The precarious state of the SDI program

On Oct. 16, just after a meeting at the Oval Office between President Reagan and Defense Secretary Caspar Weinberger, and six days before Secretary of State Shultz was to meet Eduard Shevardnadze, his Soviet counterpart, two of the Reagan administration's chief spokesmen on arms control, Gen. Ed Rowney and Arms Control & Disarmament Agency (ACDA) Director Kenneth Adelman, announced that the United States had decided to reject a Soviet proposal to "negotiate the scope of the SDI."

The rejected Soviet proposal, according to the administration, was either to draw up a list of what tests and technologies would be permissible for the SDI, or, failing agreement on that, to agree to extending the "restrictive" interpretation of the ABM Treaty for another 10 years. According to press accounts, Paul Nitze, the arms control adviser, led an effort to accept the Soviet proposal, but he was defeated by another group in the administration led by Caspar Weinberger, Frank Carlucci, Kenneth Adelman, and General Rowney.

Despite this salutary formal decision, however, the Strategic Defense Initiative continues to be in serious jeopardy, not because the administration is vulnerable to Soviet negotiating traps, but rather because forces in Congress are methodically trying to kill it.

The day following the Rowney/Adelman announcement, President Reagan, in his weekly radio address, accused Congress of trying to enact into law what the Soviets are demanding of the U.S.A. at the negotiating table. "Certain proposals in Congress," President Reagan said, "especially those that would tie our hands or even enact Soviet negotiating positions into American law, don't help us at the bargaining table, and they undermine chances of achieving mutual arms reductions. I can assure you," he went on, "I will veto any bill with provisions that hurt our national security."

The defense appropriations bill that Reagan is threatening to veto is still being negotiated in conference committee. The Senate version provides $4.5 billion and the House version $3.1 billion, for the Strategic Defense Initiative. The Defense Department has informed Congress that "if Congress approves funding for SDI at $4.5 billion or less, an informed decision on the feasibility of a strategic defense deployment date would be delayed by about two years."

Another matter bearing on possible delay of an SDI deployment decision, is the controversy over the "narrow" or "broad" interpretation of the ABM Treaty.

In two Pentagon reports to Congress, one last April and the other in September, it was announced that at "present funding levels," and under the broad interpretation of the ABM Treaty, the United States could begin Full Scale Engineering Development (FSED) by about 1990 and start full-scale deployment by "the mid-1990s.
levels, deployment could occur earlier. Under present funding levels, five or more additional years would be needed for a decision to be made on deployment, unless the U.S.A. decided to abandon the ABM Treaty during 1988.

These Pentagon reports emphasize that the decision to restructure the SDI program on the basis of the broad interpretation of the ABM Treaty is not a legal decision, but a simple matter of policy. During the next 30 days, it will be decided whether or not the SDI will be irrevocably sold out at the arms control negotiations. Should the SDI survive the "slippery slope" of the INF arms control euphoria, then, during the next 90 days, it will be decided whether it survives the budget-cutting assaults of Congress. The excerpts we publish below from Defense Department reports to Congress will help the reader obtain clarity of the issues as they are being fought.

—The Editor-In-Chief

Legal interpretation of the ABM Treaty

From in the Sept. 21, 1987 DoD A Report To Congress On the Anti-Ballistic Missile Treaty:

The 1985 review led President Reagan to conclude that a broader interpretation of our authority under the Treaty—permitting development and testing of all ABM systems involving other physical principles, regardless of basing mode—was fully justified. The President also decided, however, that it was not necessary at that time to restructure the SDI program toward the boundaries of the broader interpretation we were entitled to observe. The President made that decision as a matter of policy, not as a matter of legal requirement, and clearly reserves the right to restructure the SDI program in the future to conform with the broader interpretation if circumstances warranted it.

Advantages of 'broad' interpretation

From the same Sept. 21, 1987 DoD report:

In order to contrast a program conducted under the restrictive interpretation with one conducted under the broad, the Department of Defense postulated a restructured program which illustrates the benefits to the SDI program of the broad interpretation of the ABM Treaty. In order to develop this contrasting program, the Department of Defense assumed that this program would be fully funded at projected budget levels, would maintain a balance among technologies, and would support the development of strategic defense deployment options as soon as possible. The purpose of evaluating experiments in the contrasting program, it also was assumed that advanced kinetic energy technologies in the SDI program are based on principles other than those that governed defensive systems in 1972 and that, therefore, they could be fully tested and developed under the broad interpretation of the ABM Treaty.

SDI program under the broad interpretation. The current research program has focused on individual technology development in part because of past technical limitations and in part because the restrictive interpretation of the ABM Treaty prohibits the development and testing of mobile devices that have full defense capability (i.e., the ability to perform ABM functions) and integrated tests using these devises. Due to the significant progress that has been made to date, the SDI program is in an excellent position to benefit from the broad interpretation by integrating the basic elements of a strategic defense system, such as sensors and weapons, in realistic tests which will more fully validate defensive concepts. Under a program conforming to the broad interpretation, four major system exploration experiments would be conducted over the next three years. These experiments are designed to identify early in the program any unexpected technical issues and to increase confidence in the feasibility of strategic defenses. The first experiments in the restructured program could occur as early as Fiscal Year 1988. Planning activities to support this challenging schedule must begin immediately. In the current program, the SDI effort would remain limited to individual experiments which do not validate technologies fully and which do not establish as high a level of confidence in the feasibility of defenses based on these technologies.

In addition to the major experiments which explore the issues of system integration, the development of individual technologies would also benefit from the broad interpretation. Restructuring to take advantage of the broad interpretation would more than pay for itself by eliminating repeated flight tests of individual technologies.

Implications of restructuring. The implications of the broad interpretation for the SDI program are clear and dramatic. The restructured program would allow for more efficient use of projected budgets and could reduce the total costs of research by approximately $3 billion. Under this program, confidence in defense feasibility would increase much faster, and the program management uncertainty caused by ambiguities inherent in the restrictive interpretation would be reduced substantially. Additionally, restructuring under the broad interpretation of the ABM Treaty would allow a President to defer a decision on altering fundamentally the ABM Treaty regime until after full-scale engineering development (FSED) is completed and just prior to actual deployment. A restructured SDI program would permit a full-scale engineering development decision in the early 1990s and preserve the option to deploy an initial defense in the mid-1990s (or earlier if funding in excess of projected budgets were provided) that would be effective when such an initial deployment is completed. Conversely, if the program remained constrained by the restrictive interpretation of the ABM Treaty, the United States would have to make a decision to alter fundamentally the ABM Treaty regime in the early 1990s in order to permit the pre-FSED phase of the program to be completed (FSED could begin at the time of Treaty regime alteration, but at a lower level of confidence in defense feasibility). In fact, because of possible congressional opposition to long-lead funding for non-compliant experiments, this issue might have to be faced as early as FY 1989 if the program continues to adhere to the restrictive interpretation. An early 1990s decision to alter fundamentally the ABM Treaty regime would delay a decision to enter full-scale engineering development until the mid-1990s (assuming a requirement for a high level of confidence when entering FSED), and the nation's initial deployment option would slip to the late 1990s, forcing it to confront even further evolution of Soviet offensive and defensive threats.

Conclusions. The restrictive interpretation of the ABM Treaty already is beginning to cause the SDI program to sacrifice program effectiveness and highly significant experimental options. Any significant delay in adopting the broad interpretation of the ABM Treaty would have increasingly detrimental consequences for the SDI program,including higher costs and further delays. Because it cannot be expected that the Soviet threat will remain static, a defense that could be effective if deployed in the mid-1990s may not be effective if deployed significantly later. Consequently, such delays could result in the loss of deployment options. A delay of one year in restructuring the program using the broad interpretation would, for example, delay the option to deploy an initial defense system at least a year and a half and sacrifice substantial cost savings.

Progress achieved so far by SDI

Excerpts from the SDIO's Report to the Congress On The Strategic Defense Initiative, *April 1987.*

. . .This [Directed Energy Weapons Technology] Program pursues directed energy weapons concepts that include not only those that have emerged since the start of the SDI but also those that predate the SDI Program by several years and are more technically mature. . . . The DEW Technology Program addresses four basic concepts, with several variations identified within each concept. These concepts are space-based lasers (SBLs), ground-based lasers (GBLs), space-based particle beams (SBPBs), and nuclear directed-energy weapons (NDEWs).

The space-based laser concept envisions self-contained laser battle stations. These battle stations are seen as modular assemblies of laser devices and optical phased arrays that can increase their performance by adding additional modules as the threat grows. . . . The primary candidate for the space-based laser concept uses chemical lasers fueled with hydrogen fluoride. . . . This concept has been under development since the late 1970s. As the first DEW concept identified for ballistic missile defense, it is the most mature. The efforts are well into hardware fabrication for engineering proof-of-principle demonstrations in ground-based tests.

Other candidates for space-based lasers are devices that generate beams at short (about a micrometer or less) wavelengths. . . . The radio frequency linac (FRL) free electron laser (FEL), for which high efficiencies are projected, is one of the most promising alternatives. Another candidate is the short-wavelength chemical laser. Yet another approach uses nuclear reactors to pump a short-wavelength laser. . . .

Due to recent significant progress, the free electron laser appears to be the most promising approach for this [ground-based laser] concept. The GBL concepts have been under investigation since the early 1980s, and were accelerated as a result of the SDI.

. . .In this [space-based neutral particle beam (SBNPB)] concept, electromagnetic fields accelerate negative hydrogen ions. . . . Large numbers of these ions are accelerated to velocities near the speed of light, creating a high-energy beam which is steered toward the target by magnets at the front of the weapon. . . . Unlike lasers, the energetic particle beam can penetrate the thermal protection provided to survive reentry and destroy reentry vehicles in midcourse. . . .

The fourth set of concepts—nuclear directed-energy weapons—are being pursued by the Department of Energy. The DOE is conducting a broad-based research program investigating the feasibility and utility of using nuclear explosions to drive directed-energy weapons technologies. . . . Some concepts, such as the X-ray laser, could be placed in ground-based interceptors that pop up to engage missiles early in their trajectory phases.

. . .Some specific examples of recent technical accomplishments in directed-energy weapon technology are:

- Demonstration of high power and efficiency in converting electron beam energy into coherent microwave radiation in induction linac FEL experiments at the Electron Laser Facility. . . .
- Scalability of the ALPHA hydrogen fluoride chemical laser to brightness necessary for ballistic missile defense is being demonstrated. Very high brightness can be realized by the mutual phasing of multiple lasers in a manner that enables several individual lasers to act as one giant laser. Recent work has detailed the physics of phasing several independent laser resonators with the resultant mutually coherent output. . . . It demonstrates the feasibility of scalable, modular designs with essentially unlimited total laser power applicable to both ground- and space-based lasers.
- The switching technology needed for excimer lasers to operate continuously and reliably has been demonstrated. The excimer laser program is also addressing the problems of combining high-energy laser beams and of performing atmospheric compensation.
- Beam control and atmospheric compensation technology were demonstrated in a series of experiments in which laser beams from the RADC AMOS facility in Maui, Hawaii, successfully tracked U.S. Navy sounding rockets fired from the nearby Barking Sands Missile Range. . . .
- Metallic heat exchangers for high-energy laser mirrors were fabricated. These exchangers are the largest and most sophisticated ever made for this application. The mirrors, which represent a major advance in state-of-the-art large metallic optics, are the primary components of the ALPHA optical resonator. . . .
- Cooled optical components, required for high-power free electron lasers to control thermally induced optical surface deformation, were developed. . . .