles that would enable the United States and its allies to move toward a strategy based on defense of homelands and away from deterrence through the threat of retaliation. Such a shift in strategies would be a radical one, for the near-perfect defense of population on which it is predicated would require large-scale defenses of a sort not hitherto seen as technically viable. Many strategists who support SDI believe that the president's goal is impractical. Some want to use SDI as leverage in negotiating deep cuts in Soviet ballistic missiles with "hard-target kill" capability. Others favor limited forms of ballistic missile defenses (BMD) on the grounds that such defenses would help protect our retaliatory forces or deny certain attack options to Soviet planners—in either case to enhance deterrence. Still others see SDI as a response to Soviet BMD programs. However, the optimal technologies for the president's goal and other rationales for SDI are often different, and public support for the president's vision seems stronger than it is for the idea of limited defense.

SDI's progress has been incremental to date. Innovations have been achieved in sensors, directed energy (beam) weapons, and kinetic energy (impact) weapons; but there have been no major breakthroughs. Because of survivability considerations, the idea of basing major SDI components in space is regarded less favorably by proponents than it was two years ago. Furthermore, development of large-scale power sources, economical space lift, and reliable computational capabilities are now seen as the most difficult challenges facing SDI over the long term.

By 1993, when SDI is expected to report its results, research on eximer and free-electron lasers (FELs) may yield important conceptual and possibly experimental advances. More will be known then about the X-ray laser, which in theory could generate very intense directed energy from a nuclear explosion. Further innovations on "adaptive" optics (to shoot laser beams through the atmosphere), relay mirrors for beam weapons, and "smart" kinetic energy rockets will move these concepts closer to weapons criteria.

It remains highly unlikely, however, that any of these developments will alter the fundamental challenges involved. Two important criteria that the administration has set for judging the desirability of SDI options—that

William J. Perry and Brent Scowcroft (co-chairmen), Joseph S. Nye, Jr. (director), and James A. Schear (executive officer) are members of the directing staff of the Aspen Strategy Group, a bipartisan committee. This article is adapted from the group's recent report on "The Strategic Defense Initiative and American Security."

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any system be capable of surviving direct attack and that it be cheaper to augment than to overcome with more offensive missiles—will effectively rule out any deployment of space-based defenses, including those proposed under the Defense Department's early deployment plan, during the next decade. Moreover, while we should certainly expect scientific innovation, we cannot be certain that it will provide sought-after solutions.

Three general objections may be raised to the present orientation of SDI. First, many innovations that aid the defense can also help the offense. Some concepts now being investigated, like economical space lift, small terminal homing rockets, and the X-ray laser, would vastly improve the capacity of the attacking side to saturate or suppress the defense. Second, effective defense in the boost phase of missile attack seems problematic. The structure of boost phase intercept is such that space-based defense, whether composed of kinetic energy weapons in the near term or beam weapons in the long term, may be too exposed to sustain itself against a variety of technically feasible countermeasures. "Pop-up" systems might be less vulnerable but would pose severe operational problems. Third, effective terminal phase defense seems unlikely given the current "non-nuclear" terms of reference of SDI. Without nuclear warheads, which could work to the advantage of the defending side, the technology of maneuvering warheads may give an insurmountable bonus to the attacker.

Given these judgments, it is fair to ask whether SDI's present orientation is suitable for meeting the challenges thrust upon it. As it stands, the program is being stretched between competing priorities. Its compressed time scale to produce results clashes with its stress on basic research. In particular, its focus on component development and integrated testing in the near term is inconsistent with the goal of efficient technology development. Not only do large field experiments risk "freezing in" technologies prematurely, they appear to be driven significantly by political considerations—that is, sustaining support for the program—and not solely by the exigencies of a research program on exotic technologies.

THE SOVIETS have launched a major propaganda campaign against SDI and have played down their own involvement in strategic defense research. While aspects of the Soviet attack appear contrived, it is also very probable that they see SDI in a threatening light. Soviet leaders characterize SDI as part of a U.S. plan to acquire pre-emptive offensive capabilities, just as some in this country view Soviet defense programs as part of an effort to deflect a U.S. response to a Soviet first strike. Having worked to compete favorably with the United States as a military power, the Soviets evidently fear that SDI may drive the arms race into areas of high technology where they would compete at a severe disadvantage. Thus, it appears that the Soviets perceive SDI not as simply another problem within the normal array of threats they face, but as a fundamental rivalry between socioeconomic systems.

Nonetheless, dramatic Soviet reactions appear unlikely in the near term. Even after Reykjavik, Soviet strategy seems aimed at "fencing in" SDI through agreements. As it is, the Soviets already have many new weapons in development—especially bombers and cruise missiles—that would be suitable as offensive counters to SDI if talks fail to produce restraints. Soviet actions over the longer term are harder to predict, however. The Soviets will probably pay more attention to their own SDI program, but it is unclear whether greater investments would yield accelerated progress.

Although it seems highly unlikely in the present situation, some observers worry that the Soviets might launch a massive nationwide deployment of their own "conventional" (i.e., nuclear-tipped) BMD systems if they became convinced, rightly or wrongly, that the United States had decided to withdraw from the Antiballistic Missile (ABM) treaty and to deploy partial SDI defenses. The Soviets have a comparative advantage in conventional BMD. Any asymmetries resulting from major deployments on their side would be widely regarded as destabilizing in this country.

Generally, our allies have been cautious about SDI. Fears have been voiced abroad that SDI will unravel the ABM treaty and damage the prospects for arms control; that

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strategic defenses will make Nato's strategy of flexible response harder to sustain; that expenditures on SDI will starve conventional force improvements; that two-sided BMD deployments might reduce the effectiveness of British and French nuclear forces; and that SDI would harm the allies' overall technical competitiveness vis-à-vis the United States. For the most part, though, the allies are taking a "wait and see" attitude so long as SDI does not involve the alliance in any immediate questions of new weapons deployments. Some allies have displayed interest in the idea of an anti-tactical missile defense (ATBM), but this need not fall under the rubric of SDI research. However, if SDI is seen as impeding arms control, consensus in the alliance could well be pushed to the breaking point.

The SDI program has been criticized as a barrier to arms control. However, many programs under SDI were ongoing at the time of the president's March 1983 speech (some of them begun under previous administrations) and drew little or no attention. Moreover, the regime of existing agreements was already under stress before 1983. Some provisions are being bypassed by new technologies for missions like space surveillance, anti-satellite (ASAT) weapons, and ATBMs. To make matters worse, both sides have become embroiled in a dispute over treaty compliance. None of the current issues is significant in a military sense, but all are troublesome politically.

Nonetheless, SDI does pose complications. The program suggests that the United States has already made a conditional policy judgment (pending technology development) to modify significantly or to withdraw from the ABM treaty at a future date. Lending credence to this perception are the Defense Department's proposals for early deployment of partial defenses and a series of SDI experiments whose consistency with legal obligations is measured by criteria that we would probably reject if the Soviets used them to justify their programs.

The administration has also attempted to redefine the ABM treaty in a way that would allow the development and testing of exotic technologies for non-fixed ABM systems. This reinterpretation looks implausible when set against the strategic context of the treaty. Under this reading of the treaty, for instance, the Soviets could develop high-energy laser components for BMD systems and proliferate them across their territory, provided only that the components were transportable and declared for testing purposes. This would not be in our interest. It cannot be what either side intended to achieve in the ABM talks.

Our primary concern is with Soviet offensive forces—especially their large ICBMs—while the Soviets seem more concerned with our potential defensive capabilities. Thus, it is fair to conceive of a "grand compromise." At the same time, this would not involve our simply "trading off" our defenses for their offensive forces. SDI is not a bargaining chip, but a lever. We should aim to develop an integrated structure of restraint that provides the Soviets with some "breakout" insurance on the defensive side in return for cuts in multiple-warhead ballistic missiles to levels significantly beneath those that were deemed negotiable in the past. Both sides appear reasonably close to agreement on offensive arms. But as Reykjavik pointed out, gaining agreement on permitted BMD research is going to prove difficult. It is the present U.S. position to maintain an unlimited right to develop and test SDI systems in accordance with its reinterpretation of the ABM treaty. The Soviets initially countered with a much more restrictive reading of the treaty, which would effectively limit all SDI research and testing to the laboratory. Fortunately, the ABM treaty does provide a path for compromise if both sides are ready to show flexibility.

Historically, the United States has understood the ABM treaty's ban on "development" and "testing" to apply to the stage at which prototypes of ABM systems or components are moved from laboratory testing to field testing. Even under its traditional interpretation, however, the treaty allows development and testing of fixed, land-based systems and components, including important SDI-related technologies like "adaptive optics" for ground-based lasers. It also permits some small-scale testing in space. What the treaty does not allow are large-scale tests in space of major components. Thus, if the United States is prepared to modify its position that all development and testing of space-based systems are allowed, and if the Soviet

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Union is willing to drop its demand that nothing beyond laboratory research is allowed, major progress toward a new agreement should be possible.

It is important to note that adhering to the ABM treaty in its traditional form would not seriously hamper a sensible research and development program for another decade. The technologies with potential for providing survivable and cost-effective space-based defenses will remain in the research stage into the mid-1990s. Thus, if there is a reasonable prospect of obtaining major cuts in "heavy" Soviet ICBMs—and Reykjavik suggests that there is—it would be very much in our interest to accept a reaffirmation of the ABM treaty for a ten-year period.

CLEARLY, our national interests require that we have a strategic defense research program. Yet the program we need must be shaped around realistic goals and a reasonable time frame, and it must command broad support of the public and our allies. SDI in its present construction does not meet these criteria. While the president's vision is both clear and desirable, it is not realistic within any operative time frame. *We see virtually no prospect of building a significant and effective population shield against a responsive enemy inside of this century, and there is great uncertainty about the long term.* Correspondingly, while limited forms of SDI may be more plausible, it is unlikely that they will meet the administration's own criteria of cost-effectiveness and survivability. If they do not meet these technical criteria, premature efforts to deploy a system could stimulate a costly offensive and defensive arms race and reduce stability at a time of crisis. Both effects would reduce rather than enhance our security.

How, then, should we relate our interests in strategic defenses to the broader policy context? In our judgment, a balanced approach could be shaped around the following five priorities:

1. **The creation of a more plausible near-term agenda for BMD research and development.** In thinking about our strategic defense needs, it is useful to draw a careful distinction between short-term and long-term work programs. In the near term (up to the early 1990s), our principal interests in strategic defenses are to help deter and if necessary respond to a Soviet breakout from the ABM treaty; to preserve options for a selective defense of portions of our retaliatory forces—including fixed and mobile targets—against emerging new threats on the offensive side; and to investigate limited stabilizing defenses. SDI as now constituted is not suited to these tasks.

A near-term agenda would focus on three important areas of research and development:

- *Investigation of conventional BMD systems.* Although the United States developed a variety of technologies for terminal BMD in the 1970s, these efforts stopped short of integrating the basic systems components—radars, computers, interceptors—into a fully functional prototype test complex. Such a facility would help to close the "lead time" that the Soviets now enjoy in deployable BMD technologies, and it could serve as the test bed for more advanced technologies for tracking and intercept of sophisticated maneuvering warheads. Above all, we need to know much more about the prospects and limits of mounting a cost-effective terminal BMD defense.
- *Sensing technologies for early warning, tracking, and target acquisition.* We can do much in the near term to improve our missile launch and space surveillance capabilities. For instance, better early warning and attack assessment, utilizing infrared sensing systems, would be supportive of our present strategy and of any type of defenses we might pursue. Likewise, optical and long-wave infrared tracking of space objects (warheads and satellites) would improve our knowledge of mid-course surveillance and the other side's military space activities overall (or restrictions on such if ASAT limits were to be agreed upon in the future).
- *Countermeasures technology.* To comprehend better the cost-effectiveness of ground-base defenses and to provide a valuable near-term response to expanded Soviet defenses (especially relying on upgraded surface-to-air missiles or ATBMs), we need to revitalize our efforts to develop effective penetration aid (pen-aids) technology. Our work on pen-aids atrophied during the 1970s. We should be investigating the potential of simulation, anti-

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simulation (making warheads look like decoys or varying the appearance of each), and signature suppression technologies. Work on pen-aids would reinforce—and be reinforced by—the fielding of a functional BMD test complex (at a place like the Kwajalein test range), against which new pen-aid systems could be tested.

Of these initiatives, only sensor technology is receiving sustained attention from the SDI program. All of these steps could be carried out in strict compliance with the ABM treaty. However, they should not be seen as prejudging a decision to move terminal BMD programs into engineering development and deployment. Quite apart from arms control considerations, any deployment of "conventional" ABM defenses beyond those permitted under the present regime would play into areas of Soviet advantage. In military terms, the number of additional surviving intercontinental ballistic missile (ICBM) warheads we could gain with terminal defenses might well not be worth the offsets resulting from the reduced ability of our offensive forces (both ICBMs and submarine-launched ballistic missiles) to penetrate unconstrained Soviet defenses. Essentially, what we want from a near-term R&D program is the sort of capability and testing experience that would reduce any asymmetries that the Soviets might exploit if they decided to attempt a breakout in the near term.

2. A sharpened focus of the SDI technology program on long-term goals. As a long-term objective (through the late 1990s), we should continue to explore technological initiatives for effective wide-area defenses that would substantially limit damage to our military forces and society. We should do this to understand the prospects for achieving a form of deterrence with a larger component of defense than at present; to judge the survivability, cost-effectiveness, and stabilizing (or destabilizing) attributes of such a defense; and to avoid technical "surprises" resulting from breakthroughs by the other side. The focus here would not be on "conventional" ABMs but on new technologies with prospects for high leverage over emerging threats on the offensive side. Given that some of the more mature SDI technologies, like chemical lasers, are unlikely to meet weapons criteria, greater attention should be paid to less mature but more promising technologies. General categories of work would include:

- *Advanced surveillance, acquisition, tracking, and kill assessment (SATKA) technologies.* Basic research should be pursued on more advanced optics, radar imaging, and directed energy technologies that may contribute to solving space surveillance problems at mid-course, especially decoy discrimination.
- *Directed Energy Weapons (DEW) systems and concepts.* Work should focus on ultraviolet/visible, free-electron, and X-ray laser concepts that seem to hold the greatest potential over the long term as weapons for boost or post-boost phase intercept. Work on existing space-based laser concepts should be limited to exploration of design innovations that might reduce their inherent limitations on brightness and other performance attributes.
- *Optical technologies for DEWs.* New optical technologies could, if further developed, contribute to progress across an array of directed energy systems, including atmospheric compensation (i.e., adaptive optics) and beam relay (i.e., space mirrors) for ground-based lasers, and phased array concepts for improving the intensity of chemical lasers.
- *Kinetic energy weapons.* Work should be continued on developing technologies for lightweight KEWs, especially on infrared homing systems that might substantially reduce the weight of guidance systems on missile interceptors.
- *Survivability enhancements.* Even rapid and successful technology development cannot change the defense's prospects if an answer is not found to the vulnerability of space-based components. Further exploration of technologies to protect space-based systems (including sensors) against nuclear effects, DEWs, and projectile attack is well warranted and would have desirable spin-offs in other areas (such as satellite protection). A specific challenge would be to determine the survivability requirements of large ground-based laser installations, since they would in theory be very vulnerable to an array of aerodynamic threats or unconventional threats.

Again, the overall direction of this program would be toward high-payoff technologies, with less emphasis on boost phase concepts and more on solving the mid-course

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challenge. Also, for at least the next ten years, the focus should remain on basic research. It is very unlikely that any sort of wide-area BMD system we could put into full-scale engineering development before this point—whether directed or kinetic energy—would be worth having. Certainly it would not meet the president's criteria for effectiveness, cost advantage over the offense, and survivability.

3. The focusing of experimental work on technology development, not engineering development or field demonstrations. Field experiments are a sensitive issue in the SDI program. Many experts argue that such tests are not really of an experimental character, but designed as "spectaculars" to generate political support for the program. In fact, near-term testing of large-scale mock-ups of SDI hardware is not advisable and should be avoided. First, as mentioned earlier, such testing may "freeze" technologies prematurely. Second, it would further erode confidence in the ABM treaty, which is not in our interest. There are definite risks in applying a standard that says testing may be treaty compliant if the demonstration hardware cannot meet the power or performance criteria of ABM systems or components, or that the orbital target has the attributes of a satellite, not a warhead. Such criteria are too subtle and spark political controversy. A better criterion would be: would we raise objections if we saw the Soviets conducting the same test?

4. Continued adherence to the traditional interpretation of the ABM treaty. The larger policy context of our research efforts ought to be shaped by the continuance of the ABM treaty as traditionally defined to include both conventional and exotic systems. There are several reasons why the treaty is in our interest. First, we do not wish to release the Soviets from constraints on their BMD programs. Although we could in time respond effectively with pen-aids and more warheads to stem any military impact, the political consequences of Soviet breakout (or "creep-out") would be very destabilizing. Second, the treaty serves as the conceptual basis for offensive arms control and, in this sense, provides important reassurance that options for offensive arms reductions are not foreclosed as we investigate longer range options for defenses that might prove stabilizing for both sides. Third, the treaty is important as a political symbol and is vital in sustaining public and alliance support for balanced defense policies. If we contribute to further unraveling of the treaty, the threat we face would increase while domestic support for our responses might well decrease.

Beyond these considerations, it is worth stressing again that a sensible research program can be conducted within the traditional interpretation of the ABM treaty for at least the next ten years. Put another way, we would forfeit very little in technical terms by remaining in the treaty and thereby continuing to reap its contributions to our security.

5. The establishing of a framework accord with the Soviets for deep cuts in offensive arms and restraint on defense as part of a comprehensive package. Because our primary concern is Soviet offensive forces—especially their large ICBMs with hard-target kill capability—while the Soviets seem more concerned with our potential defensive capabilities, it is reasonable to speak of a "grand compromise." On the defensive side, a number of issues must be sorted out. We need progress toward solving outstanding compliance issues, like the Krasnoyarsk radar, that carry political burdens of their own. We also need to clarify the distinction between permitted research and prohibitions on development and testing. Over the longer term, we should seek common positions to make the ABM treaty more relevant to current technologies in the areas of anti-satellites, anti-tactical ballistic missiles, and surveillance technology. To structure and give impetus to these negotiations, our object should be to seek early agreement with the Soviet Union on a general framework statement. Both sides could agree to: adhere to the ABM treaty in its traditional interpretation and reaffirm that any decision to depart from its provisions must be subject to negotiation; refrain from exercising the withdrawal provision for a period of ten years; begin discussion on the prospects of a possible transition to defensive systems at a specified time in the mid-1990s (possibly at the 1997 ABM review conference); and commit to a consultation on existing compliance problems with a view to their resolution.

These general points should be but-

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tressed by some additional clarifications. First, both sides would acknowledge that articles III and V of the ABM treaty apply to exotic as well as to conventional ABM systems (thereby establishing the traditional interpretation of the treaty). Second, they would recognize that continued work on ATBMs, ASATs, and space surveillance systems raises questions of overlap that require clarification. Third, the parties would agree that the significance of technology testing is measured in relation to existing forces. The proper criterion is that tests should not make either side feel anxious about its existing arsenals. Fourth, as noted earlier, we would agree to discuss definitional issues (i.e., "components") and ambiguities raised by future technologies in the Standing Consultative Commission. Overall, our objective should be to make the existing defense arms regime more durable and to adjust our R&D strategy to that reality, at least until it could be demonstrated that some other mix of offensive and defensive forces would provide significantly enhanced stability.

On the offensive side, our overriding goal is to obtain substantial cuts in highly accurate multiple warhead ICBMs. In this sense, the real or apparent leverage we gain from our comparative advantage in SDI technologies must be used to gain cuts in heavy Soviet ICBMs, in particular their SS-18 force, which poses a serious threat to stability. The offensive weapons portion of the package could also be specified in a joint statement following the broad outlines of the proposals on 50 percent cuts discussed at Reykjavik. In general, both sides would agree to: denominate their reductions in weapons (warheads or bombs, not launchers) covering ICBMs, SLBMs, and bombers, with sub-limits on delivery systems, as appropriate; allow no more than a specified percentage of these weapons on ICBMs; and assure that reductions in weapons, however carried out, would lead to a substantial reduction in throw weight.

As with the defense, a number of important clarifications would have to be included—for example, to ensure access to data necessary for verification of existing limits and to agree to discuss separate limits on sea-launched cruise missiles (SLCMs) as part of follow-up talks. A separate agreement on intermediate-range nuclear forces (INF) would also be highly desirable.

TAKEN TOGETHER, the points outlined above suggest a positive direction that has the potential for sustained bipartisan support in a key area of our national security policy. We offer these ideas not as categorical directives, but as general guidelines for managing the tensions between our ballistic missile defense R&D strategies and our other policy goals in the context of great technical uncertainties and rapid change.

As this analysis suggests, there are two good reasons to carry out a significant BMD research program: to hedge against Soviet breakthroughs in the short term, and to understand the options for the long term. Even if scientific and technological innovations solve the key problems of system effectiveness, cost advantage to the defense, and survivability that the administration has identified as necessary conditions for an effective system, there will still remain important problems in managing a stable transition to a greater reliance on defensive systems. In this respect, the United States has enormous stakes in re-establishing a framework for restraint and dialogue with the Soviet Union. We cannot, in any sense, "go it alone" with SDI and expect technical fixes to solve our security problems.

SDI MONITOR — 6 APRIL 1987

SDI countermeasures might cost as little as 1-2% of SDI deployment, Soviet officials contended recently. Maj. Gen. Ivan Anureyev, quoted by *Tass* said clouds of metal balls could destroy space-based SDI components. He said a one-ounce ball, traveling at 10 miles per second, "can pierce a steel casing — or a space station's wall — which is [six inches] thick and lasers could be countered by coating missiles with light-deflecting material or by tumbling warheads to prevent laser focusing.

Other countermeasures offered by Anureyev included a missile cooling system to draw off laser heat, expelling gas around missiles to diffuse the beam, decoys to exhaust U.S. defenses, and electronic systems to confuse the defenses.

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Developing a European perspective for SDI

By Frederick Jocelyn

SOME TWO YEARS after the initial announcement of the Strategic Defense Initiative by President Reagan, the appreciation of some of the difficulties of a global strategic defence system are causing unexpected attitudes to appear.

Among the conflicting statements of recent months there are clear signs that some Europeans see a place for elements of SDI in Europe.

Tracing the strands that seem to be leading towards such a conclusion, which would have been preposterous in 1985 and seems surprising even now, unearths interesting observations on the way in which attitudes to SDI are changing, both in the USA and among the European allies.

The popular cartoon image of a global SDI system, with a world-wide constellation of satellite-based sensors and a plethora of kinetic energy and directed energy weapons, has taken a sharp knock in recent studies in the USA.

Probably the most worrying aspects of SDI research so far have been the disappointing solutions offered on SDI command and control architectures.

It is known that the SDI Organisation's senior officers in Washington have been concerned at the failure of the battle management/command, control and communications (BM/C³) architecture studies to come up with solutions that are comprehensive yet comprehensible, detailed yet controllable, and strategically affordable in technical, financial or manpower terms.

Where detailed sub-architectures have been defined, they appear to have been difficult to bring together under an overall command system. Where a global command system has been defined, it has been demonstrably unable to control critical individual engagements.

In addition there are major conflicts between technical requirements within the BM/C³ system, particularly those relating to multi-level security, to handle the intelligence data which must be available in real-time to the SDI BM/C³ system.

It is also clear that the architectures envisaged by the US contractors do not overlay existing command, control and communications systems at all well. Rather the opposite: the solutions tend to suggest a new and unique SDI command system quite separate from existing systems until the highest levels are reached. Such a solution would be difficult to man, let alone afford.

The inevitable conclusion at present is that the creation of a global SDI system to provide a strategic defensive shield for the USA and its allies is not attainable within the medium term, let alone the near term.

It seems likely that as this realisation percolates through the US Administration there will be a shift in the publicly quoted goals for SDI. Part of the problem in defining the shift will be that expectations have been raised in the US national consciousness which it will be hard to redirect without reducing the credibility of the Administration itself.

The conclusion of President Reagan's second term of office and the arrival of a new incumbent in the White House will give an opportunity for such a shift. However, it seems possible that the groundwork for the change will be laid this year for good political reasons.

Firstly, the Republican camp will be trying to preserve a substantial part of SDI, even should a Democrat be elected to the Presidency. A shift away from unrealistic or unattainable SDI goals may help preserve a core of SDI, particularly as there is so much support from the US industrial base involved in fruitful SDI-related research. Therefore, limiting SDI's goals may preserve the central theme of SDI created by a Republican President.

Secondly, the Republicans would hope to follow the vastly successful and popular Reagan years — and despite the Irangate tarnish, most of the Reagan years have been outstandingly popular — by bringing in another Republican President. But another Republican Administration would have to deal with the continuing dilemma of a Republican Presidency and a Democratic Congress. The power struggle would, as always, centre around the budget. Reducing the scope of SDI would reduce the financial strains on the defence budget and blunt some of the more telling Democrat arguments politically, a powerful combination.

Thirdly, the restriction of SDI goals would give President Reagan the opportunity to regain the initiative in strategic arms talks with the USSR at whatever level these may be conducted this year. There is no denying the appeal that this would have, both to the US electorate and to the President personally. It would be a marvellous end to the Presidency.

There are therefore sound reasons why the USA should consider a limitation of SDI, but the translation of such a limitation into practicality is easier said than done. A global SDI system is all-embracing, simple to comprehend and simple to tell to allies. A limited SDI system inevitably means that something — or someone — will not be protected.

There are perhaps two main ways to approach the limitation of SDI — by function or by geography.

Limiting SDI functionally makes a lot of sense from a technical point of view. It would be entirely possible, for example, to develop and deploy a more comprehensive set of sensor systems than exist now. Such a global missile detection system could be brought into being, capable not only of launch detection in real time but also of through-life tracking for the missile, its warheads and associated decoys.

In theory, if no weapons were deployed, such a system would not require a fully comprehensive battle management/C³ system. But it is unlikely that an Administration would ask, or that Congress would approve, the large funds for a global missile detection system that could do nothing about any threat that it detected.

More likely would be a limitation that somehow included an element of anti-missile weapons. In strictly functional terms such weapons, and the BM/C³ systems that go with them to command and direct engagements, could be divided into boost, post-boost, mid-course and terminal phases, since each requires different solutions.

But unless there is an unforeseen breakthrough in some aspect of weapon technology, it seems unlikely that only terminal phase defence — the last ditch defence of a target — will prove viable in the near or medium term.

Such a selection would be attractive politically, since it would be seen as providing defence for the US taxpayer who is, after all, paying for SDI. However, it seems unlikely that a widespread Terminal Defence System would be attempted

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immediately. Such a system would contravene the ABM Treaty and it would be costly to set up.

Nevertheless the construction of an element of such a functionally limited SDI system would be highly attractive. Defining a functionally *and* geographically limited objective, such as a terminal defence of the US capital, would match what has happened already in the Soviet Union and arguably overtake it since the technology, particularly in the anti-ballistic missile weapons and the BM/C³ system, would be much more modern.

The threat of a wider defensive system would be implicit, but it would not be made fact. Politically and strategically, the initiative would be held in US hands.

But there would be an unfortunate side-effect. The defence of an element of the USA against ballistic missiles would reinforce the difference in the positions of the Western European and US partners in the NATO Alliance, particularly since European governments would be able to see all too clearly the likely Soviet response of an enhanced ABM shield over Moscow.

Such a situation would emphasise the nakedness of London, Paris, Rome and Bonn and would immediately cause problems for the two independent European nuclear deterrents in France and the UK.

The postulation of a limited deployment of a US SDI system for Washington would not, by itself, be enough to cause any immediate movement in the major capitals of Europe. But there has already been a substantial amount of work on which European perceptions can be based.

In part, it was the USA itself which stimulated the European interest. George Keyworth, one of the original architects of the SDI concept during his time in the White House, saw quite clearly the problems that a US strategic defence system would create for the Europeans. The President himself, and the State Department, laid down the policy which the head of the SDI Organisation, Lt Gen James Abrahamson, has followed so assiduously.

His brief was simple: draw in the Allies. What the President feared was that the SDI concept would create a schism between the USA and its European or Japanese allies.

Accordingly, a series of bilateral memoranda of understanding were drawn up, which eventually the UK, West Germany, Italy and Japan signed. There were a number of absentees, but these were at the decision of the Allies, and not because the USA excluded them. There was also a surprising addition: Israel, which faced by Soviet-supplied short-range ballistic missiles based in Syria, convinced the USA that it should also be a signatory.

The European MOUs have been followed by contracts. Most of them are small because they are for the start-up study phase of activities. US companies have gone through a similar phase; one US consortium claims to have invested over $16 million of its own money in the first two study phases of what it hopes will finally be a very lucrative contract.

The important thing is that work is being undertaken in Europe on sensors, weapons, computers and related technologies, and that an understanding is developing among the European technical community as to what is feasible in terms of ballistic missile defence.

Such knowledge also formed the basis for the contracts announced in December by Caspar Weinberger for study of the European Theatre Ballistic Missile Defence System.

Three of the seven winning teams are led by Europeans — one by Messerschmitt-Bolkow-Blohm of Germany, one by an Aérospatiale-Thomson-CSF partnership and one by SNIA of Italy.

By all accounts, the European activity on these initial six-month $2 million parallel contracts is high. This is not just in expectation that at least one of the European-led teams will be in the 12-month $7-10 million Phase 2 studies which will start in July. Rather it is that some of the European governments are beginning to think that it is time they began to be better informed on their strategic defence options.

It might be thought that the Europeans already have more than enough defence problems without worrying about something that has been hitherto unattainable.

But it seems possible that some of the forward thinkers close to the European decision makers recognise that the strategic goals of defence policy have to change over the next few years to reflect changes in technology as well as changes within the NATO Alliance.

The changes in technology that may now permit some sort of last-ditch European defence against ballistic missiles are perhaps more evident than the deeper changes in Alliance perceptions that could actually be more important in strategic terms.

The talks at Reykjavik revealed the view that US nuclear weapons could be moved out of Europe as part of a wider bargain between the USA and the Soviet Union. This undoubtedly came as a shock to many of the European leaders; there can be little doubt that their view of the reliability of the US offensive nuclear deterrent has been changed.

It should not perhaps be surprising that Europeans are less convinced than their US allies of the strategic benefits of Soviet withdrawal of ballistic missiles from Eastern Europe and that this concern should see practical expression in looking for a way to counter a sudden return of the missiles at an awkward moment in the future.

Since there is little chance of an increase in a European-controlled offensive nuclear deterrent, it follows that the only real option is to look at a defensive deterrent. In short, at a European SDI.

There is also concern in Europe about the spread of ballistic missiles into less reliable hands. Syria already has these weapons; could they also find their way to Libya, or to Albania? What if other states acquired a shipborne or submarine-launched ballistic missile system? Under such circumstances, it is easy to envisage a damaging European surrender to the demands of a dictator or a fanatic group. If the USA or the USSR stepped in, the situation would hardly be improved, since there would be grounds for super-power confrontation and conflict.

So, in practical terms, there is a good deal of sense in a measure of European ballistic missile defence. But there is yet another rationale that lies beneath the surface.

So far West Germany has been uninvolved in the strategic nuclear balance. There is still a deep-seated concern among Germany's European partners that the German armed forces should not have their own nuclear weapons, even though these may now be small enough to be reduced to tactical uses.

The involvement of West Germany in a missile defence system for Europe — and, for such a system to work, Germany must be involved — would draw the Germans into active participation in the strategic nuclear balance by collaboration in a purely defensive deterrent system.

To many, this would be the final unravelling of the tangled legacy of the Second World War. By itself, it would be reason enough for the creation of a European SDI. There is little doubt that this has been perceived in Bonn and probably in Paris. Sir Geoffrey Howe's speech in Brussels on 16 March suggests that Whitehall too has seen the opportunity for greater European participation in deterrence by defence.

:FENSE NEWS 10 AUGUST 1987 Pg. 5

oard Approval Nets Push Forward for SDI Technology Researcl

Weapons Review Panel Endorses Proposal

By TRISH GILMARTIN
Defense News Staff Writer

WASHINGTON — The Strategic Defense Initiative (SDI) Organization cleared an important hurdle last Wednesday in its effort to accelerate testing on six systems that could form the core of an initial ballistic missile defense.

The SDI Organization proposal was endorsed by the Pentagon's top weapons review panel, the Defense Acquisition Board, and now awaits Defense Secretary Caspar Weinberger's approval.

The Defense Acquisition Board, in what is called a Milestone I Review, approved plans to move research on the six technologies from a concept development phase to a demonstration and validation phase.

The six systems under consideration encompass the full range of weapons and sensors that might be needed by a limited missile defense. They include two satellites designed to detect and track Soviet missiles as they fly toward the United States and ground- and space-based rockets capable of smashing into the incoming missiles at high speeds, rendering them useless. The Pentagon also wants to look at a pop-up sensor system or probe for spotting enemy missiles and tracking them and a complex battle management, command, control and communications apparatus that would serve as the brains of the entire strategic defense system.

The systems and some of the planned tests are:

■ Boost surveillance and tracking system (BSTS): This satellite will be designed to detect and track Soviet long-range ballistic missiles and submarine-launched ballistic missiles as they are launched.

Lockheed Missiles & Space Co., Sunnyvale, Calif. and Grumman Corp., Bethpage, N.Y. are building competing versions of the test satellite. One of the two will be chosen to build the spacecraft for test flight.

Present plans call for one BSTS satellite to be launched from Cape Canaveral Air Force Station, Fla. The unmanned Titan IV rocket being developed for the Air Force by Martin Marietta will be used to place the test satellite into orbit. The SDI Organization plans to assess the performance of the satellite "by tracking [rocket] launches from worldwide locations," documents say.

■ Space-based surveillance and tracking system: These satellites would be able to track Soviet missiles and their warheads in their post-boost and midcourse phases of flight. The spacecraft are to be able to discriminate warheads from other non-threatening objects, process the data and transmit it to other SDI systems in order to counter targets.

Planned tests include placing the satellite in orbit to test its performance against a small number of "realistic targets," the documents say. The SDI Organization has not yet decided whether to use a Titan IV rocket or the space shuttle to place the satellite into orbit. Also undecided is the launch site; Cape Canaveral and Vandenberg are the two possibilities, though additional launch facilities may be required for either vehicle, the documents say.

■ Space-based interceptor. This system would consist of weapons-carrying space platforms capable of identifying and tracking enemy targets, predicting their trajectories and destroying warheads in the boost, post-boost and midcourse phase of flight.

Each platform would house multiple missiles guided by sophisticated homing devices and containing computers that would enable data on the location of targets to be transferred from the platform to the interceptor. The missiles would be fired from the platforms and destroy their tar-

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WEINBERGER...CONTINUED

through. Without that knowledge, the success of a first strike is not just in doubt, it is virtually unachievable.

Moreover, the Soviets might well have to expend so many missiles in the first salvo that they would be left without a credible reserve force. That prospect alone would bolster deterrence.

What if Moscow decided to attack our spaced-based defenses before launching missiles against our country?

First, one of President Reagan's goals is to insure that these defenses are survivable. And even an attempt to overwhelm them with many warheads would not increase the Soviets' confidence that they would succeed.

Some critics might claim that we are seeking to solve a nonproblem. Even without defense, they say, a first strike is unthinkable and not feasible. But in an extreme crisis, to fulfill their limitless ambitions the Soviets might take extreme action — no matter what some Americans specializing in defense theory believed. Additionally, their missile technology is moving toward making a first strike more feasible.

Technology will simply not stand still. That is why we must match the new technologies of offensive war with the new technologies of strategic defense.

By saying no to a first strike, an initial phase would begin to degrade the value of ballistic missiles; it would work toward making their very existence a burden. When these weapons lost their justification, arms reductions would become not only possible but inevitable.

Without incentives to reduce armaments, the Soviets will continue their buildup. This means both offensive and defensive weapons, for the Soviets have long been deeply engaged in a strategic defense program that is equal in scale to their massive offensive buildup.

One of the best incentives we can provide is our demonstrated will to begin to deploy strategic defenses. This will show Moscow that the offensive ballistic missile is on a path to ultimate extinction.

A first phase of S.D.I. is a genuine possibility. The technology is close at hand. The strategic rationale is clear and the benefits compelling. It must, of course, be followed by other phases until the system is complete and the ultimate goal achieved. So I ask our critics to turn away from their preoccupation with straw men and false alternatives and to join the debate on the real issue at hand: How can we best reap the benefits of an initial phase of the Strategic Defensive Initiative?

Caspar W. Weinberger is Secretary of Defense.

gets by smashing into them at high speeds.

Test firings of the propulsion system that will enable the missile's homing device to be highly maneuverable will be carried out at Edwards Air Force Base, Calif. Flight tests of the homing device against a movable target with a safety net also are planned. These tests would occur before 1992 and would last for about six months, according to the documents.

■ Exoatmospheric Re-entry Vehicle Interception System: These ground-based missiles would be designed to intercept and destroy enemy ballistic missiles in their midcourse portion of flight by smashing into them at high speed. Up to eight flight tests of the system are planned to test the ability of the vehicle to intercept targets in space. Lockheed Missiles & Space Co. is prime contractor for the missile interceptor.

The flight tests are to be performed at the U.S. Army Kwajalein facility, a northern atoll within the Ralik chain of the Republic of the Marshall Islands. It is located southeast of Guam in the Pacific Ocean. SDI planners envision using Polaris A-3 missiles as targets. These missiles would be launched from Vandenberg Air Force Base and possibly from the Pacific Missile Range Facility at Barking Sands, Kauai, Hawaii.

■ Ground-based surveillance and tracking system: Sensors and detectors aboard a ground-based missile would serve as a probe to acquire and track incoming enemy warheads and discriminate between them and non-threatening objects, such as decoys.

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Flight tests to assess the capability of the sensor to track space objects will be carried out at government and contractor facilities that have not yet been selected. The use of the Kwajalein facility for flight testing is likely to require construction of additional launch facilities, the documents say.

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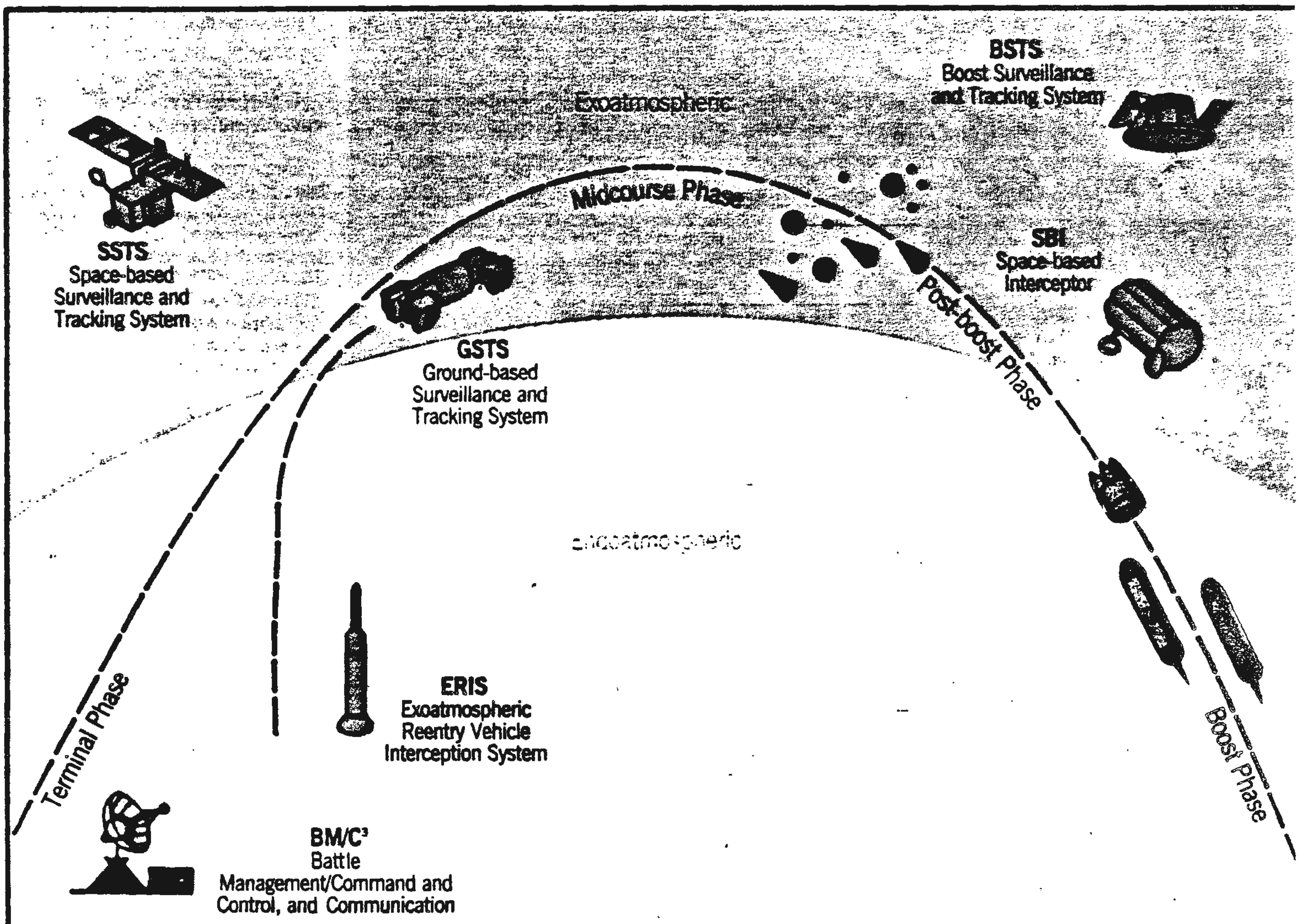

SOURCE: DEPARTMENT OF DEFENS

This artist's concept depicts

the six SDI technologies that are leading candidates for the early portions of a future missile defense system.

SCIENTIFIC AMERICAN. SEPTEMBER 1987 Vol.257, No.3 Pg.41

Strategic Defense and Directed-Energy Weapons

The cochairmen of the American Physical Society panel summarize the group's findings concerning the developmental gap that stands between the laboratory and a decision to deploy such weapons

by C. Kumar N. Patel and Nicolaas Bloembergen

In November, 1983, about eight months after President Reagan called on the U.S. scientific community to develop a system that "could intercept and destroy strategic ballistic missiles before they reach our soil," the American Physical Society commissioned a study to evaluate the status of directed-energy weapons. The evaluation, which was finally released this spring, focuses on the potential of lasers and particle beams in strategic defense. The 17-member committee, of which we were the cochairmen, sought to provide a report that would serve as a technical reference point for further discussions on the feasibility of the "space shield" envisioned by proponents of the Strategic Defense Initiative (SDI), the program that grew out of the president's entreaty. This article is based on our report.

Members of the panel were selected on the basis of their expertise in the various scientific and technological fields essential for directed-energy weapons. The members were drawn from a wide range of academic, government and industrial laboratories, many of which are actively involved in the development of nuclear and related weaponry as well as supporting technologies. In preparing the study we had access to classified information. Although the public release of the report was delayed for seven months while the U.S. Department of Defense reviewed it, the amount of material deleted was minuscule. The most significant omissions in the report concern the vulnerability of the defensive systems and possible countermeasures.

What did we find? Compared with the length of the report (424 pages), our conclusions are short. We quote from the study itself: "Although substantial progress has been made in many technologies of DEW [directed-energy weapons] over the last two decades, the Study Group finds significant gaps in the scientific

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Study Group of the American Physical Society report "Science and Technology of Directed Energy Weapons"

Nicolaas Bloembergen, *cochair*
Harvard University
C. Kumar N. Patel, *cochair*
AT&T Bell Laboratories
Petras Avizonis
Air Force Weapons Laboratory
Robert Clem
Sandia National Laboratories
Abraham Hertzberg
University of Washington
Thomas Johnson
U.S. Military Academy
Thomas Marshall
Columbia University
Bruce Miller
Sandia National Laboratories
Walter Morrow
M.I.T. Lincoln Laboratories
Edwin Salpeter
Cornell University
Andrew Sessler
Lawrence Berkeley Laboratory
Jeremiah Sullivan
University of Illinois
James Wyant
University of Arizona
Amnon Yariv
California Institute of Technology
Richard Zare
Stanford University

L. Charles Hebel, executive officer
Xerox Corporation
Alex Glass, principal consultant
KMS Fusion, Inc.

The history of the study is a long one. Commissioned on November 20, 1983, by the APS, the study group was assembled by November, 1984. The report required some 21 months ("the gestation period of an elephant," according to Patel) until its release on April 24, 1987. The last seven months were taken up with security reviews by the Department of Defense.

decisions that will cut across individual service prerogatives is not so readily forthcoming.

The White Paper

Almost a year after Dibb Review, the government released its White Paper on defense. This policy document retains Dibb's strategic concepts and proposals for the structure of the armed forces, but the political opposition and sections of the media have claimed that there are important differences between the two approaches.

•*Strategy:* In assessing Australia's security environment, the White Paper acknowledges that the uncertain political future of the Philippines is something for Australia to worry about. In the South Pacific, the Paper notes: "The establishment of links between some regional states and external powers with strategic interests potentially inimical to Australia". In South-East Asia, the Soviet presence at Cam Ranh Bay, in Vietnam, is viewed as a matter of "significant concern for Australian defense policy".

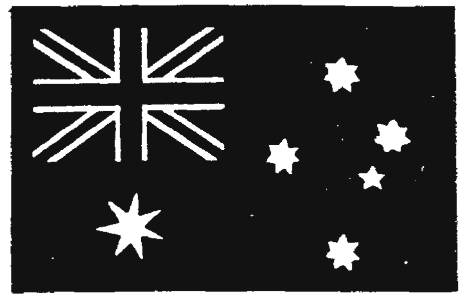
The White Paper does not mention the term "strategy of denial". Australia's security posture for the years ahead is described as one of "defense-in-depth". This retains Dibb's concept of "layered defense", but the terminology used to describe "defense-in-depth" frequently involves words such as "strike", "offensive capabilities" and "interdiction".

•*Opposition:* According to its political opposition, the Labor government has yielded to their criticism of the Dibb Review as being too defensive to deter hostile action and for undermining Australia's regional defense role in alliance with the US. Defense minister Beazley, however, sees no difference in substance between the Dibb Review and the White Paper. Professor Desmond Ball, one of Australia's leading strategic analysts, and a member of the committee that drafted the White Paper, dismissed the opposition's claims during an interview with the authors. According to Ball, the reference in the White Paper to "offensive capabilities" merely reflects a decision to leave open Australia's future weapon requirements.

•*Regional aspects and ANZUS:* While it does not envisage a capability for long-range intervention, the White Paper endorses two recent decisions by the Australian government which would give the navy a wider role. The first is the decision to shift half of the fleet to the Indian Ocean, from Sydney to a base near Perth in Western Australia. The second is the "South Pacific Defense Initiative", announced a month before the release of the White Paper. This stresses the importance of the South Pacific in Australia's defense planning, and includes the following measures:

1) Increased deployment of Australia's long-range maritime surveillance aircraft and naval ships to the region.
2) Assistance to the South Pacific states to modernise their maritime surveillance forces by providing patrol boats, training and advisers.
3) Increased co-operation between Australia's defense forces and those of the South Pacific states, including provision of Australian training and technical assistance.

Domestic critics of the Dibb Review have more or less welcomed the White Paper. The US also appears satisfied. The White Paper takes particular care to dismiss the notion that the Labor government is promoting isolationism and a "fortress Australia" mentality. It strongly endorses the ANZUS treaty with the US, now reduced to a bilateral understanding following New Zealand's *de facto* expulsion from the treaty in 1986 after refusing to lift its ban on American nuclear powered or armed vessels. New Zealand, to, should be pleased about the White



Paper's support for closer co-ordination between its defense forces and those of Australia, which could partially offset the gaps caused by the withdrawal of American intelligence facilities and other forms of defense co-operation.

•*Cost:* The major problem with the White Paper, as with the Dibb Review, is the potential cost of its recommendations. The Paper discards the Dibb Review's criteria of a 3.3% real annual growth in defense spending and instead sets forth a spending target of between 2.6 to 3% of the GDP. A total figure of A$25,000 million over the next 15 years would be needed to implement the "defense in depth" strategy. But doubts have already emerged regarding the government's ability to provide this amount. There is also concern among the government's political opposition that much more than A$25,000 million would be needed to implement the new strategy.

* * *

Overall, however, the White Paper has created a positive impression within the country and has attracted an unprecedented degree of bipartisan support. The era of "forward defense" in Australia's defense strategy has ended. After a prolonged debate, and despite continuing feelings of uncertainity regarding its implementation, a new and comprehensive security framework for Australia is finally in place.

and engineering understanding of many issues associated with the development of these technologies. Successful resolution of these issues is critical for the extrapolation to performance levels that would be required in an effective ballistic missile defense system. At present, there is insufficient information to decide whether the required extrapolations can or cannot be achieved. Most crucial elements required for a DEW system need improvements of several orders of magnitude. Because the elements are inter-related, the improvements must be achieved in a mutually consistent manner. We estimate that even in the best of circumstances, a decade or more of intensive research would be required to provide the technical knowledge needed for an informed decision about the potential effectiveness and survivability of directed energy weapon systems. In addition, the important issues of overall system integration and effectiveness depend critically upon information that, to our knowledge, does not yet exist."

The study focused on directed-energy weapons because they would be needed in almost all stages of the destruction of a missile, including detecting the launch, locating and tracking the target, distinguishing warheads from decoys, destroying the target itself and verifying the kill. The study did not explicitly review the other major class of weapons, kinetic-kill weapons: chemical guns (rockets) and electromagnetic guns. A ballistic-missile defense that relied on kinetic-kill weapons for the actual destruction of a target would still need directed-energy technology to carry out the other tasks outlined above. As such, an effective ballistic-missile defense is very dependent on the availability of mature directed-energy technology.

The study also made no attempt to discuss in detail many significant issues concerning command, control, communication and intelligence (C^3I), computing hardware, software creation and reliability for battle management and overall systems complexity. Other issues that were recognized but not addressed include manpower requirements, costs and cost-effectiveness, arms control and strategic stability, as well as international and domestic policy implications. Many of these topics have been the subject of intense debate in the years following the president's "Star Wars" address; it is somewhat surprising that the one aspect that had not been analyzed with sufficient objectivity and in sufficient detail was the technology itself.

The effectiveness of any ballistic-missile defense depends on taking careful account of a missile's four phases of flight: boost, postboost, midcourse and reentry. The boost phase begins when the missile leaves its launcher and ends when the payload separates from the lifting vehicle. The boost phase usually lasts for about three minutes. During a typical postboost phase, which has a duration of about five minutes, a "bus," or postboost vehicle, ejects a number of smaller missiles called reentry vehicles (typically called multiple independently targeted reentry vehicles, or MIRV's). Thrusters are actuated to help direct the reentry vehicles to individually designated targets. Often the boost phase is defined as the total period covering the launch and deployment of all the reentry vehicles. We have chosen to divide this period into two because of the different signatures available to the defense during the two parts.

The longest phase is the midcourse flight, in which the reentry vehicles and any decoys move along together in nearly frictionless trajectories

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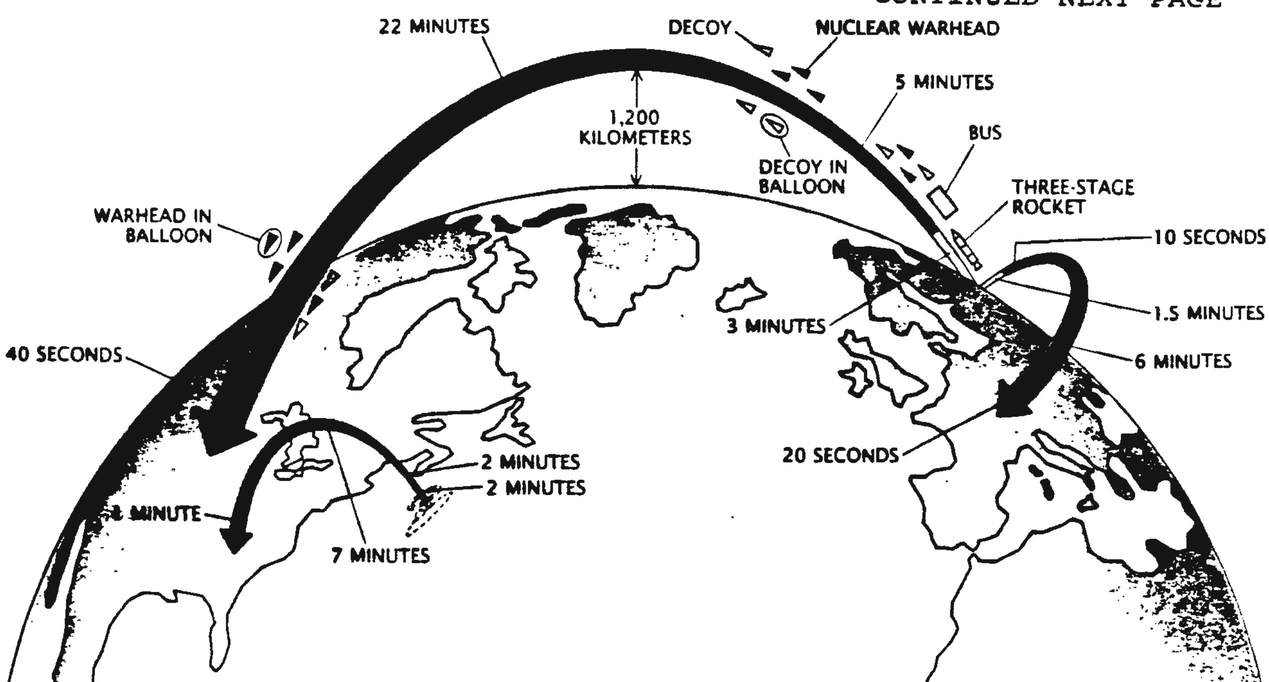

FOUR PHASES of flight are shown for an intercontinental ballistic missile (ICBM), a submarine-launched missile and an intermediate-range missile. The first phase, the boost phase (*yellow*), begins when the missile leaves the launcher and ends when the payload separates from the lifting vehicle. During a typical postboost phase (*light orange*) a "bus," or postboost vehicle, ejects a number of smaller missiles called reentry vehicles. In the midcourse phase (*dark orange*) the reentry vehicles and any decoys move along in nearby trajectories. The flight ends with the reentry phase (*red*). Because of the large number of targets associated with the midcourse phase, the best points at which to thwart an enemy attack are during the boost and postboost phases.

FLIGHT INTERNATIONAL

25 JULY 1987 Pg. 35

Fokker backs Arall

AMSTERDAM

Following successful tests of an F.27 lower wing panel made from aramid-reinforced aluminium laminate (Arall), Fokker is to build and fly components made from the new material.

A number of lower wing panel inspection covers for the Fokker 50 will be produced to gain flight experience with Arall, which promises to both reduce weight and increase structure life. The twin-turboprop F.50 is developed from the F.27.

Arall is a laminate of thin aluminium sheets and aramid composite layers. The F.27 lower wing panel made from this material is 33 per cent lighter than the all-metal component, and has demonstrated excellent fatigue behaviour and damage tolerance in tests equivalent to 270,000 flights—three times the design life.

DEFENSE...CONTINUED

far above the atmosphere. The midcourse phase lasts for about 20 minutes for intercontinental flights. Finally, the reentry vehicles pass through the atmosphere; less than 60 seconds later they strike the earth.

Perhaps the best points at which to thwart an enemy attack are during the boost and postboost deployment phases. For a variety of reasons, directed-energy weapons do not have an important role in the final reentry phase. The advantage gained by the long length of the midcourse phase is offset by the increased number of threat objects (reentry vehicles and decoys) over that of the boost and postboost deployment phases. Indeed, given the present number of Soviet boosters and their capability, it is estimated that half a million or more threat objects could be deployed. Even a boost-phase defense that was 80 percent effective would still leave 100,000 or more objects entering the midcourse phase. The tracking and discrimination of tens or hundreds of thousands of objects would pose formidable challenges to sensors and battle-management computers.

Currently four kinds of lasers are being considered as kill weapons for operation during the boost phase. They are chemical, excimer, free-electron and X-ray lasers. The beams produced by all of them travel at the speed of light, which means that for all practical purposes any target can be reached instantaneously. Chemical lasers, the maturest technology being considered, generate radiation by means of chemical reactions between two gases, such as hydrogen and fluorine, or deuterium ("heavy hydrogen") and fluorine. Running continuously, hydrogen-fluoride and deuterium-fluoride lasers have been reported to have power outputs exceeding one megawatt (10^6 watts); a 10-kilowatt laser beam can cut through a quarter-inch steel plate in a matter of seconds.

In spite of the impressive power of chemical lasers and the high quality of their beams, we estimate that the least demanding strategic-defense applications require the present power levels to be increased by at least a factor of 20 while keeping the beam free of distortion and minimizing its divergence. For a typical distance between a target and a laser the needed power may require an additional improvement by a factor of four. The chemical-laser geometry that has produced the megawatt-level power is not considered scalable to much higher powers. The needed improvement must therefore be obtained with a geometry that has not yet been explored. Whether or not a chemical laser can be made sufficiently powerful remains to be seen.

Moreover, the wavelength of light emitted by a hydrogen-fluoride laser (2.8 micrometers, or millionths of a meter) is absorbed by the atmosphere. As a result a hydrogen-fluoride laser would have to be based in space, which would lead to problems arising from vibrations and exhaust from burnt fuel. We should point out, however, that the atmosphere is virtually transparent to the beams of deuterium-fluoride and atomic-iodine chemical lasers, which have wavelengths of 3.8 and 1.3 micrometers respectively. As such the two lasers could be based on the ground if the necessary power requirements are met. It is worth noting, however, that we find oxygen lasers need to be scaled up by at least five orders of magnitude (a factor of 100,000) over their current capabilities.

Excimer lasers are the second kind of laser being considered for directed-energy weapons. Excimer stands for excited dimer: an unstable compound composed of two molecules. An electric discharge excites the molecules into forming an ionically bound dimer molecule. The dimer gives off radiation and dissociates. An excimer laser produces light in the form of short pulses. Among the most powerful excimer lasers are the krypton-fluoride lasers under development at the Los Alamos National Laboratory. Such lasers have a wavelength of .25 micrometer, which has the disadvantage of relatively poor atmospheric transmission compared with visible light or well-chosen infrared lasers. In the case of the excimer lasers of the most interest, the poor transmission is caused not by absorption but by the high amount of

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scattering from molecules in the atmosphere. (The particular type of scattering, known as Rayleigh scattering, increases as the inverse of the fourth power of the radiation wavelength.) The problem can be ameliorated somewhat by shifting the excimer-laser wavelength to longer wavelengths through a technique called Raman shifting.

We estimate that ground-based excimer lasers for strategic-defense applications must produce at least 100 megajoules of energy in a single pulse or train of pulses with a total duration of between several microseconds and several hundred. Existing pulsed excimer lasers can generate about 10 kilojoules of energy in a pulse lasting for about a microsecond: the energy needs improvement by at least four orders of magnitude. The gap might be bridged by combining many lasers, but the feasibility of such a scheme is unclear.

The third kind of laser under development that could serve in ballistic-missile defense is the free-electron laser. It operates by sending a beam of electrons through a series of "wiggler" magnets that cause the electrons to vibrate and emit radiation. By changing the distance between the magnets or the energy of the electrons, the laser can be tuned to radiate at theoretically any wavelength. For ballistic-missile defense applications a ground-based free-electron laser should have an average power of at least one gigawatt (one billion watts) at a wavelength of one micrometer. Radiation of such a wavelength would pass through the atmosphere with ease.

Peak powers of approximately a megawatt have been produced at a wavelength of one micrometer; peak powers of approximately a gigawatt have been produced at a wavelength of eight millimeters (a wavelength absorbed by the atmosphere). Scaling to short wavelengths at high powers is a difficult technical problem. The feasibility of building high-efficiency, high-power free-electron lasers that operate at one micrometer depends on first verifying several physical concepts that have been developed only theoretically.

Perhaps the most exotic kind of laser under development is the X-ray laser. The device consists of a nuclear explosive surrounded by a cylindrical array of thin metal fibers. X rays emitted during the nuclear explosion stimulate the emission of a beam of X rays from the fibers in the short time before the device destroys itself. Workers have tested the X-ray laser in an underground site, but the feasibility of making a militarily useful X-ray laser remains uncertain. The absorption of X rays by the atmosphere means the device would have to be deployed at an altitude greater than about 80 kilometers, perhaps in some kind of "pop up" scheme. A way must be found to focus and guide the beams of X rays toward their targets. Many other physical concepts must be validated before the application of nuclear-pumped X-ray lasers to strategic defense can be evaluated.

Even if lasers sufficiently powerful for strategic-defense applications can be made, significant hurdles must be overcome to deliver the beams to their targets. First, any laser beam, no matter how intense and collimated it is, will suffer from diffraction as it travels through space: the beam will spread and become less intense. For a given power output from a laser, the intensity of the beam on a target is proportional to the square of the diameter of the mirror with which the beam is focused. The intensity is also inversely proportional to the square of the product of the wavelength of the laser and the distance to the target. Consequently the longer the wavelength or the range is, the larger the diameter of the mirror must be to maintain the desired target intensity.

The largest mirrors that are practical for steering and pointing have diameters of about eight meters, but diameters of 10 to 40 meters would be required for ballistic-missile defense missions. Such effective sizes could be achieved by employing an array of small mirrors instead of a single large mirror. The mirrors would have to be coordinated by electrically driven devices called actuators. Although it is currently possible to control several hundred actuators at once, it is not known whether the estimated 10,000 to 100,000 actuators for defense tasks can be controlled simultaneously. Moreover, the array of mirrors calls for phase-correction techniques, in which the "crests" and "troughs" of the waves in a beam are carefully aligned. It remains to be seen whether such techniques can work for the high-intensity beams needed for defense purposes. An alternative approach, which would make use of a single, large, flexible membrane, is in the conceptual stage of development.

The mirrors in any laser system would be vulnerable to radiation from other lasers, particularly if the mirrors were part of a space-based system. Even a relatively weak laser could cause significant damage if its wavelength were different from the one the coating was designed to handle. Energetic particles from cosmic rays could also damage the coating. Small mirrors in the laser would have to be cooled to prevent damage from the laser beam itself.

Ground-based lasers, such as free-electron lasers and excimer lasers, have advantages over space-based ones in that weight, power and servicing problems are not relevant. Even ground-based lasers, however, would depend on substantial optical components mounted on space platforms for relaying the laser radiation from a ground site in the continental U.S. to a target not within the line of sight. In addition atmospheric turbulence will degrade laser-beam quality. A technique called optical phase conjugation is being explored as a way of compensating for the turbulence. In this technique one would measure the distortion of a low-power beam from a beacon laser on a relay-mirror platform in space. The information would be encoded in the outgoing high-power laser beam from the earth in such a way that the beam is "predistorted" and emerges from the atmosphere with its original high quality. The technique has been demonstrated at low powers, but it needs to be scaled up to high ones. Furthermore, the number of actuators needed to deform the mirror that would produce the predistorted beam must be scaled up by two orders of magnitude.

During the operation of a pulsed laser (such as an excimer laser) the optical field associated with the downward leg from the mission mirror to the target would be quite intense. The intensity would be high enough to cause the laser beam to scatter (through a process called stimulated Raman scattering) at altitudes below 80 kilometers. The phenomenon changes the wavelength of the radiation, which in itself is not crucial, but it also reduces the power available for attacking the target.

Finally, ground-based laser systems would have to be set up at multiple sites separated by hundreds of kilometers to keep adverse weather conditions, such as cloud cover, from immobilizing the defense. Each of these sites in turn would require some duplication of large telescope

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mirrors over scales of a few kilometers in order to deal with local cloud-cover conditions.

The other class of directed-energy weapons being considered for ballistic-missile defense consists of particle beams, which can be made up of electrically charged particles or of electrically neutral ones. Most charged-particle beams consist of high-energy electrons. We estimate that booster-kill applications of a charged-particle beam call for a scale-up in accelerator voltage by at least one order of magnitude, in pulse duration by at least two orders of magnitude and in average power by at least three orders of magnitude. Discrimination between targets and decoys requires a scale-up in pulse duration by at least two orders of magnitude and in average power by at least two orders of magnitude.

Charged-particle beams have the limitation that they are bent by the magnetic field of the earth. Moreover, they tend to "blow up," or be unstable, as a consequence of the repulsive force between charged particles that have the same sign. Attempts to compensate for both problems have been made using laser beams. The basic idea is to create in a gas an ionized channel that guides a high-energy electron beam, just as an optical fiber guides a light beam. Such a channel is formed by directing a laser beam through the gas to strip the electrons from the gas atoms. This mechanism for beam guiding has been successfully demonstrated in the laboratory over distances of 95 meters; it would have to be effective over distances of 1,000 kilometers for ballistic-missile defense applications. Furthermore, the laser-created plasma channel for guiding electron beams cannot be used at altitudes so high that there is little gas to ionize but where the effects of the earth's magnetic field are still felt. Also, at low altitudes the high density of gas results in beam instabilities.

Because neutral-particle beams are not affected by magnetic fields, investigators have turned toward developing them. To generate a neutral beam, a beam of negative ions (atoms that have an excess electron) is first accelerated to the required energy, directed and focused, and the extra electron is then stripped away. We estimate that neutral-particle beam accelerators operating at the necessary current levels must be scaled up by at least two orders of magnitude in both voltage and the rate at which they can deliver a beam. The pointing accuracy and the rate at which the devices can be retargeted must be improved considerably. Another drawback of neutral-particle beams is that they interact strongly with all matter. At lower altitudes, where the gas density is substantial, the atmosphere strips the neutral particles of their outer electrons. As a result a neutral-particle beam can become a charged-particle beam and inherit the latter's limitations. Neutral-particle-beam devices would have to be based in space.

No matter how a strategic-defense system seeks to kill a missile—be it with lasers, particle beams, rockets or electromagnetic guns—that sys-

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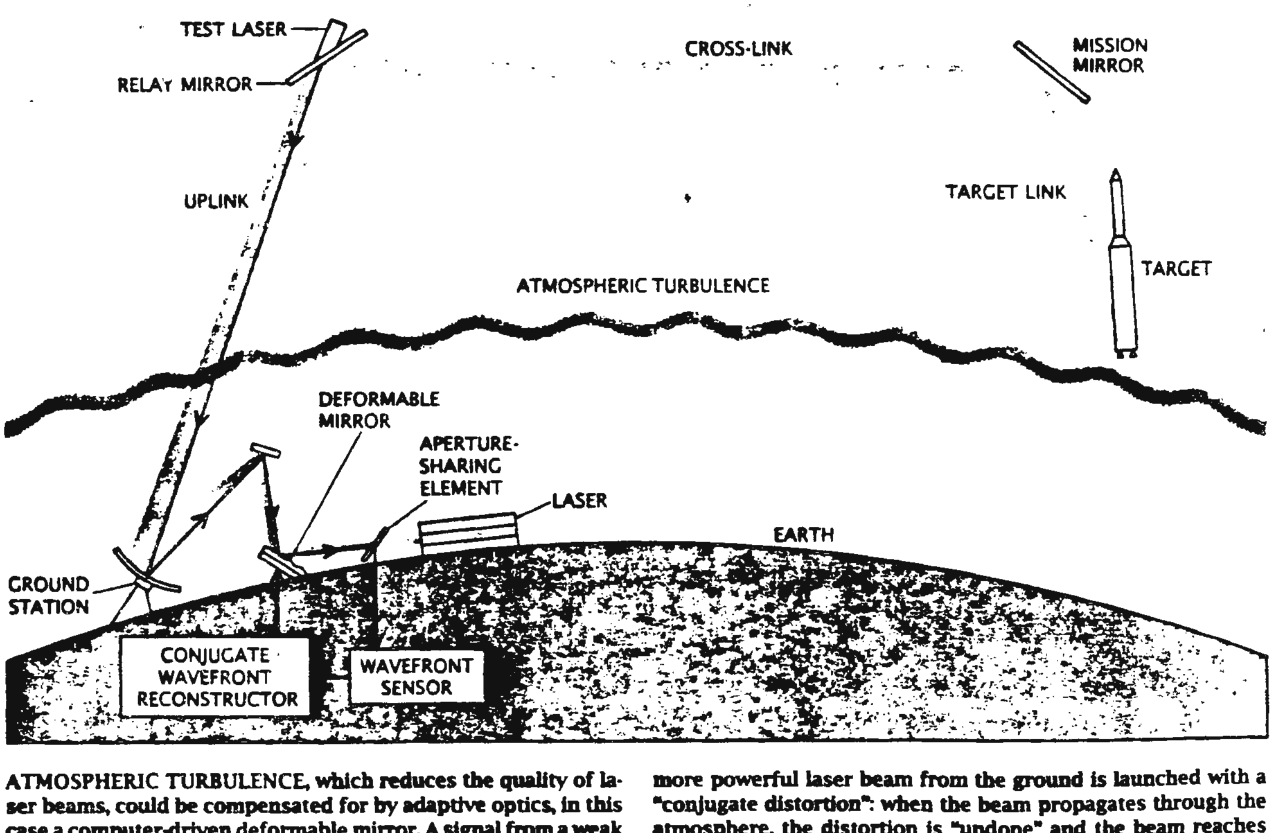

ATMOSPHERIC TURBULENCE, which reduces the quality of laser beams, could be compensated for by adaptive optics, in this case a computer-driven deformable mirror. A signal from a weak laser beam directed from the relay mirror to the ground tells the wavefront sensor the nature and extent of the atmospheric distortion. A computer then instructs electrically driven devices called actuators to deform segments in the mirror, so that the more powerful laser beam from the ground is launched with a "conjugate distortion": when the beam propagates through the atmosphere, the distortion is "undone" and the beam reaches the relay mirror undistorted. Although it is currently possible to control several hundred actuators at the same time, it is not known whether the estimated 10,000 to 100,000 actuators needed for purposes of defense can be controlled simultaneously.

tem can be no more effective than its ability to detect and track its target. In order to ensure that 90 percent of the incoming missiles are destroyed during the boost and postboost deployment phases, for instance, well over 90 percent of the missiles must first be detected. In addition the ability to track and destroy a target during the midcourse phase depends on knowing with high precision the target's trajectory during the boost phase. Of even greater importance is the need to maintain low false-alarm rates so that a defense system against ballistic missiles is not activated in peacetime.

A missile is typically tracked during its boost phase by detecting the intense infrared radiation from its booster plume. The position of the missile within the plume depends in a complex way on altitude, missile type and the kind of rocket motor and fuel. As a consequence the precise location of the missile is susceptible to variation by the offense that cannot be predicted by the defense. Infrared tracking of missile plumes will have to be supplemented by other means to ensure that the precise aiming requirements of directed-energy weapons are met.

Tracking requirements also pose a challenge during the postboost and midcourse phases. Because of the weak thermal signatures of postboost and reentry vehicles, thermal detectors will have to be supplemented with microwave or optical radars. A large number of space-based platforms carrying the detectors would be needed. Such platforms could perhaps contain supplementary detectors for tracking during the boost phase as well.

In the midcourse phase an additional challenge confronts the defense: reentry vehicles must be distinguished from decoys, and many options are available for confusing or saturating defensive detectors. Directed-energy technologies may offer the possibility of identifying decoys. Particle beams penetrate deep into all kinds of material; a neutral-hydrogen beam at from 100 to 400 million electron volts (MeV) of energy, for example, can penetrate from four to 40 centimeters of aluminum. Hence particle beams directed at a target can sample its contents. The kinds of emissions from the target's interior could be exploited to determine whether it is a decoy. Such discrimination would require large numbers of additional directed-energy platforms based in space. The platforms would have to be able to operate in an environment that might contain large amounts of nuclear radiation. The application of directed-energy weapons to discrimination is currently in the conceptual and early experimental stages.

Any strategic-defense system utilizing directed-energy weapons would require significant amounts of power. A space platform would need from about 100 to 700 kilowatts of continuous power to satisfy "housekeeping" functions alone—to control altitude, cool mirrors, receive and transmit information and operate radars. Since no precise designs for these platforms exist, the requirements stated here should be considered reliable only to within a factor of two. In any case such a power level could be attained effectively only with a nuclear reactor. Each platform would need its own reactor, so that perhaps 100 or more reactors would have to be deployed in space. Meeting the challenge means first solving many daunting engineering problems that have not yet been explored, such as how to cool large space-based nuclear reactors.

The power requirements during an actual engagement could reach from 100 megawatts to a gigawatt for periods of several hundred seconds, depending on the type of space-based directed-energy weapon. The power would have to come from large chemical or nuclear rocket engines, which would have to be deployed at considerable distances from the platforms to avoid mechanical disturbances. If chemical engines were used, the fuel consumption would be more than five tons per minute of operation per platform. The system for transferring energy from the engines to the platforms would no doubt be complex. The prime power requirements for space-based directed-energy weapons present significant technical obstacles.

Another key issue for any ballistic-missile defense system is survivability. Space platforms would carry such delicate instruments as sensors, optical mirrors and radar dishes, many of which have considerably lower damage thresholds than boosters, postboost buses and reentry vehicles. Although sensors and optical mirrors can be shielded during long periods of inactivity, they would be exposed when put on the alert prior to an impending attack. The defense system would be vulnerable to assault by space- and ground-based directed-energy weapons and kinetic-energy weapons. The system would be particularly vulnerable to attack in the course of being assembled in space. The survivability of a defense system employing space-based assets is highly questionable.

The survivability of ground-based facilities also raises serious issues. The facilities would have to be protected successfully from direct attack by many threats, including cruise missiles and even sabotage. The projected small number of ground-based facilities, each of which would have to be capable of carrying out the entire task of the directed-energy weapon component of a ballistic-missile defense, would put a high premium on these sites.

Survivability is further called into question by the simple observation that even if a directed-energy weapon is too weak to serve in a ballistic-missile defense, it may still be powerful enough in the hands of the offense to threaten space-based components of a defensive system. Space-based platforms move in known orbits and can therefore be targeted over longer time spans than boosters, postboost buses and reentry vehicles. The platforms may have key components that are more vulnerable than boosters and reentry vehicles. Space-based platforms in low orbits can also be attacked from shorter ranges than those required for boost-phase intercepts. Moreover, X-ray lasers driven by nuclear explosions would constitute a special threat to the delicate operation of space-based sensors, electronics and optics.

The issue of strategic and tactical environment should also be considered. The development and deployment of an effective ballistic-missile defense would occupy many years. As a result considerable time will be available during which the offense can develop countermeasures. Any defense will have to be designed to handle a variety of such responses, yet it seems possible that some unanticipated ones could be deployed. It is quite conceivable that a directed-energy weapon system designed for today's threats will be inadequate for one or more of the threats it will face when it is deployed.

SUPPLEMENTAL: TUESDAY, 25 AUGUST 1987

INTERVIEWS

NATIONAL DEFENSE JULY/AUGUST 1987 Pg. 41

SDI

AT

SANDIA NATIONAL LABORATORIES

AN INTERVIEW WITH RICHARD C. WAYNE

ALEX GLIKSMAN

When most people think of the national laboratories, the names Lawrence Livermore and Los Alamos usually spring to mind. It would probably surprise many to learn that Sandia National Laboratories' budget is larger than either of those two. One reason for this is that its primary mission is to collaborate with and support the nuclear weapons activities of the two weapons design laboratories. Sandia's main facilities are located at Albuquerque, NM, and Livermore, CA.

Participating in Lawrence Livermore's and Los Alamos' strategic defense programs is part of this mission. This interview was conducted with Sandia's Director of Component and Systems Research, Dr. Richard C. Wayne. Dr. Wayne's responsibilities include coordinating Strategic Defense Initiative operations at all Sandia facilities.

Dr. Richard C. Wayne

NATIONAL DEFENSE: What is Sandia's mission? What makes it the largest of the national laboratories and what distinguishes it from Livermore and Los Alamos?

Richard C. Wayne: Sandia's primary mission is engineering development and systems engineering on nuclear weapons. In this, we work with both of the nuclear laboratories. What distinguishes us from Lawrence Livermore and Los Alamos is that Sandia emphasizes the engineering aspects, whereas the other two laboratories are involved in weapons physics. Regardless of whether California or New Mexico is assigned to design any given weapon system, Sandia is involved in a major way.

We also conduct substantial research and development in the field of energy and perform work for the Department of Defense. About a thousand technical people at Sandia work on DOD projects.

NATIONAL DEFENSE: We previously interviewed former Strategic Defense Initiative Organization (SDIO) Chief Scientist Gerold Yonas, who came to the SDIO from Sandia. Dr. Yonas indicated that Sandia has long been involved in the investigation of technologies that may be relevant to strategic defense. Which of Sandia's traditional activities are now part of the SDI?

Wayne: Sandia has divided its activities into two elements. One is technologies that have a broad relevance, including strategic defense; the other is technologies that are SDI specific, either to a given concept, such as the X-ray laser, or more generic and

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SOVIET INTELLIGENCE

СВЕДЕНИЯ ИЗ СССР

Assessing the Soviet ability to counter SDI

By Jim Bussert

A COMMON counter-argument to SDI deployment is the possibility of cheap and simple counter SDI decoys or penetration aids.

What do the Soviets say about this technology and could penetration aids invalidate the exotic SDI defences?

The Military Publishing House in Moscow published *Star Wars Delusions and Dangers* in 1985. It was translated into English and widely distributed. The only Soviet military space research claimed, was in "space-based early warning, surveillance, communication, and navigation systems".

The pamphlet specifically denied developing a 'nationwide' missile defence system or 'space strike weapons'. Elsewhere, the Soviets claimed that SDI would force "the other side" to build up "means of defence" or offensive forces. On page 54 the booklet states the Soviet Union would "take countermeasures" that are "commensurate with the threat". Obviously, nowhere in this pamphlet did the Soviets specify technical countermeasures.

In 1986, Mir Publishers of Moscow published *Weaponry in Space: The Dilemma of Security*. It was written by the Soviet Scientists' Committee for the Defence of Peace Against Nuclear Threat.

Chapter six, entitled 'Countermeasures' was very detailed concerning active and passive countermeasures against a deployed SDI system. Interestingly, six of the seven references were from US sources.

Active countermeasures include neutralisation of space-based components with weapons including kinematic energy, lasers, high-energy radiation, fast-burn booster rockets, space mines and small pellets.

The Soviets said that eliminating SLBM-launched pop-up x-ray lasers would be a simple ASW job in the northern Indian Ocean and Norwegian Sea. The surveillance, acquisition, and tracking elements of the SDI could be blacked out by an upper atmosphere nuclear blast, or simply jammed.

The point is made that total destruction of a widescale SDI is not required, just attacking of a few vulnerable links or elements.

Enhancements to the strategic nuclear forces would be additional ICBMs deployed, deliberate concealment of launchers, additional MIRV warheads, decoys, and 'fake ICBMs'. ICBM launch tactics can degrade the SDI with mixed real and fake ICBMs, "various lofted and depressed forms of trajectories, and launches in various directions". Increased reliance upon cruise missiles and SLBMs would not be effectively defended by SDI either.

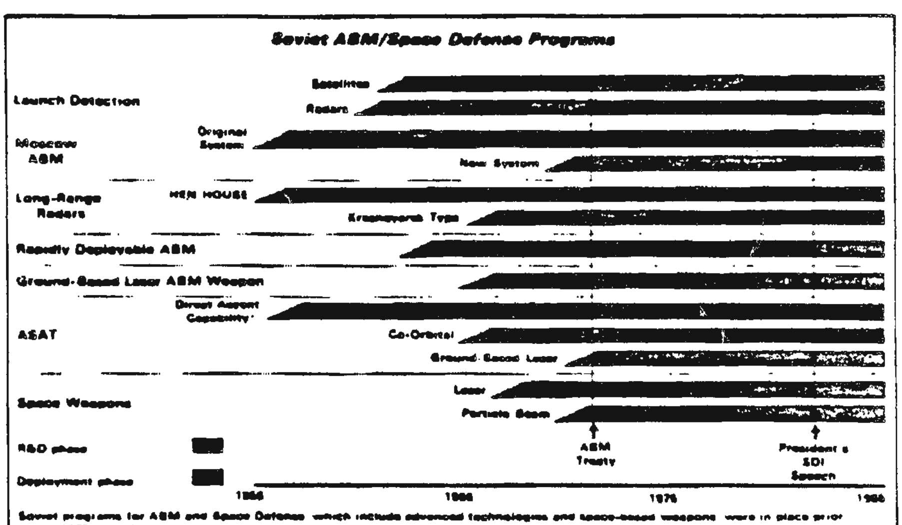
Modifications to ICBM launch characteristics such as shortening burn out times can minimise SDI acquisition and classification time, and changing exhaust plume brightness would throw off infra-red (IR) detectors.

Reflective or ablative coatings, cooling, aerosol screen, or missile rotation are all anti-laser protective countermeasures.

Counters to mid-course sensors include metal chaff, warheads inside metallised reflective balloons, and IR-emitting aerosols to conceal the warheads and decoys from tracking and aiming systems.

The decoys will lag the warheads during re-entry phase, but manoeuvrable high-velocity warheads and high-yield explosives are mentioned as SDI counters. The booklet points out that battle-management is not multi-layered like sensors or weapons, and damage to it would cripple all SDI components.

In summary, the Soviet scientists correctly point out that the SDI countermeasures are comparatively simple and low-cost, compared to the SDI itself. This does not mean that the USA should not continue research and development of the SDI, but the deployed system must be able to function despite the many Soviet active and passive countermeasures to the SDI elements.



Soviet programs for ABM and Space Defense, which include advanced technologies and space-based weapons, were in place prior to the 1972 ABM Treaty and have continued to expand in scope and size. During the same time period, US ABM Space Defense research has been limited in scope as well as the level of effort in terms of resources invested.

*Potential capability of the Moscow ABM system

SEVEN DEMOCRATIC PRESIDENTIAL HOPEFULS BLAST SDI

The following are excerpts of the candidates' views on SDI:

Sen. Albert Gore, Jr. (D-Tenn.). He said he is not opposed to research on ABM systems, "it was there before the SDI program and it will be there after. But purposeful research that violates the ABM treaty or is the kind that takes us far down the road towards deployment when we haven't answered the question will it make the world safer, will it be vulnerable to an attack, will it be cost effective, those questions haven't even been addressed by the Reagan Administration. That's the main reason why the SDI program in my opinion is a profound mistake."

Jesse L. Jackson. "We cannot afford a trillion dollar misadventure into space. It is unnecessary. We'd better spend our time negotiating arms reductions. Stop using rhetoric that will excite the American people and incite the Soviet people. Begin to use developed minds and not guided missiles. Lets move towards meaningful arms reductions. Star Wars is an arms stimulus."

Rep. Richard A. Gephardt (D-Mo.). "If you really think about it, Star Wars doesn't make a lot of sense. It cost a trillion dollars, it cost $40 billion a year to maintain it, no scientist will tell you it will do what the Reagan Administration says it will do. In short there's not a technological fix to a human problem. Arms control is the answer and we ought to use Star Wars as a bargaining chip for good arms control."

Michael S. Dukakis, Democratic governor of Massachusetts. "A few weeks ago a distinguished committee of scientists, engineers and weapons experts issued a detailed report on Star Wars that said the thing wouldn't work. So what are we spending money on it for? We need star schools, not Star Wars. To spend billions on it doesn't make any sense to me. "

Bruce Babbit, former Arizona governor. "Star Wars less than perfect is simple gasoline on the arms race. I would go back to Reykjavik and say, let's negotiate to stop the deployment of Star Wars, for a comprehensive test ban treaty, for a 50 percent reduction, I think that deal is there for the President if he is willing to go and work it out."

Sen. Paul Simon (D-Ill.). "Star Wars is a disaster. What we ought to do is seize opportunities to move in the direction of arms control. What we should do, if it is still available come January 21, 1989 is say, 'Soviets if you stop testing, we'll stop testing.' I' is the major next thing we can do in the area of arms control and we ought to do it quickly."

Sen. Joseph R. Biden (D-Del.). "I have a slight disagreement with my colleagues here. I think our technological capabilities are so awesome we might be able to do something with Star Wars. But if we did, it would make us less secure, because it reduces the response time that the President has to make a judgement as to whether or not we're under attack. If a nuclear war starts, it's going to start by accident, it's not going to start because it's intended. The second point I want to make is not only will it bankrupt our system as all my colleagues have pointed out, to spend a trillion or a trillion-five. It's bankrupting our intellectual capital. We are spending today, more research dollars on defense and Star Wars than at anytime in the last 35 years. Seventy-five to 80 percent of those brilliant students at MIT, they're working on defense projects, they're not working on commercial applications, how to make automobiles better, apply the technologies that allow us to compete in the future. It is a squandering of talent that will only make us less secure quite frankly."

RESEARCH...CONTINUED

weapons was cheaper than defending against them. The situation is likely to change with continued advances in defense-associated technologies such as sensors, information processing, space launch capability, and laser weapons. Technologies associated with offensive forces have advanced less dramatically. I believe that defense could become less expensive than offense if we do not demand unrealistically effective defense.

Our national security and our ability to continue living in a democracy require that we persist in studying new strategic weapon systems, both offensive and defensive. At a minimum we must invest in the research that is necessary to understand the potential of systems for strategic defense.

In the near term, most if not all of the important research issues, including field experimentation associated with near-term technology, can be explored within the terms of the ABM Treaty as it is traditionally interpreted. Consider, for example, the primary issue of testing kinetic weapons' ability to observe targets. Data relating to the detection, tracking, and discrimination of targets by ground- and space-based weapons can be gathered by equipment that is not suitable for operational use. Therefore treaty questions are not raised.

We are not alone in pursuing such knowledge. The Soviet Union has an extensive research program in this area, about which we know relatively little. In addition, it has experience in deploying, operating, and upgrading its extensive terminal defensive system, which is built around Moscow and permitted by the ABM Treaty.

Both the United States and the Soviet Union are interested in defending against nuclear missiles. If both countries can meet the Nitze criteria in developing SDI-like defenses, I believe it would be to our mutual interest to deploy them. □

. . . But the Soviets would love it if we dropped SDI

By Edward L. Rowny

It seems a day never passes that I am not asked by a journalist or a scientist about the "grand compromise." They ask me such questions as: "What compromise can we make on SDI to get the START deal?" "Will the compromise take the form of an explicit trade-off or will it be 'finessed' with intentionally vague language?" "Isn't President Reagan planning to sign a START treaty on his watch and 'kick the can'—that is, the SDI question—down the road to his successors?"

I'm afraid that those who ask such questions fail to understand Ronald Reagan. These fanciers of the "grand compromise" are out of touch with the President's thinking and leadership on strategic defense, which, according to opinion surveys, is consistently supported by the majority of the American people.

The "grand compromise" formulation turns the problem and the solution inside out. The problem is the Soviets' drive for strategic superiority, manifested in their massive offensive build-up and their unwillingness, as yet, to agree to equitable and verifiable strategic arms reductions. The Soviets have also run up a record of violating the ABM treaty and other arms control agreements. The Strategic Defense Initiative, on the other hand, has the same purpose and supports the same goals as sound arms control; its aim is to enhance strategic stability and reduce the risk of war.

When I first began to advise President Reagan in 1979, he was already concerned with the issue of strategic defense. He believed the so-called doctrine of mutual assured destruction was deeply inconsistent with the American ethos. He asked me if there were not a safer, more civilized way to protect ourselves than to "hold a gun at the other fellow's head just because he has a gun at yours." I replied that the concept of a shield against ballistic missiles was not considered feasible to the scientific experts.

President Reagan was determined, however, to make strategy drive technology, and I heard him ask that question again and again. In 1983, his science and defense advisers replied that technology was far enough along to warrant an SDI research program.

On March 23, SDI will mark its fifth anniversary. I have observed its progress hopefully but realistically. Today I am much encouraged by SDI's progress in such categories as sensors and optics, energy sources, miniaturization, survivability and battle management.

It is now clear that a mix of strategic defense systems with offensive systems is not simply possible but inevitable. While it is too early to foresee with certainty SDI's architecture or its cost, I am encouraged that an effective layered defense can be developed according to the Strategic Defense Initiative Organization's current estimates—about $10 billion a year, less than 3 percent of the total defense budget.

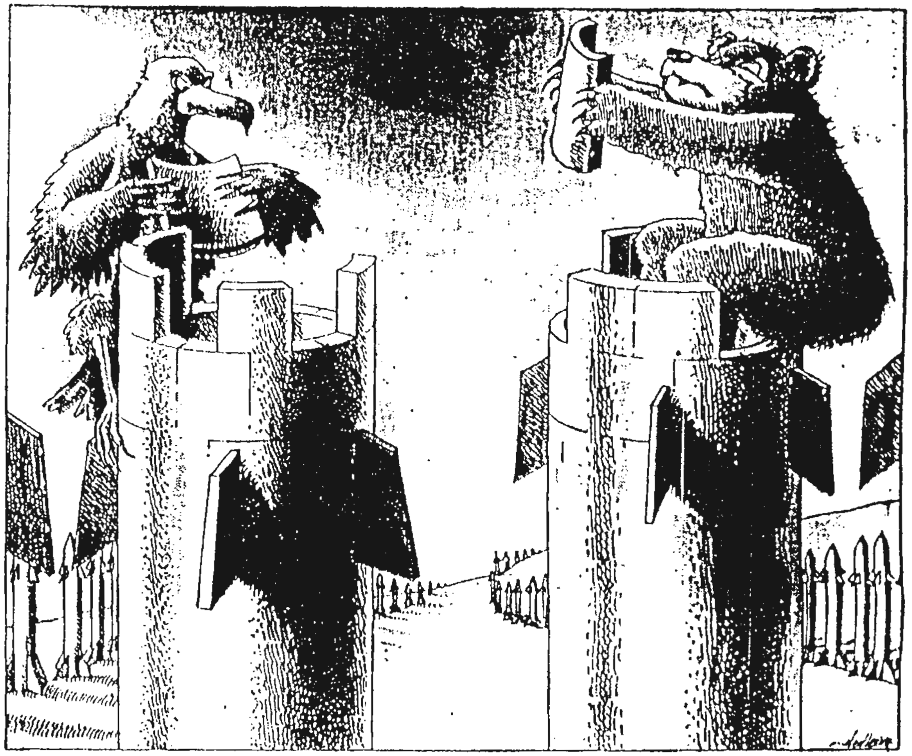
SDI is going to make possible a return to the common-sense view that effective defenses, which threaten no one, contribute to peace and stability. When we signed the ABM treaty, the U.S. declared that the restrictions it placed on defense were premised on the necessity of achieving agreement on more complete limitations on offensive strategic nuclear arsenals than were provided for under SALT I.

However, the promise of deep and stabilizing offensive nuclear cuts has not yet been fulfilled. Instead, the arsenals of strategic nuclear weapons have continued to grow, with the largest growth by far on the part of the Soviet Union, which has about four times the number of strategic nuclear weapons it had when the ABM treaty was signed. It continued this build-up under the SALT I agreement and during and after negotiation of the flawed SALT II treaty.

Meanwhile, the Soviets have deployed and modernized the full complement of strategic defense systems permitted by the treaty. Moreover, they have violated the ABM treaty, giving the U.S. government reason to believe they may be planning an illegal nationwide territorial ABM defense system. In addition, the Soviets are pursuing a robust strategic defense program costing an estimated $20 billion annually. The Soviet leadership has never embraced the mutual assured destruction concept. It has, in fact, followed an action plan based on fighting and winning a nuclear war, despite rhetoric to the contrary.

No nation is as strong a proponent of strategic defenses as the Soviet Union and no nation is more strongly opposed to our SDI than the Soviet Union. Clearly, there is a message in this.

The Soviets have had a near-monopoly on strategic defenses for many years. In the Soviet view, a U.S. decision at this point to give up on defense and to rely solely on offensive weapons for deterrence not only would preserve the Soviet monopoly in strategic defense, but would be a key indicator of a loss of U.S. will to compete militarily. Failure to proceed with an American strategic defense would hand the Soviets a unilateral military advantage of historic consequence—with awesomely negative implications for strategic stability and peace.



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Edward L. Rowny is a special adviser for arms control to President Reagan and the secretary of state.

CHICAGO TRIBUNE, MARCH 18, 1988

by Lt. General Daniel O. Graham
Director, High Frontier

March 1988

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SOVIET ABM BREAKOUT?

The evidence is piling up that the Soviets are working feverishly to deploy their own nationwide anti-missile defense system. More accurately, evidence of the Soviet SDI program that has been piling up for years is now being noticed by official Washington and the press. The evidence includes new missile defense radars (not least among them the Krasnoyarsk giant that obviously breaks the ABM Treaty), large-scale production of anti-missile missiles, and heavy investment of scarce resources in "Star Wars" technology.

None of this evidence should be particularly newsworthy to military intelligence analysts. As far back as 1975 when I was the Director of DIA (Defense Intelligence Agency), I became sufficiently concerned with such evidence that I prepared a special report to the Secretary of Defense and Chairman of the Joint Chiefs on the matter. I warned that the Soviets had adopted programs and policies that made sense only if they intended one day to break out of the ABM Treaty of 1972.

Some of the elements of that analysis remain classified but most are now common knowledge. For one thing, the precepts of the Mutual Assured Destruction theory that underpinned the ABM Treaty were totally rejected by Soviet strategists. The MAD notion that nuclear forces should be entirely offensive with no significant strategic defenses was denounced by the Soviets as "bourgeois naivete." They were not about to abandon the search for nationwide defenses as the U.S. side had done. (By 1975, the U.S. was for practical purposes undefended against nuclear attack.) Marshall Grechko, then top man in the Soviet military, had assured the officers and scientists working on Soviet strategic defenses that the ABM Treaty would in no way hinder their efforts.

By 1975, it was already clear that the Soviets would violate the ABM Treaty in letter and spirit any time it posed a serious obstacle to progress toward a nationwide defense — dozens of violations were detected by intelligence agencies but not vigorously protested by State Department lest progress toward SALT II be jeopardized. The ring of ballistic missile defense battle management radars — of which Krasnoyarsk was to be the final link — was being built at a fast pace.

In light of all this evidence it was clear twelve years ago that the Soviets would be ready today to break out of the ABM Treaty. In fact, they already have broken out according to Congress which voted 418-0 in the House and 92-0 in the Senate that the Soviets are in violation of the ABM Treaty. What else then would constitute "breaking out" — the Soviets declaring in advance that they were going to violate the Treaty?

The spirit of the ABM Treaty was this: "Let us both remain vulnerable to nuclear annihilation so that neither of us will attack the other." The Soviets never bought that idea and therefore never were really *in* that Treaty. They signed it because they correctly guessed that the U.S. would for many years actually leave itself defenseless against Soviet missiles.

Evidence of the Soviet Strategic Defense Initiative may be surfacing now because Gorbachev recently let slip the fact that it exists – this to the disgruntlement of American SDI opponents who had pooh-poohed the notion of a Soviet "Star Wars" program. Perhaps, since their boss had blown their cover, Soviet SDI managers are getting a little lax with their security and allowing U.S. military intelligence to find out more about their efforts.

Whatever the reasons, the revelation of the huge Soviet SDI program is certain to be misused in arguments for and against the U.S. SDI program.

Pro-SDI spokesmen will point to the Soviet program as reason to proceed immediately with SDI. The problem with this reasoning is that the U.S. SDI will not be built to counter Soviet defenses system, but Soviet *offensive* system. Two thousand long-range nuclear ballistic missiles pointed at us today is reason enough to deploy SDI. Assuming a 50 percent reduction, *half* that number (which in the odd arithmetic of the State Department comes out at 1600 missiles) is *also* reason enough to deploy SDI.

Anti-SDI spokesmen, including Pentagon turf-guarders, will argue that the Soviet ability to break out of the ABM Treaty is a reason to *prolong* the Treaty for the 10-years requested by Moscow. Already, this has been put forward as a reason not to deploy defenses while the ABM Treaty has been in effect should indicate its dangerous uselessness. The ABM Treaty has been used like a holy icon by the anti-military lobby to eradicate once strong U.S. strategic defenses and to cripple the U.S. SDI program. Yet it is often Pentagon spokesmen who use Soviet "breakout" capabilities as a reason to prolong the ABM Treaty and delay deployment of SDI.

In reality, should the Soviets "break out" of the ABM Treaty, it might not make much difference in the pace of their strategic defense program. After all, they have been putting as much money into it over the past 15 years as they have into the unprecedented offensive build up we have heard more about. If *both* the U.S.S.R. and the U.S. should "break out" of the ABM Treaty and deploy defenses, the Soviets would be adding increments to their already impressive capability; the United States on the other hand would start from scratch. The Soviets would go from some defenses to more defenses; the U.S. would go from *no* defenses to some. Even if the Soviets should deploy faster, the United States gains the most.

If our leaders are to react wisely to the newly revealed Soviet strategic defenses, they will bear in mind that there is no foreseeable future where *neither* side has strategic defensive systems deployed. It will be the Soviet Union only, or both of us. We do not need defenses to defeat defenses; the danger comes from a combination of a first strike ballistic missile force *and* a strategic defense. We have neither. The Soviets have *both.*

Herein lies grave danger with no answer in sight except SDI, and SDI *deployed.*

Lt. General Daniel O. Graham was formerly Deputy Director of Central Intelligence and Director of Defense Intelligence. He retired from the military in 1976.

HIGH FRONTIER NEWSWATCH

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DESPITE SDI'S TECHNICAL PROGRESS "ANTIS" CLING TO EMPTY ARGUMENTS

by Susan G. Long

Despite the rapid technical progress achieved in all areas of SDI research since the program's inception in 1983, and the countless successful experiments which have demonstrated clearly that defenses against nuclear ballistic missiles are possible with current technology, critics of SDI continue their public and predictable tirade against SDI.

The left's temper tantrum over SDI, like most strictly emotional spectacles, relies solely on claims which although long ago refuted still alarm and ignite.

What is most maddening about the left's temper tantrum over SDI is that, like most strictly emotional spectacles, it relies solely on claims which although long ago refuted still carry enough residual clout to alarm and ignite the uninformed audience.

The arguments most preferred by the anti-SDI lobby are those which behave like "triggers" to elicit a familiar, negative response – it will cost a trillion dollars, it will be destabilizing, it can't be 100 percent perfect. Rather than truths based on engineering or scientific reality, they are but another form of political propaganda.

To quote former Defense Secretary Caspar Weinberger, "No major technical roadblocks stand between us and the deployment of the first phase of SDI. The roadblocks are almost entirely political."

Yet, like the deliberately perpetrated hoax of "Nuclear Winter" put forth by Carl Sagan and others, the political

The arguments most preferred are those which behave like "triggers" to elicit a familiar, negative response.

rhetoric and oversimplistic arguments continue to surface in college debates, on local radio and television stations, and receive wide circulation in the daily press. Uninformed reporters are as guilty as the average lay audience of failing to dig below the surface of the claims to see if there is any credibility to be found.

A simple analysis of the typical debate, for example, would expose the essential contradictions in the arguments:

Opponent: SDI won't work.

Supporter: If SDI won't work, why are the Soviets so opposed to it?

Opponent: Because it will be destabilizing.

Supporter: How can it be destabilizing if the Soviets know it won't work?

Opponent: Because it will start an arms race and the Soviets will try to overwhelm the system or build countermeasures to get around it.

Supporter: Why would they need to overwhelm or countermeasure a system that won't work?

And so it goes. Said former Arms Control and Disarmament Director Ken Adelman recently, "The truth is that the Soviets are not seeking a world without SDI. They are seeking a West without SDI."

In an "anti"-sponsored forum on Capitol Hill, the best and the worst in the SDI debate spoke to the question: Is the Strategic Defense Initiative in the National Interest? SDIO chief Lt. General James Abrahamson and former Assistant Defense Secretary Richard Perle

"The truth is that the Soviets are not seeking a world without SDI. They are seeking a West without SDI."

—Kenneth Adelman

debated anti-SDI scientist Richard Garwin and pop cosmologist Carl Sagan.

Garwin, who still maintains that a good terminal defense would be "burying bombs across the northern territory of the country and blowing it up in such a way that the dust will stop the warheads on the way in," derided SDI as a stumbling block to further arms reductions. When pressed about why SDI would be a stumbling block, Garwin said, "I think the Soviets are so unhappy about the U.S. SDI because they don't like to sign an

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Inside:

A SHIELD, NOT A SWORD

Why SDI Is Not Offensive

A recent *Backgrounder* Report published by The Heritage Foundation (January 21, 1988), exposes the fallacies behind opposition claims that the U.S. Strategic Defense Initiative is merely a cover for a U.S. effort to develop space-based offensive weapons or a shield behind which the U.S. might launch a first strike on the Soviet Union.

Heritage called such claims "part of the Soviet propaganda campaign against SDI" and said "U.S. opponents of SDI echo similar views."

The publication, entitled, *The Strategic Defense Initiative: A Shield, Not a Sword*, comprehensively explained why these arguments are without merit.

SDI Provides No New Strategic Capabilities

There are several problems with the suggestion that SDI will use lasers to destroy military targets on the earth's surface and to start urban conflagrations. For one thing, there are serious technical difficulties in using laser weapons to strike down through the Earth's atmosphere; cloud cover over a target area, for instance, dissipates laser beam intensity. For another, even if defensive technologies could start "urban conflagrations," this would not give the U.S. a militarily meaningful capability in the age of nuclear-armed ICBMs.

There is no way, moreover, that SDI weapons could destroy missiles in their silos or other hardened military targets as confidently and effectively as highly accurate nuclear-armed ICBMs. Without being able to approach the capability of ICBMs, the impact of SDI technologies on the offensive strategic military balance is likely to be no more than marginal.

SDI opponent Robert English, a member of the group that calls itself the Committee for National Security, claims that: "While the presence of thick clouds would impede a laser strike, an attacker has the luxury of waiting until conditions are ideal (the defender does not)." This ignores the obvious facts that the U.S. has neither a first-strike policy nor capability and that, if hostilities were already under way, it would be ridiculous in an age of high-speed weapons, such as ICBMs, to wait for good weather before striking. A laser weapon that must wait for good weather or a favorable position in orbit to be used provides little added offensive capability to U.S. strategic forces.

Space-based Offenses Incompatible with U.S. Targeting Policy

Use of SDI lasers in an offensive role to cause urban incineration makes no sense in terms of current or projected U.S. national security policy. For nearly two decades, official U.S. strategic policy has placed the highest target priority on the Soviet military, its political leadership, and critical economic targets. The objective is to strike such targets with as few non-combatant deaths and as little residual damage as possible. To the extent that militarily important targets that are underground, well defended, or otherwise protected can be attacked at all, they can be struck far more effectively with nuclear weapons than with any present or prospective SDI weapons, such as lasers or other directed-energy devices. And even if it were U.S. policy to cause urban conflagrations (which it is not), it could do so far more effectively with nuclear weapons than with any know defensive technologies.

A U.S. First Strike Is Impossible

Moscow's assertion that Washington might use space-based strategic defenses as a shield behind which the U.S. might launch as nuclear first strike is contradicted by the U.S. force structure. While the Soviet Union has developed and deployed a first-strike nuclear force, the U.S. has not. The Soviets have deployed 1,398 large land-based ICBMs, giving Moscow a superiority of 3 to 1 in overall nuclear throw-weight and 10 to 1 in hard target kill throw-weight. Moscow has 5,240 nuclear warheads on its first-strike capable SS-18 and SS-19 ICBMs, or five times the number of such weapons needed to destroy the entire U.S. land-based nuclear deterrent force.

By contrast, the U.S. has operational only 14 MX ICBMs and 300 Minuteman missiles with the new MK 12A warhead. These missiles carry a total of 1,040 of those warheads whose total yield and accuracy make them first-strike capable weapons, although the capability of the 300 Minutemen is questionable. Even including the Minutemen, this is not nearly enough warheads for the U.S. to contemplate a first strike. It would require at least three warheads for each Soviet ICBM or 4,200 first-strike capable warheads. This is nearly four times as many as the U.S. has operational.

Insufficient numbers of U.S. first-strike offensive weapons prevents the U.S. from contemplating a first strike, even if it wanted to do so. SDI does not change this fact in any way. Even if the U.S. wanted to launch a first strike behind a SDI shield, it would not be able to do so. On the other hand, Moscow's huge arsenal of such weapons means that the Soviet first-strike threat to the U.S. would be greatly increased if Moscow were to deploy comprehensive strategic defenses.

Offensive SDI Would Face Effective Countermeasures

SDI opponents curiously are silent about possible Soviet countermeasures to an offensive use of SDI. This is in sharp contrast to the host of countermeasures that SDI opponents envision against the defensive use of SDI. Yet, even cursory examination reveals that it is likely to be far easier to develop countermeasures to space-based offensive attacks against targets on land than it is to develop countermeasures for SDI

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Vol. V No. 3

Daniel O. Graham
Publisher

Terri Lukach
Editor

Susan G. Long
Associate Editor

Thomas G. Shack III
Mark H. Goodkin
Production Editors

From the Editor

Dear Readers:

If you listen carefully to the litany of negative arguments about SDI, you can't help but be struck by the obvious contradictions. Are the naysayers against SDI because it *won't* work or because it *will*? If the defenses are impossible, why worry about their destabilizing effects on the Soviets? And how do you figure out how much an *impossible* defense would cost?

Few opponents will admit they oppose SDI because they actually support Mutual Assured Destruction. That would mean advocating nuclear terror as the status quo. Ironically, those who are genuinely afraid of nuclear weapons never realize that, by supporting MAD, they are actually perpetuating the condition that causes their fears—a precarious balance of nuclear terror.

There are many who have staked their political, academic, or journalistic reputations on the proposition that accomodation with the Soviet Union via arms control negotiations is the only answer to the nuclear dilemma. For them, opposing SDI is the only way to go.

But the proven success of the SDI program makes it harder and harder to claim that strategic defense is impossible. Hence, the purely emotional approach.

As with its predecessor, the Nuclear Freeze, the anti-SDI movement will soon be forced to admit that there is an alternative to freeze or fry. That alternative is SDI.

Terri Lukach

IN BRIEF

REAGAN CLEARS SPACE BOOSTER FOR 1990s

President Reagan recently gave his approval for a joint Defense Department/NASA effort to develop the Advanced Launch System (ALS), a new unmanned super booster for the 1990s.

The Soviet Union already has the world's largest booster, the Energia, which they say "can lift the blocks from which cities will be formed" in space.

The ALS rocket will be based on new technology and capable of carrying more than 100,000 pounds of payload into low orbit. One goal of the program is to reduce the launch price per pound from about $3,600 to $400.

Currently, NASA's manned space shuttle and the Air Force's new Titan IV rocket can only safely orbit fewer than 40,000 pounds of cargo. The ALS rocket will be able to carry more than twice the cargo of the Titan IV.

SOVIETS CAPABLE OF LAUNCH ON DEMAND

According to Vice Admiral William E. Ramsey, deputy commander-in-chief of the U.S. Space Command, the Soviets possess a tremendous security advantage over the U.S. because of their ability to launch satellites on demand while the U.S. can only launch on schedule.

Ramsey said the Soviet Union's ability to "launch in hours" gives the Kremlin a responsiveness and flexibility in a crisis that the Pentagon lacks.

Soviet space analyst Nicholas Johnson told a recent space conference that "within a few days, if not the next day" the Soviets can "see" any spot on Earth with their satellites.

The U.S.'s fewer,although more sophisticated, satellites are ironically less able to maneuver to any given spot as easily, Johnson said. He added that the low-tech Soviet satellites are also less susceptible to the effects of radiation from nuclear weapons explosions than the high-tech American models.

BRAZIL SIGNS MISSILE CONTRACT WITH LIBYA

The Brazilian government's missile and rocket building company, ORBITA, over objections from the U.S., has signed a $2 billion contract to build intermediate-range nuclear missiles for Libya.

Despite the recent treaty between the U.S. and the Soviet Union banning intermediate nuclear forces, the ability to build this class of missiles by other-than-superpower countries is widespread.

Now that Brazil has made the decision to build and sell INF missiles to Third World countries, it is expected they will experience no shortage of customers.

SPOTTING MIR

The light you see streaking across the sky some star-filled evening may be the Soviet Union's space station, Mir.

According to the National Space Society, the most surprising thing about Mir is that most people don't know it exists.

"We want to let people know that the Soviets have a serious, aggressive space program," said the Society's deputy executive director, Greg Barr.

For the past year, Soviet cosmonauts in Mir have orbited 200 miles above the Earth performing hosts of sophisticated scientific and reconnaisance tasks while U.S. plans for a space station have been thwarted by budget cuts and repercussions following the Challenger tragedy.

If you would like to try to spot the Soviet space station, the National Space Society's hot line, answered by a Mir expert, will tell you where and when to look to see the best of Mir's upcoming 90-minute orbits. Radio conversations between the cosmonauts have reportedly been picked up on 143.625 MegaHerz using an air and police band radio.

The hotline's number is (202) 546-6010. People who spot the space station qualify for an "I saw Mir" button from the Society.

SHORT ANSWERS TO TOUGH QUESTIONS

Opposition to the President's Strategic Defense Initiative has always been *political,* not technical as demonstrated by the fact that opponents almost never argue the facts, but choose instead to set up "straw men" arguments which can be easily defeated. They conveniently avoid debating the real question which is whether or not it's a good idea to defend the American homeland.

In the five years since the program was officially launched on March 23, 1983, not a single new argument has come forward and one doesn't need to be a "technical" expert to debate the merits of each.

In one small and easy-to-understand brochure called **20 Questions,** High Frontier has provided short answers to the most frequently asked questions about the Strategic Defense Initiative. Those used most often by opponents are listed below.

Q: Don't scientists say it can't be done?

A: There are some scientists who say SDI is impossible, but what they are *really* saying is that a *100% perfect* defense is impossible (the straw man argument). But neither the President nor any other supporter has ever asked for perfection. Even a 50% *effective* defense can be 100% *efficient* by deterring any deliberate attack in the first place and easily coping with any accidental or madman nuclear launch.

The fact is we could begin building defenses *today* using mature, non-nuclear technology and have a robust, three-layered defense in place with 6-8 years.

For every Orville Wright, there has been an Orville Wrong. There will always be scientists who say "it can't be done" and scientists who say they can. They're both right—those who say they can't, can't. And those who say they can, can.

Q: Won't SDI cost a trillion dollars?

A: Reputable analysts both inside and outside government place the cost of building a robust strategic defense at somewhere between $30 billion and $60 billion, depending on which component parts are selected for the final "architecture." The trillion dollar figure is a shibboleth created by opponents like the Union of Concerned Scientists with no basis in reality.

SDI *might* cost as much as $10 billion a year, or about three percent of the Defense budget. Meanwhile, it would *save* a trillion dollars in costs for offensive modernization which would no longer be necessary and put trillions into the civil economy through increased production and spin-off technologies.

Q: Even if SDI is 95 percent effective, won't 5 percent of Soviet missiles cause terrible damage?

A: Strangely enough, this argument always begins with the war already started. Again, there is a vast distinction between *effective* and *efficient.* No sane Russian would attack if he knew only 5 percent of his missiles would get through. What this question really asks is what would happen if they attacked anyway? If they attacked anyway today, *100 percent* of the missiles would get through.

Q: Doesn't SDI protect just missiles and not people?

A: No. With today's technology, it would be almost impossible to design a defense that does not protect both our retaliatory forces and our people.

Consider this: How many of the six or seven thousand of the existing Soviet missile warheads do you think are aimed a your hometown rather than at our missile launchers and SAC bases? Two or three, perhaps—if they really wanted to destroy your town. If 95 percent of those warheads are destroyed when launched, what is the chance of those two or three aimed at your town getting through? Awfully small is the answer. So does SDI protect your hometown and missiles, too? You bet it does!

Q: Why not trade SDI away for a reduction in weapons. Wouldn't that reduce the risk of nuclear war?

A: Even with greatly reduced nuclear arsenals, we would still be on the nuclear treadmill—depending on the awesome destruction power of *offensive* nuclear weapons and a policy of revenge. But revenge is not defense. SDI is a change of strategy based not on assured destruction but on assured survival. SDI is a way to save lives, not merely avenge them.

The larger question is shouldn't we place all our hopes on arms control treaties instead of technology, on Soviet integrity rather than American ingenuity. If it came down to a bet, I'd bet on American ingenuity.

Q: Couldn't the Soviets "simply" overwhelm any defense? What about other Soviet countermeasures?

A: When the calvary, once considered to be the "ultimate weapon," was defeated by advances in defensive technology, did the Army go out and buy twice as many horses? Neither will the Soviets build more missiles when the "ultimate weapon," the long-range ballistic missile, is suddenly made less useful by a measure of strategic defense. However, if they were foolish enough to try, with a 50 percent effective defense in *only one layer* would take not 3000 but 6000 Soviet warheads to overwhelm the defense. With a three-layered, 50 percent effective defense it would take 29,000 warheads or more than 3 1/2 times their entire inventory. With a 90% effective defense in three layers, it would take not 3000 but 3,888,000 warheads to overwhelm the defense. I wonder how long and how much it would cost the Soviets to build that many warheads, not to mention delivery systems.

Other "countermeasures" like space mines and fast-burn boosters have not been invented yet, they are merely measures we are anticipating as a precaution. According to the founder and former director of NASA's Goddard Space Flight Center, Dr. Robert Jastrow, "Probably a heavy ICBM as a fast-burn rocket could not be built at all" but even if it could it would cost the Soviets $900 billion to do so and a U.S. defense at $100 billion would be cheap by comparison. As to space mines, Jastrow says space mines cannot be deployed or kept in orbit covertly and present NORAD capabilities allow tracking of small objects in space out to 1,000 miles. Moreover, the SDI space platforms would not be sitting ducks but able to both maneuver and defend themselves.

Q: Wouldn't SDI militarize space?

A: No. Space was "militarized" in 1945 during WW II when the Germans fired over 1000 V-2 rockets through space at London and Antwerp. Those who speak of militarizing space refuse to admit that long-range missiles are space weapons. Once launched, they travel through space to deliver destruction. SDI's mission is to prevent the use of space by the weapons that would surely militarize it. In that sense, SDI *de*-militarizes space.

Q: Aren't the Soviets justified in believing we are creating a shield so that we can strike them with impunity?

A: No. And they don't believe it nor do our own SDI opponents who make the charge. The Soviets know that if we harbored any ideas about nuclear attack against them we would have done so long ago when they had no way to retailiate. With SDI in place, they know they can't contemplate a first strike, and they also know U.S. and Allied political systems rule out a first strike.

Q: Doesn't SDI get in the way of peaceful uses of space?

A: No. SDI has already created a demand for more and better space transportation and that is the key to all U.S. and allied space efforts—commercial uses, scientific uses, and further exploration. The uses of space technology for our security and for other purposes have always gone hand-in-hand and will continue to do so. Photography from space serves both military intelligence purposes and the needs of geologists, meteorologists, oceanographers and other civilian efforts. The boosters that place defense satellites in orbit also place scientific instruments and TV relay satellites in orbit. It is a myth that space technology can be neatly divided into military and non-military categories.

Q: What about cruise missiles and bombers which SDI doesn't defend against.

A: These are not weapons which can be used in a deliberate attack. It takes too long for them to reach their targets—8 to 16 hours if launched from the U.S.S.R., weeks if sent over on ships and submarines. They are retaliatory weapons. We can prevent a retaliatory attack by not attacking first, and we can already cope with an accidental or rogue nation attack involving cruise missiles or bombers.

FIRST STRIKE MISSION REQUIREMENTS

Critics who say that the Soviets would simply overwhelm any U.S. defenses with additional offensive missiles should consider the table below. Even a 50% efficient defense in only one layer requires not 1,000 but 6,000 Soviet RVs for the same mission—more than their current inventory.

A conservative estimate of High Frontier's three-layer SD^3 system recommended in October, 1986 is 70% per layer. To overcome SD^3 and achieve a successful first strike, the Soviets would have to launch 142,000 warheads to have the necessary confidence that the attack would succeed. Not even the command economy of the Soviet Union could afford to build that many nuclear warheads and the necessary launchers—not to mention how long it would take. There is an important distinction between efficiency and effectiveness in evaluating strategic defense. A 90% efficient defense can be 100% effective by making the success of an attack so improbable as to assure it will never be launched.

NUMBER OF RVs NEEDED TO ACHIEVE 90% CONFIDENCE LEVEL

DEFENSE EFFICIENCY	ONE LAYER	TWO LAYERS	THREE LAYERS
50%	6,000	14,000	29,000
60%	8,000	22,000	59,000
70%	11,000	41,000	142,000
80%	18,000	95,000	484,000

EMPTY ARGUMENTS
continued from Page 1

agreement with an insane partner . . . they think that the SDI will not work against a Soviet first strike, and they ask what we want it for. There is no real explanation why." So, the Soviets are against SDI because they think we're crazy?

Mr. Perle pointed out that even if deep cuts like the ones currently under discussion were to occur, offensive nuclear weapons would be reduced only to about 6,000 which would still "leave enormous scope for horrendous damage. To go utterly undefended in the face of nuclear forces of that scale," Perle said, "would be dangerous and unwise."

General Abrahamson and Mr. Perle also disputed the opposition's instability claims by arguing that there is no fundamental difference in concept between an adequate deterrent and the active defenses that could serve as a last resort if indeed deterrence failed, or an accident occurred.

In this debate, as always, Dr. Garwin, a member of the American Physical Society and Dr. Carl Sagan, a member of the Union of Concerned Scientists, dutifully deployed the same old figures and fallacies to illustrate that SDI would be detrimental to the world's security.

Sagan: "SDI is fine, if it is perfect .. the near perfect reliability required for Star Wars .. is simply not achievable." Sagan also cited "$1 to $3 trillion dollar range" costs.

However, when contacted on several occasions, the Union of Concerned Scientists was repeatedly unable to come up with any figures, background, or rationale to support the $1 trillion cost estimate which they initiated and which has become a "buzz" word of the anti-SDI lobby.

Said Perle, "The simple fact is that SDI is affordable and manageable, particularly if one looks at the enormous investment that we now make in offensive forces, and can look forward to a future in which we can reduce that emphasis on offense and use the consequent budget reduction to finance SDI.

"It is all very well to talk about a trillion dollars in some future program. But that is not the program we are operating. No request has been made for a trillion dollars," Perle said.

The Union of Concerned Scientists is fond of publicizing figures that upon analysis are meaningless. Like the American Physical Society, which was forced by its chairman to admit to bogus use of statistics to generate an anti-SDI argument in their report, the UCS has had to retract some of its other factoids.

For example, in its first SDI report in March, 1984, the UCS said that SDI would require lasers placed on 2,400 battle stations.

"Over time, they have finally come to the point that, in fact, it is not 2,400 but on the order of 46-59 battle stations," said General Abrahamson.

Speaking to the necessity of perfection put forward by Dr. Sagan, Mr. Perle said the "perfect defense" is a straw man erected by the opposition to divert attention from the fact that there are objectives and purposes of the SDI program other than the construction of a perfect defense.

"Is there not something in between perfection and absolutely nothing that makes sense, that is in our national security interests, that might protect lives if a disaster should happen," Perle asked.

"One of those objectives is to strengthen deterrence by diminishing the Soviet capacity to execute an effective attack. Another one, a vital one, is to deal with precisely the kind of accident Dr. Sagan referred to in another context, Chernobyl."

It's clear that the arguments put forth by the Sagans and Garwins are not arguments based on facts but on emotion.

The latest amusing twist, however, is that even hard-core SDI dissenters like Senator William Proxmire (D-Wis), whose amendment to the Defense Appropriations bill cut back SDI tests, and Senate Armed Services Committee Chairman Sam Nunn have found it politically necessary to endorse the insurance policy of at least a limited defense. Nunn caused a sensation by owning up to the fact that nuclear vulnerability is not a strategy that promotes a secure future for the Free World.

Perhaps Nunn's conversion demonstrates that the anti-SDI lobby is tiring of their own argument that nothing less than a perfect shield would be useful or worthy of the cost. Now that a prominent Democrat has endorsed the concept of at least a limited defense, it will be interesting to watch what happens to the old cliches. Will they say—Anything but a limited SDI won't work . . . anything but a limited SDI would be destabilizing . . . anything but a limited defense would militarize space . . . anything but a limited SDI would be too expensive . . . ?

In concluding that Capitol Hill debate, moderator Congressman Edward Markey (D-MA) recited the familiar litany of old questions and then cautioned Americans not to put their faith in technological solutions but in politically-negotiated solutions.

Richard Perle reminded the audience of the danger of putting American ingenuity at the mercy of Soviet integrity. He recalled the difficult decision facing President Truman in the 1940s. "The scientific community was 90% against the development of the hydrogen bomb. Yet even as the U.S. debate raged, a young Soviet physicist named Andre Sakharov had already been assigned by Stalin the task of developing the hydrogen bomb.

"Had Harry Truman waited to see the facts as they emerged from the research, had Harry Truman decided with Robert Oppenheimer and not with Edward Teller, the Soviet Union would have emerged in the late 1940s or early 1950s with a monopoly of thermonuclear weapons.

"I leave it to you to conclude how the face of the globe, how the values that Carl Sagan and Dick Garwin and General Abrahamson and I all share, might have been altered," Perle said.

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Dr. Edward Teller

IMPORTANT SUPPORT FOR SDI

On February 19 of this year, America's preeminent nuclear physicist, Dr. Edward Teller, testified to the U.S. Senate that the United States can, and indeed, *must*, deploy the kinetic energy defensive systems (KEW) currently available, and continue to research directed energy weapons (DEW) to ensure the future effectiveness of SDI.

Dr. Edward Teller

High Frontier applauds and supports Dr. Teller's views, and deplores the recent attempts by anti-SDI scientists at Lawrence Livermore Laboratories to discredit Dr. Teller. It was Teller's great prestige which made his early support of SDI instrumental in President Reagan's adoption of the program.

We also note with satisfaction that Dr. John Nuckolls, who was recently nominated to head up the Livermore labs, joins Dr. Teller in support of SDI.

SDI SPIN-OFF CAN CLEANSE BLOOD

A Texas medical research team, financed in part by Pentagon SDI funding, has used a laser to clear donated blood samples of viruses and other infectious agents.

The Baylor University Medical Center team reported that a combination of non-toxic dye and laser light could destroy a number of viruses in blood, including the AIDS virus, without harming the blood itself.

Although the procedure is experimental, the team's director, Dr. James Matthews, thinks that within five years, the system may be refined enough to cleanse a pint of blood every fifteen minutes.

The research findings were recently disclosed by DoD officials in discussions of the potential medical and scientific spin-off benefits of SDI research.

LATEST DEFENSE CUTS DELAY DEPLOYMENT ANOTHER YEAR

The latest round of Congressional cuts in Defense has cost the FY 1988 SDI budget $1.7 billion, delaying Phase I programs and testing and pushing the overall date for a deployment decision back at least a year. An "informed decision" is now not expected before 1993.

SDIO's Director of Program Planning Dr. Richard Bleach said funding priorities had been set by top-level DoD officials who decided to cut the program the same amount in 1989 as had been cut in 1988. This, apparently, in keeping with Defense Secretary Frank Carlucci's pledge to Congress to reduce Defense spending.

The delays will cause all of the Phase I programs (BSTS, SSTS, GBSS and ERIS) to lose momentum, create potential cost increases and in the case of at least one program, BSTS (Boost Surveillance and Tracking System), reduce the systems performance.

Budgetary cuts in Directed Energy Weapons (DEW) will also take place.

The Space-Based Interceptor (SBI), the only space-based weapon in Phase I, will have its contracts altered for a lower level of technical activity and its flight tests restructured and delayed. Demonstration/validation test flights for ERIS will also be reduced.

SDI ANNIVERSARY
March 23, 1988

High Frontier's annual celebration of the SDI program will be held this year at Washington's Capitol Hilton Hotel. The gala black tie event is always a fun-filled evening for Star Warriors with lots of notables on hand.

For your tickets or more information, call Elizabeth McDonald at (202) 737-4979.

UPCOMING HIGH FRONTIER SEMINARS ON STRATEGIC DEFENSE AND SPACE POLICY

March 12,	Cleveland, OH
April 9,	Newark, NJ
April 21,	Boston, MA

For more information, contact Sheila Combs at (202) 737-4979.

PUBLIC LECTURE

Strategic Defense: Impossible Dream or Dire Necessity

by Gene Vosseler

Americans for the High Frontier

High Frontier's veteran writer, lecturer and activist, E. Gene Vosseler, in a follow-up to his successful tour of the Western United States continues his 32-city lecture tour of the East.

In an effort to help make SDI a major focus of the 1988 presidential debate, Vosseler has visited the New England cities of Burlington, Boston, Providence, Hartford, and New Haven; New York City; Mendham, NJ; Baltimore, MD; Philadelphia, PA; Washington, D.C.; Arlington and Richmond, VA; and Pinehurst, NC.

March and April will find Vosseler in Charlotte and Columbia, NC; Atlanta, GA; Birmingham and Mobile, AL; Orlando, Miami, and Sarasota, FL; New Orleans, LA; Nashville, TN; and Pittsburg, PA.

For more information, contact Kate Gordon at (202) 737-4979.

SWORD, NOT SHIELD
continued from Page 1

defensive attacks against Soviet missiles in space on their way to U.S. targets.

Most surface targets could be shielded, placed underground, or otherwise hardened to a very high degree against a space-based offense, and probably could be protected to a degree that would require laser power beyond the inherent capability of space-based or redirected weapons.

Concern about offensive attacks by ground-based laser beams, which are reflected and directed by space-based mirrors to targets on the ground, fails to consider that the mirrors themselves would have to be made sufficiently reflective to withstand the laser effects. But if mirrors could be developed to reflect high-energy laser beams without damage, then as a countermeasure, protective reflector mirrors could be placed on the ground as passive defenses to deflect laser beams away from high priority land-based targets.

Limited Military Value Against Soviet Targets

Even if SDI weapons had some offensive capability against stationary Soviet targets on the ground, it would be of limited future value. Moscow has given high priority to both defensive and offensive mobile weapons systems, thereby reducing their vulnerability to attack. The Soviet SS-24 and SS-25 ICBMs are both mobile and difficult to target and track and there is some suspicion that even many fixed Soviet ICBM silos are empty and the missiles themselves are dispersed and hidden throughout the vastness of the Soviet land mass.

KEW Space Use Limited

The use in space of kinetic energy weapons to attack Soviet surface-based strategic targets is neither militarily nor economically effective. Kinetic energy weapons designed to be launched from platforms in space against targets on earth would require enormous and costly space-launch payloads to get all that equipment into orbit. Moreover, the weapons would suffer major problems on re-entering the earth's atmosphere. Even if designed to prevent burn-up upon re-entry, they would still have to contend with the problem of serious air drag and deteriorating accuracy. In addition, the terminal guidance system being considered for advanced U.S. strategic missile systems could not be applied to small spaced-based offensive kinetic energy weapons nor would they be sufficiently effective to produce anything approaching a credible alternative to nuclear-armed ballistic missiles.

Incompatible with Offensive Use

It is simply untrue that offensive kinetic energy weapons could be developed and deployed in space clandestinely as part of the SDI program. There are fundamental differences between the development and testing of kinetic energy offensive and defensive systems, involving different radars and sensors and different targeting and atmosphere penetration requirements. There is no way that an offensive space-based system could be deployed under the aegis of a defensive system. It is also incomprehensible that any U.S. administration would try to deploy a "covert" strategic offensive capability under the guise of a defensive one and close to impossible to carry out such a subterfuge in the open American society without Congress or the press learning about it, at least in peacetime.

Conclusion

Heritage concludes that assertions by Moscow and some American critics of SDI that the SDI program may have strategic offensive applications have been neither accurate nor objective.

The attempt to label SDI as offensive was compared to the attacks made against the development of the neutron bomb a decade ago. Many of the leading foes of that weapon have re-emerged as outspoken opponents of SDI, using similar arguments – arguments which closely match the positions of the Soviet Union.

These SDI opponents previously had put forth almost every conceivable reason why SDI defenses would not work while at the same time arguing that, if strategic defenses did work, they would dangerously destabilize the strategic balance. Now that it has become clear that SDI indeed is technically feasible, these same SDI opponents appear to claim that SDI technology is so highly feasible that it holds great offensive potential.

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THE WHITE HOUSE

WASHINGTON

February 25, 1988

MEMORANDUM FOR REBECCA RANGE

FROM: MAX GREEN

SUBJECT: SDI events

We are fast approaching the fifth anniversary of the SDI program, the date being on March 23rd, only a month away.

It is highly advisable that we give the program the recognition that its achievements and promise deserve. Failure to do so will convey the inaccurate impression that the President's commitment to the program and the concept it represents is weakening. This would be a particularly unfortunate signal to send at this time, when the program is under attack on the Hill. Conversely, renewed Presidential support for the program, starting now and running throughout the year, will ensure that the future of the program will be a debated issue in the upcoming Presidential campaign and increase the possibility that SDI will be one of the President's permanent legacies.

We propose the following program of events for the next two months:

1. SDI speech to IFPA on March 14th (approved).

2. On March 23rd, a release of a Presidential Statement on the program.

3. Saturday radio address about SDI, preferably March 19.

4. Room 450 Presidential event for young government and private sector scientists involved in SDI research. This has been approved in principle and should be scheduled for early April for maximum effect. The President's remarks to the group might highlight SDI spin-offs as well as key policy points.

NSC(Steiner) has reviewed and concurs.

Political side - ~~op~~ trips - need back

Pr Minister - memo

Drug Policy - ideas -

Contra aid - Cong Sr - 10:00 tomorrow morning

Grove City - Agudath

THE WHITE HOUSE

WASHINGTON

January 29, 1988

SCHEDULE PROPOSAL

TO: FREDERICK J. RYAN, JR., Director of Presidential Appointments and Scheduling

Rebecca G. Range

FROM: REBECCA RANGE, Deputy Assistant to the President and Director of the Office of Public Liaison

PAUL SCHOTT STEVENS, Special Assistant to the President and Executive Secretary for the National Security Council

REQUEST: Presidential Participation in ADPA SDI Technical Achievements Program

PURPOSE: To commemorate the 5th anniversary of SDI and to honor outstanding technical achievements in the program.

BACKGROUND: The American Defense Preparedness Association (ADPA), with more than 40,000 members, more than 1,000 corporate members and over 50 chapters, is one of the staunchest supporters of the President's SDI program. In addition to their public emphasis on SDI technical achievements, ADPA produced an excellent film on SDI last year which the President viewed and appreciated.

PREVIOUS PARTICIPATION: We have been unable to date to arrange direct Presidential participation in any of ADPA's SDI activities. We feel it is appropriate now to recognize ADPA for their educational efforts on SDI, and we believe the March 8 event offers the best opportunity for the President to highlight the 5th anniversary of his program.

DATE AND TIME: March 8, 1988; 8:00 p.m.
DURATION: 15 minutes

LOCATION: Washington Hilton Hotel

PARTICIPANTS: The President, the Secretary of Defense, SDIO Director Abrahamson, ADPA President Lawrence F. Skibbie

OUTLINE OF EVENTS:	President addresses Awards Dinner at Washington Hilton. ADPA is flexible on timing. President does not have to stay for awards or dinner. Note: Alternatively, the President could briefly drop-by one of the other events in the achievements program, on March 7 or 8.
REMARKS REQUIRED:	Keynote address on SDI. Text to be provided.
MEDIA:	Open
RECOMMENDED BY:	NSC, OPL, OSD, SDIO
OPPOSED BY:	None

#92998SS

(Dolan edit)
October 22, 1987 PR011
2:30 p.m.
PR014-08
ND018
CO165
PR007-01

PRESIDENTIAL TAPING: STATEMENT FOR NEW DOCUMENTARY ON SDI
FRIDAY, OCTOBER 23, 1987

Good evening, ladies and gentlemen: I am sorry that I could not be with you personally this evening, but I did want to extend my greetings to those of you who are attending tonight's "sneak preview" of one of the most important -- and informative -- documentaries ever made.

You know, I've attended more than a few "sneak previews" in my time, but few have dealt with a subject as critical as the one addressed in tonight's film: the Strategic Defense Initiative.

Just a few days ago, I had a chance to preview the film for myself. Now like anybody who's been in the business, I've always been wary of film reviews, but in this case I'd like to make an exception. I think "SDI: A Prospect for Peace" deserves four stars. It's an original, accurate, and informative film that is meant to educate the American public on one of the leading national security issues of our time. And I think it succeeds in what it sets out to do.

The Strategic Defense Initiative is a cornerstone of our national security policy; it must continue as a top priority. We are now embarked upon an ambitious but feasible effort designed to defend the U.S. and our allies against the threat of ballistic missile attack. If we can achieve a workable system of defense against these missiles -- a system that deters by protecting lives instead of threatening to avenge them -- I believe it will stand as a major contribution to our goals of world peace and

Comments/ American Defense Preparedness Association - ADPA
NSC 8707746

freedom. It will become a lever to get the Soviets to reduce, and to keep reducing, offensive arsenals. And it will be our insurance protecting us against Soviet violation of any new agreements.

But the fact is that most people are unfamiliar with what S.D.I. really is. That is why I believe a documentary of this type is absolutely essential. "S.D.I.: A Prospect for Peace" seeks to educate the American public concerning the true facts of that debate. The more we deal in facts -- and the less we simply use political rhetoric -- the more rational will be our decisions on S.D.I.

That is why I congratulate the producers of this film, the American Defense Preparedness Association, on this excellent documentary. A.D.P.A. takes seriously its long history as one of the Nation's leading defense educational organizations. This documentary marks an excellent achievement by A.D.P.A. but, even more significant, it is important for all our citizens, for they will finally have an opportunity to understand what the S.D.I. debate is all about.

I hope you will enjoy the film. I know I did. Thank you and good night.

4:00

Document No. ____________

WHITE HOUSE STAFFING MEMORANDUM

DATE: 3/17/88 **ACTION/CONCURRENCE/COMMENT DUE BY:** 4:00 pm today

SUBJECT: RADIO TALK: SDI'S FIFTH ANNIVERSARY AND CENTRAL AMERICA

	ACTION	FYI		ACTION	FYI
VICE PRESIDENT	☐	✓	GRISCOM	✓	☐
BAKER	☐	✓	HOBBS	☐	☐
DUBERSTEIN	☐	✓	HOOLEY	☐	☐
MILLER - OMB	✓	☐	KING	☐	☐
BALL	✓	☐	POWELL	✓	☐
BAUER	☐	☐	RANGE	✓	☐
CRIBB	☐	☐	RISQUE	✓	☐
CRIPPEN	☐	☐	RYAN	☐	☐
CULVAHOUSE	✓	☐	SPRINKEL	☐	☐
DAWSON	☐P	✓SS	TUTTLE	☐	☐
DONATELLI	✓	☐	DOLAN	☐	✓
FITZWATER	☐	✓	GRAHAM	✓	☐

REMARKS:

Please provide any comments directly to Tony Dolan by 4:00 this afternoon, with an info copy to my office. Thanks.

RESPONSE:

Rhett Dawson
Ext. 2702

(Dolan)
March 17, 1988
11:30 a.m.

PRESIDENTIAL RADIO TALK: SDI's FIFTH ANNIVERSARY AND CENTRAL AMERICA
SATURDAY, MARCH 19, 1988

My fellow Americans: There was a nice celebration of St. Patrick's Day up on Capitol Hill this week; but believe me that wasn't the only reason Congress knew I had my Irish up. On two issues vital to our national security, I had some stern words for some of our lawmakers.

The first has to do with the safety of our hemisphere. Back in the early 1980's some in Congress were saying the prospects for democracy in Central America were bleak and we would do little to prevent Marxist dictatorships there. But after much opposition and by only a few votes, Congress finally passed our Administration's economic and military aid program and today the countries of Costa Rica, El Salvador, Honduras, Guatemala are solidly democratic; indeed, tomorrow, El Salvador, the nation some in Congress were gloomiest about, will host congressional and municipal elections, just one more sign of successful democratic reform in that nation and region.

However, in one Central American nation, Nicaragua, the cause of freedom is in grave peril. Up until the end of last month, the United States had been aiding the freedom fighters who have been trying to restore democracy by resisting the regime of the Soviet-backed Sandinista Communists. However, just as the heroic efforts of the democratic resistance has forced the Communists to cut back on their aggression abroad and to make peace promises, the Congress, in a close vote, decided to cut off aid to the freedom fighters.

And since the Congress turned its back on those fighting for freedom in Nicaragua, the Communist dictators have done exactly as we predicted. Instead of "giving peace a chance," the aid cutoff is giving the Communist dictators a chance, a chance they long hoped for, a chance to smash their opponents. They have hardened their negotiating position; they have fired the mediator; they have sent mobs of thugs against peaceful opposition groups. And now, instead of negotiating for a cease-fire, they have launched a major military assault on the weakened contras -- invading Honduras in the process.

Now from the beginning our Central American policy has been designed to prevent another Cuba there; and the whole point has been designed to let people of Nicaragua win back their freedom and their independence from the Soviet Union on their own -- to do this without having to commit American military personnel. Now as I say because of Congress' aid cutoff last month, the Sandinistas have invaded Honduras and on the request of President Ascona, I have had to send some American military units to the scene. This is a tragedy; and the blame can be laid squarely at the feet of Congress.

It's time for our Congress to wake up, the freedom fighters need arms to defend themselves, not bandages. If we betray them now, it will not only eventually lead to a national security crisis of the first order, it will compromise one of the most disgraceful and shameful events in the history of the United

States Congress. I am doing all in my power to prevent this and to get the Congress to provide vital humanitarian and military assistance to the freedom fighters.

Now another vital security matter where the Congress has not been doing its job has involved our plan for a strategic shield against nuclear missiles. This week marked the Fifth Anniversary of my call for just such a Strategic Defense Initiative or S.D.I. and I took the occasion to note that Soviets have been making alarming progress on their own S.D.I. program in the last few years. Indeed, I suggested that the Soviets have moved so quickly they may be positioning themselves for a breakout from the restrictions of the A.B.M. treaty which prohibits a massive deployment of such a system.

However, at the very moment when the Soviets are stepping up their efforts Congress has been cutting back ours. Every year Congress has cut the S.D.I. budget. We are now 1 to 2 years behind schedule. And this despite the fact the actual S.D.I. program is progressing faster than we expected in technical matters like intercepting an attacker's ballistic missile or the sensors that are the eyes and ears of such a system.

But our scientists must have Congress' support. Polls show the American people are troubled that today we have no defense, none at all, against a ballistic missile attack. And that's what S.D.I. is about.

So, I can't think then of two more vital national security issues than these: preventing the establishment of a Soviet beachhead in Central America and erecting a defense shield that will eliminate the nuclear terror that has so overshadowed the post-war era. I need your help on both because some in Congress are taking dangerous risks with America's national security.

Until next week, thanks for listening and God bless you.

THE WHITE HOUSE

WASHINGTON

March 17, 1988

MEMORANDUM FOR REBECCA RANGE

FROM: MAX GREEN *MG*

SUBJECT: Young Scientists Schedule Proposal

Enclosed is a copy of the original schedule proposal for a Presidential speech to young SDI scientists. It is my recollection that the proposal was approved in principal, but never scheduled.

I will get a slightly revised proposal over to you as soon as possible.

Lawin
Sachs OK 8/15
Linhard
Tobey

THE WHITE HOUSE

WASHINGTON

SCHEDULE PROPOSAL

July 29, 1986

TO: FRED RYAN

FROM: PAT BUCHANAN

REQUEST: Presidential Address to Young SDI Scientists

PURPOSE: To meet with young scientists whose research and skills will impact the future of SDI.

BACKGROUND: SDI is to this generation of young physicists and scientists what the Manhattan and Appollo Projects were to previous generations of scientists - a rare opportunity to be part of an historic scientific epic.

There are thousands of scientists and technicians working on SDI research. These individuals represent an elite group of the finest scientific minds to come out of our colleges and universities.

An event specifically for young SDI scientists would provide inspiration to a whole generation of future scientists and instill pride of association with the SDI project in those who are dedicating their emerging careers to it. It would draw public attention to the importance of comprehensive SDI research versus a terminal program and give the President a "high road" opportunity to echo future, high tech, SDI and defense themes.

DATE: Fall, TBD

DURATION: 30 minutes

LOCATION: East Room

PARTICIPANTS: Approximately 200 young SDI scientists, TBD with NSC.

OUTLINE OF EVENT: The President would follow senior Administration spokesmen in an "SDI Briefing" and offer remarks.

REMARKS REQUIRED:	Prepared speech.
MEDIA COVERAGE:	TBD
RECOMMENDED BY:	~~Steve Steiner~~ OPL, NSC
PROJECT OFFICER:	Tom Gibson

NATIONAL SECURITY COUNCIL
WASHINGTON, D.C. 20506

5355

July 23, 1986

ACTION

MEMORANDUM FOR JOHN M. POINDEXTER

FROM: Steve STEVE STEINER/WILL TOBEY by SES

SUBJECT: SDI Public Affairs Program

At Tab I for your signature is a response to Pat Buchanan giving NSC concurrence with the White House communications plan on SDI, which has been developed as a cooperative effort by Pat's staff and ourselves. As we have indicated to you, this is just the start of a long term intensive effort to step up our public diplomacy on SDI. Pat's people are working closely with us, and we are providing the interface with the interagency SDI community.

Pat's memo and the plan are at Tab II. At Tab III are the White House Talking Points developed by Tom Gibson and ourselves.

RECOMMENDATION

That you send the memo at Tab I to Pat Buchanan.

Approve ___________ Disapprove ___________

SES Bob Linhard and Paul Hanley concur.

Attachments

Tab I Memo to Buchanan

Tab II Buchanan's Memo and Plan

Tab III White House Talking Points

5333
add-on

THE WHITE HOUSE

WASHINGTON

MEMORANDUM FOR PAT BUCHANAN

FROM: JOHN M. POINDEXTER

SUBJECT: SDI Public Affairs Program

In response to your memo of July 14, the proposed public promotion plan on SDI has our enthusiastic concurrence. My staff members have briefed me on the work which your staff is doing in support of SDI. They are particularly appreciative of the work being done by Tom Gibson and members of his office.

The public promotion plan and the new White House Talking Points on SDI are just two examples of the collaborative effort between our staffs. I am delighted that this close connection has been established on SDI and look forward to seeing implementation of the rest of the plan. Needless to say, we will also need to revise and up-date the plan as events proceed.

5355

THE WHITE HOUSE

WASHINGTON

July 14, 1986

MEMORANDUM FOR JOHN POINDEXTER

FROM: PAT BUCHANAN

SUBJECT: SDI Promotion

Attached is a conceptual plan for an ongoing advocacy program for SDI. Members of my staff have met with Steve Steiner and Will Toby to put these items together. It would be useful to have NSC review/concurrence. This paper would subsequently be refined to reflect NSC views and offered to the Chief of Staff for long term scheduling purposes.

Thanks very much.

WHITE HOUSE COMMUNICATIONS INITIATIVE ON SDI

OBJECTIVES

1. To continue building popular consensus to support the President's Strategic Defense Initiative;

2. to maintain required funding levels for research;

3. to prevent a scaling back in research to confine effort to a terminal defense program rather than the comprehensive investigation of defenses which the President has clearly identified as the goal of SDI research; and

4. to counter anticipated full scale Soviet arms control propaganda campaign.

STRATEGY

- o Increase visibility of the President on SDI issues.

  -- Provide more information in non-technical language for public and popular press.

  -- Associate President with research progress through appropriate events.

- o Cultivate conceptual support of Congress, academics, futurists, the business community and other constituencies.

- o Aggressively pursue media "understanding" of the potential of SDI as peace insurance.

THEMES

- o What SDI is:

  1. a response to the combination of ongoing Soviet strategic offensive and defensive programs;

  2. research, pure and simple. Taps the finest scientific minds to explore and expand the technology, and test out what is possible;

(What SDI is, cont'd)

3. an enhancement to U.S. and Allied security;
4. the responsible, moral solution to the nuclear arms race by finding a way to deter aggression through defenses which threaten no one;
5. the means to fulfill our ultimate objective of rendering nuclear weapons obsolete by underwriting the integrity of agreements controlling offensive arms; and
6. an invigoration to the scientific community that will also yield new commercial technologies.

- What SDI is not:

  1. a tool of war: it is a way to defend against missiles, protect populations and insure against war;
  2. a "quick fix" effort to ensure a hasty strategic defense only for ground based missiles; rather, an investigation into the potential of all technologies to determine the best possible strategic defense for the American people, our Allies and ultimately the entire world; and
  3. a U.S. conceived effort to militarize space.

TIMING

Begin some efforts immediately and continue through congressional activity on SDI appropriations (scheduled before August recess, although not probable). Thereafter, continued moderate activity, with emphasis on placing information in the popular press and influencing potential opinion leaders ("multipliers").

NOTE: Planning "weeks" do not necessarily occur consecutively.

Week 1

o Saturday Radio Address on SDI.

o Mailing to media/supporters/spokesmen on budget points, the President's basic policy statement on SDI and information on Soviet strategic defense programs.

o Saturday Radio Address converted to a column and mailed to small dailies and weeklies.

Week 2

o RR receives new DOD publication on research/technology.

o Press briefing and mailings on research/technology.

o Room 450 event.

o Talking Points, Issue Briefs, Speech inserts on research progress.

Week 3

o RR luncheon with scientific media. Include Poindexter, Shultz, Weinberger, Abrahamson, Regan, Buchanan.

o Room 450 event.

Week 4

o RR visits site with appropriate visuals.

o Room 450 event.

Week 5

o Report on SDI Soviet Propaganda.

o Talking Points/Issue Briefs on Soviet Propaganda.

o Room 450 event.

Weeks 6-12

o Fall report on strategic picture.

o RR by-line article in popular press on SDI.

o RR meets with selected young physicists who are working on promising SDI technologies.