Nunn proposal spells death of the SDI

Charles B. Stevens and Carol White cover a top-level policy conference and technology review, called to defend SDI against Senator Nunn's proposed ALPS alternative.

In the midst of mounting evidence that in the next year there will be a Soviet breakout from the 1972 Anti-Ballistic Missile (ABM) treaty, several hundred Western defense scientists and policymakers gathered in Washington, D.C., from March 13-16, to review the status of President Reagan's Strategic Defense Initiative missile defense research program, which was first announced in a March 23, 1983 speech. "SDI: The First Five Years," sponsored by the Institute for Foreign Policy Analysis and the U.S. Department of Defense Strategic Defense Initiative Organization (SDIO), reviewed both the significant technical progress of the Western SDI effort and the future policy options.

Coming as it did, on the fifth anniversary of President Reagan's ground-breaking speech, the conference was certainly well timed; however, the conference was intended to accomplish more than merely a review of the accomplishments of the program over the five-year period. There is presently a debate going on within the Reagan administration, as to whether or not to accept the proffer made by Sen. Sam Nunn (D-Ga.) for a bipartisan coalition on the SDI.

Nunn proposes immediate deployment of a very limited point defense—100 exoatmospheric reentry vehicle interceptor system (ERIS) missiles—whose principal purpose would be to guard against accidental launch of a ballistic missile. The system would be deployed in the near future. At the same time, existing plans for a phased SDI deployment would be further delayed.

Supporters of ALPS—Accidental Launch Protection System—argue that such a deployment, which relies chiefly upon existing technology, would "get the show on the road" at a low cost. Another sweetener, not discussed, is that such an agreement would lay the basis for a broader deal between anti-SDI Democrats and the administration, so that the President would get a smooth passage of the Intermediate-range Nuclear Forces (INF) treaty in return for his agreement to further limitations on the SDI program. The Nunn proposal was roundly attacked by a succession of conference speakers, as in no way comparable to the presently planned missile defense system.

The esteemed elder statesman of science, Dr. Edward Teller, gave the first speech of the conference. In this he endorsed the shift of the program away from directed energy weapons—in particular rapid development of x-ray laser technology, which he had championed in the past. He reported that advances in the technology of kinetic energy weapons are far greater than he had anticipated five years earlier, when he urged that priority be given to a laser defense. He pointed to the fact that these new weapons will be cheap and survivable; and he pointed to the success of the far less sophisticated Stinger missiles, which are used to good effect by the Afghan guerrillas, as substantiation of the case for smart, heat-seeking missiles.

While Lyndon H. LaRouche, Jr. was the first to actively campaign publicly for what subsequently became the SDI, Dr. Teller had taken an active role in mobilizing the nation to understand both the potentialities of the new directed energy weapons and the potential threat posed for Soviet deployment of them. Over the years, he has repeatedly warned that the Soviets have been in advance of the United States in researching x-ray lasers.

Although there have been significant advances in kinetic energy weapons defensive technology since the days when Gen. Danny Graham created the High Frontier—which proposed that off-the-shelf technologies used in surface-to-air missiles be adapted to a space-based missile defense—the fallacies of depending upon these, and postponing development of laser and electron beam technologies, remain the

same as they were when LaRouche and Teller both disagreed with Graham's perspective.

At that time, it appeared that deployment of such rockets as ABM weapons would prove neither feasible from the point of view of battle management, nor reasonably cost-effective, nor survivable. But the most important objection to High Frontier was the fact that it was misnamed. Essentially, the High Frontier proposal called for a retreat from the real technology frontier. It was clear five years ago, that the future (for industrial as well as military technology) lay in deployment of the whole array of the energy spectrum—from low-frequency microwaves to the high range of the spectrum, gamma-rays.

As LaRouche polemicized and General Keegan warned as early as 1976, the Soviets have concentrated on developing a whole array of weapons which rely upon entirely new physical principles. The deployment of lasers and electron beams, and of microwaves to blind satellites, is only the front-end of a technology which includes a whole new generation of sophisticated anti-personnel, portable radiowave devices, and potentially includes the deliberate manipulation of whole weather systems to create electromagnetic pulse effects.

President Reagan keynotes conference

In his keynote address to the conference, President Reagan held the door open to the Nunn proposal for such a bipartisan coalition, but the theme of his speech was a reassertion of his commitment to SDI. He noted, "Congress should realize that it is no longer a question of whether there will be an SDI program or not; the only question will be whether the Soviets are the only ones who have strategic defenses while the U.S. remains entirely defenseless." He cited Soviet General Secretary Gorbachov's startling admission in an NBC-News interview with Tom Brokaw, shortly before the last summit, when Gorbachov stated that the U.S.S.R. is matching anything that the United States is doing in the area of SDI. As he said, it is the Soviets today who have the only functioning ABM defense and an ongoing anti-satellite (ASAT) weapons program, while Congress has cancelled funding for its U.S. equivalent.

Reagan pointed out that while the Soviets have deployed over $200 billion on their program, which he called Red Shield, this is 15 times as much as we have spent in this country. Reagan charged the Congress with responsibility for undermining and dangerously retarding the U.S. SDI program through budget cuts, imposition of unwarranted restrictions, and the cancellation of essential program elements, such as the space rocket heavy lift vehicle.

Congress has cut the SDI budget every year since 1983. The 1988 request was slashed from $5.6 billion to $3.9 billion. Only $4.6 billion is being sought for 1989. Reagan noted that the Soviets have spent 15 times as much as the United States on defensive systems, including both the deployment of a limited defense permitted under the 1972 ABM treaty and the deployment of the elements of a nationwide defense in open violation of that same treaty. Reagan reported that the Soviets have more than 10,000 scientists and engineers working on laser weapons alone.

"Some in Congress would bind us to an artificially restrictive interpretation of the Anti-Ballistic Missile treaty that would effectively block development of our SDI program and perpetuate the Soviet advantage in advanced strategic defenses," Reagan noted. "This effort makes even less sense when the Soviets aren't even abiding by the ABM treaty, while we are." And Reagan warned that the Soviets appear to be making all of the preparations to break out of the ABM treaty.

The Soviet threat

The Soviet Union currently has in place a conventional type of ABM defense for Moscow. U.S. Air Force Intelligence reports indicate that the Soviets are mass-producing the elements of this technology in order to be ready to deploy them once their large ABM radars, such as the one being built at Krasnoyarsk which is an open violation of the 1972 ABM treaty, have been completed, in order to provide a nationwide missile defense within a few years. Perhaps even more important, it was reported at the conference that the Soviets now have the capability of small, mobile radars in one comprehensive national system, a capability previously thought to be beyond them, because such a system demands advanced computers. Most recently, it is reported that the Soviets are preparing to deploy the SAM 12B "Giant" ABM missile interceptor. This system would be a mobile ABM in violation of the 1972 treaty, and would fill in the nationwide defense. The SAM 12B would negate the United States's submarine-launched missiles force.

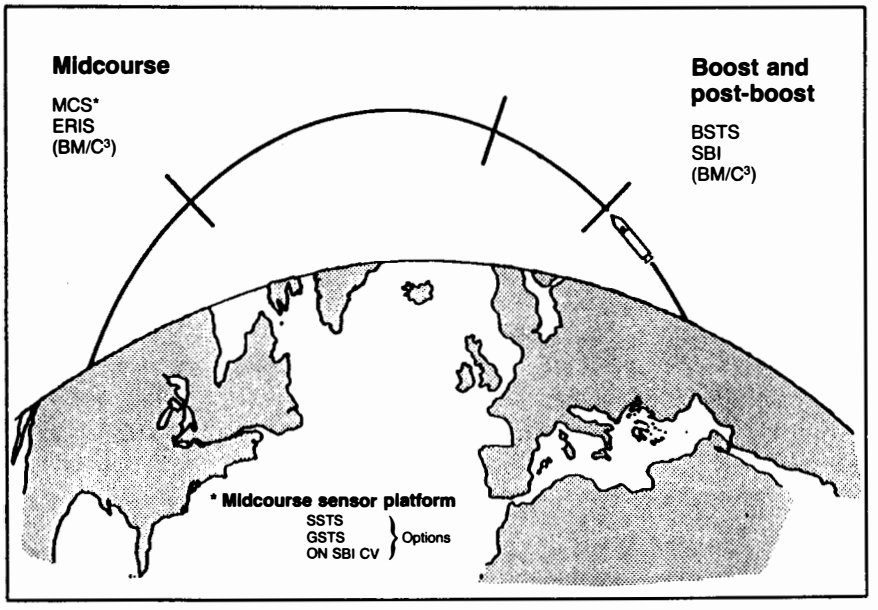
Gen. Edward L. Rowny (ret.), the special adviser and representative to the President for arms control, noted that, at present, the United States only has a research program. "We can only deploy viewgraphs," while the Soviets are deploying an actual ABM defense, Rowny told the participants.

The U.S. response

Dr. William R. Graham, Jr., science adviser to the President, was the most up-front of all the speakers about the desirability of accepting the Nunn compromise. Playing a spoiler role all too familiar to critics of his disastrous misleadership of NASA, Graham openly expressed his willingness to sacrifice portions of the existing SDI program in order to do this, admitting that Nunn's ALPS proposal "could very well divert funds from the [SDI] Phase One program and research." He attempted to justify this by referencing Soviet breakout potential and asserting that it would be better for the United States to have an inadequate system in place than nothing at all.

Other defenders, such as Sen. Dan Quayle (R-Ind.), praised Nunn's proposal for offering a defense of missile

FIGURE 1
SDS phase I core concept



The six elements of Strategic Defense System (SDS) Phase I Core Concept are: ● Boost Surveillance and Tracking System (BSTS) ● Space-based Interceptor (SBI) ● Space-based Surveillance and Tracking System (SSTS) ● Ground-based Surveillance and Tracking System (GSTS) ● Exoatmospheric Reentry Vehicle Interceptor Subsystem (ERIS) and High Endoatmospheric Defense Interceptor (HEDI) ● Battle Management/ Command and Control, and Communications (BM/C3)

fields and national command facilities which, since the proposal limited the deployment to only 100 ERIS missiles, ALPS would be in accord with the narrow interpretation of the ABM treaty; he was in a minority at the conference. This minority attempted to sell ALPS by making the false claim that the first phase of SDI will be neither survivable nor cost-effective.

As many speakers pointed out in rebuttal, SDI had been handicapped by having to meet ridiculous criteria of survivability posed by groups such as the Union of Concerned Scientists, whose real aim is to sabotage SDI rather than assure its survivability. Dr. Robert Jastrow, a leading SDI proponent, detailed how the Nunn ALPS could not even accomplish its purported purpose. A single-site ABM would be incapable of even defending against a single depressed-trajectory submarine-launched ballistic missile. Dr. Albert Carnesale of Harvard University emphasized that we need ABM production lines, not political compromises, to meet the Soviet threat.

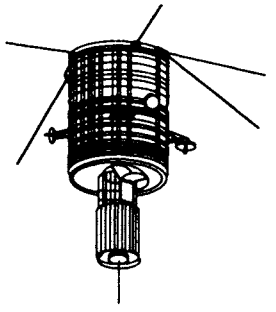
But one senior strategic consultant, who is also a leading defense scientist, likened the conference policy debate to the actions of circling goldfish who suddenly find themselves thrown from their accustomed bowl into the shark-filled waters of the ocean. He emphasized that the Soviets can deploy space-based missile defenses before we can. As SDIO Director Lt. Gen. James A. Abrahamson detailed in his address to the conference, Congress has emasculated the U.S. program to develop a heavy-lift rocket needed for placing large satellites in space orbit. General Abrahamson noted that this was done supposedly to prevent and retard U.S. deployment of a space-based SDI, but it has critically undermined existing U.S. space surveillance and general defense capabilities.

General Abrahamson referred to the recently published Pentagon study on the Soviet space challenge. This report details that the U.S.S.R. is very close to achieving complete superiority in this essential theater. By 1990, the Soviets will have an order-of-magnitude greater capability than the United States to lift systems into Earth orbit.

In this context, one senior strategic consultant asked what the West can do, if the Soviets deploy elements of a space-based ABM over the next several years. The Soviet Union could simply announce that it would shoot down any "weapons over the Soviet Union" the United States attempted to deploy. A Soviet space-based missile defense would most easily achieve the capability to make good on this threat, even at the earliest stages of deployment. This threat of a Soviet SDI monopoly is further enhanced by the advanced stage of their ground-based laser program. Speakers at the conference detailed how existing Soviet ground-based lasers have the ability to destroy or jam many components of existing U.S. satellites.

This senior consultant concluded that the West is being led down the primrose path of arms control with the INF treaty, while the Soviets are rapidly reaching the point where they can achieve unquestioned military superiority within a few short years.

FIGURE 2
Phase I—BSTS element



Key requirements

Size: approx. 36 × 16 ft.

Bands: multispectral

Sensor: Scanning or staring

Power: 6-10 kW

Total spacecraft weight: 5,000-7,000 kg

Functions

- Surveillance: continuous global observation of the Earth's surface
- Detection: ICBMs, IRBMs, SLBMs
- Acquisition: initiate tracking of missiles
- Tracking: compute state vectors and predict future positions
- Typing: determine the missile type
- Kill assessment: provide data to weapons to assist in determination of a hit or kill
- Communications: transmit required data to all users
- Battle management: as determined by the SDI architecture

The Boost Surveillance Tracking System (BSTS) would provide the capability to detect and track attacking intercontinental and submarine-launched ballistic missiles during their boost phase or powered flight portion of their launches. If the attacking missile can be destroyed in its early boost phase, which is the shortest phase of a missile's flight, the number of warheads destroyed per hit would be greatly increased. (The reentry vehicles and decoys are released during the next phase, the post-boost phase.)

Once the BSTS senses a launch and tracks the attacking missiles, the information would be relayed to the Battle Management/Command, Control and Communications (BM/C3) system and other elements of the Strategic Defense System. The BM/C3 would then communicate target assignments to weapon elements such as the Space-Based Interceptor to destroy the incoming missiles.

Technical overview

The failure of the U.S. SDI program to meet the specifications originally called for by Lyndon H. LaRouche in 1981, when he initiated the effort to get the United States to adopt an SDI program, has critically undermined the U.S. capability to realize advanced, directed energy anti-missile weapons, such as lasers and relativistic particle beams. Dr. Edward Teller of Lawrence Livermore National Laboratory pretty well reflected the current state of affairs, when he claimed that the recently signed Intermediate-range Nuclear Forces treaty with the Soviet Union was a "victory" for the SDI! Teller went on to endorse the kinetic energy weapon (KEW) type of anti-missile defense system, stating that the development of the more advanced directed energy systems could be put off into the future.

Dr. Gerold Yonas, currently president of Titan Technologies and former chief scientist and assistant director at the SDIO, pointed out the dangers that would arise from putting too much emphasis on KEW systems. First, Dr. Yonas, who was a member of the Fletcher panel that was set up to study President Reagan's SDI proposal in 1983, noted that the Fletcher panel had called for a $25 billion investment in SDI research and development over a five-year period starting in 1984; because of congressional budget cuts, less than $16 billion will have been spent by the end of 1989. Thus, according to Dr. Yonas, it is no surprise that the SDI is two years behind schedule.

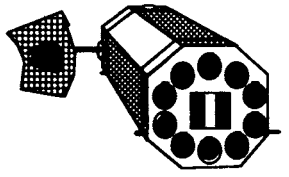
Furthermore, Dr. Yonas emphasized, the fact that kinetic energy weapons have been made to work quite effectively against the present and near-term generations of Soviet missiles, is no surprise either. "We had a large technical base developed over 15 years previous to the SDI to work from," noted Dr. Yonas.

The question is not whether KEWs are effective—they are—but that, given the imposition of small budgets by the Congress, the SDIO has not made and will not make the investments needed to ensure the United States the technical base to realize the next generation of strategic weapons—directed energy weapons—according to Dr. Yonas. As the deployment of resources now stand we will be giving the future to the Soviets by default.

'Brilliant pebbles' and 'smart rocks'

Throughout the three-day conference, many presentations were given detailing the progress that has been made in developing the required technology for KEW anti-missile systems as a Phase One missile defense. Development of a six-element Phase One missile defense system proposal has now been approved by the Defense Acquisition Board (DAB). This Milestone One demonstration and validation review is prescribed by Pentagon policy for acquisition of all major programs. The DAB approval means that the SDI proposed Phase One defense system will now be assessed through a demonstration and validation phase which will evaluate the feasibility of elements of a potential strategic defense system through analysis, experimentation, and simulation. (See **Fig-**

FIGURE 3
Phase I—Space-based interceptor element



Key requirements
Carrier vehicle
- 3,000 kg

Interceptor
- Low cost/long life

Functions
- Intercept boosters, PBVs, RVs, self defense against direct ascent ASATs
- Carrier vehicles
  —Store and launch interceptors
  —Assess kill and report status
- Interceptor
  —Acquire, home on and destroy target

Tech maturity and hardware development supports feasibility

The Space Based Interceptor (SBI) would consist of a number of space vehicles (also referred to as Space-Based Kinetic Kill Vehicles or kinetic energy weapons—KEW,) that would house multiple rocket-propelled interceptors. These non-nuclear interceptors would be designed to destroy attacking missiles in the boost phase and re-entry vehicles (RVs) in the mid-course phase of their flight. The interceptors would destroy the respective targets by the force of their impact with them at extremely high speed.

Prior to intercept, boost surveillance systems would detect and track the ballistic missiles. This information would be relayed to the Battle Management/Command, Control and Communications (BM/C3) system, which would process it and communicate target assignments to interceptors such as the SBI. Once the SBI platform received the command to intercept the incoming missiles, it would launch interceptors to destroy the attacking missiles.

ures 1-5.)

Dr. Lowell Wood of Lawrence Livermore National Laboratory detailed how near-term developments in microcomputers and sensors, combined with the Western advantage in mass-production of advanced technologies, can be harnessed to achieve miniature space-based KEWs that are so small, so cheap, and so smart, that they could be proliferated in near-Earth orbit by the hundreds of thousands as totally independent systems and provide a robust defense against ballistic missiles.

Dr. Wood began by documenting how fragile and easy ballistic missiles are to detect in their boost phase. In fact, a well-thrown rock would be capable of critically disabling a ballistic missile in its boost phase, and several U.S. ICBMs have indeed been mortally damaged when workmen inadvertently dropped hammers and wrenches on them. The rocket engine plumes from missiles in boost phase make them brighter than all but the largest cities and, therefore, easy to detect.

Major advances in development of microcomputers was then reported by Dr. Wood. In fact, one program Dr. Wood initiated at Lawrence Livermore National Laboratory, the S-1 Project, has been developing the means for automated and simultaneous design of supercomputer hardware and software. Dr. Wood stated that we can now develop microchip computers, weighing less than 100 grams, which have a computing power equal to the largest supercomputers, such as the Cray, currently existing today. (One version of the Cray computer today has a computing power equal to all of the world's computers circa 1970.)

The same technology can also be harnessed for realizing advanced microchip-based sensor systems, also weighing less than 100 grams, according to Dr. Wood. At a collision velocity of 10 kilometers per second (more than 20,000 miles per hour), this mass alone has many times the wallop needed to kill missile boosters.

Dr. Wood then pointed out that the mass-production of advanced technologies gives the West a major advantage over the Soviets. Our "pubescent pre-adolescents" have minicomputers much more powerful than those available to most scientists in the Third and even Second World. Many of these Second and Third World scientists would be quite happy to join with one of our pre-adolescents and use their computers as the central tool for various research projects.

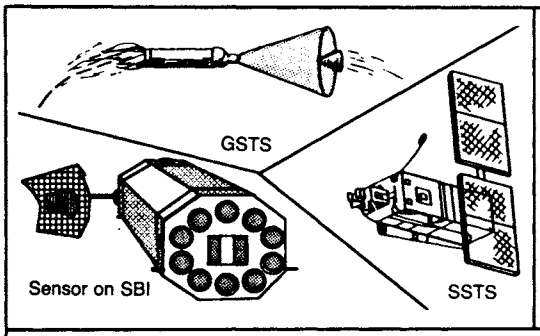
In an ironic swipe at the heavy deployment of U.S. high-technology into consumer toys, he remarked that many teenagers have video camera set-ups which produce higher-quality, higher-resolution pictures than most of the sensors utilized by our military.

Dr. Wood went on to point out that this Western advantage of mass-production of advanced technologies has turned the tables on Soviet aggression in Afghanistan and Angola. In 1986, the Stinger hand-held anti-aircraft missiles were given by the United States to the rebels in Afghanistan. According to Wood, this has totally transformed the military situation there—cleared the skies of Soviet aircraft and helicopters—to the point that the Soviets are clammering to leave as quickly as possible. In Angola, he asserted, the Cuban mercenaries are similarly trying to get out as soon as possible.

Given the near-term progress in microchip technology, the existing industrial base for manufacturing advanced technologies, and the fact that mass-manufacturing of such tech-

FIGURE 4

Phase I—Midcourse surveillance element



Key parameters

- Aperture: <1.5 meters
- Sensor: Scanning
- No. of detectors: 100s to 1,000s
- Bands: Multispectral

Functions

- Acquire and track cold (non thrusting) PBVs, RVs, Decoys, ASATs
- Track data provided via BM/C³ to SBI and ERIS
- Discriminate decoys
- Bulk filter debris and keep track of all threatening objects in field of view

The Space-Based Surveillance and Tracking System (SSTS) would be capable of detecting and tracking ballistic missile buses and warheads in the post-boost and midcourse phases of missile flight. The system would use a series of satellites to track the missiles and to discriminate between reentry vehicles, decoys, and space debris.

This tracking information would be relayed to the Battle Management/Command, Control and Communications (BM/C3) system and other elements of the Strategic Defense System. The BM/C3 system would then communicate target assignments to weapon elements such as the Space-Based Interceptor (SBI) and/or the Exoatmospheric Reentry-Vehicle Interceptor subsystem (ERIS) to destroy the incoming warheads.

The Ground-Based Surveillance and Tracking System (GSTS), also referred to as the Long Wavelength Infrared (LWIR) Probe, has four basic functions: search, acquisition, acking, and discrimination. Launched into space upon warning, the GSTS, which represents state-of-the-art exoatmospheric LWIR sensor design, would track an incoming missile's warheads in the missile's midcourse and early terminal trajectory phases. It would also discriminate between reentry vehicles, penetration aids, and debris in space. This information would be relayed to the BM/C3 system, which would process it and communicate target assignments to interceptors. The interceptors would then destroy the attacking warheads.

nologies makes them extremely cheap, Dr. Wood forecast that the United States could, within a few years, develop a mini space-based interceptor, weighing less than five pounds and costing less than $50,000 each. These mini SBIs, which Dr. Wood termed brilliant pebbles, could be placed in near-Earth orbit. Since each of them would have a 100-gram supercomputer aboard, they would be able to function totally independently; that is, each "brilliant pebble" would be able to make the decision when to strike and what to strike most efficiently as part of the overall missile defense.

Placing 100,000 of these in orbit, according to Dr. Wood, makes a very robust missile defense. The proliferation of 100,000 independent defense systems would ensure that a sufficient number of them could survive any currently projected countermeasures to kill all ballistic missiles launched anywhere on Earth.

Dr. Wood projected that the total cost for deploying this near-term defense would be less than $30 billion. Furthermore, since the technology would be based on commercially available systems—which would continuously be upgraded—the U.S. would be able to make available the same technology to the Soviet Union.

When asked by *EIR* whether he thought that these brilliant pebbles precluded the necessity for developing directed energy lasers and particle beams, Dr. Wood replied that they didn't, and that the effort to develop directed energy is essential to the future national security of the United States.

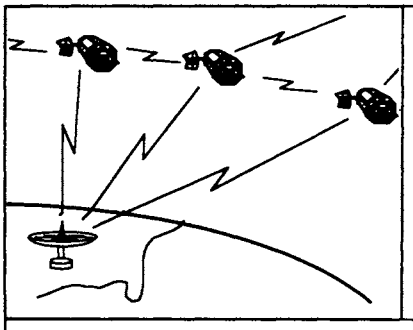
The exhibits at the conference gave stark testimony to Dr. Wood's projection for the near-term development of small, integrated systems. As recently as 1984, ABM interceptors weighed hundreds of pounds. Existing mock-ups have been scaled down to scores of pounds and are shorter than the height of an average person. The models for the five-pound SBI can be easily held in one's hand. And some of this technology is already being deployed. As Dr. Teller described in his presentation, the Israelis have developed a ground-based interceptor capable of interdicting short- and intermediate-range missiles, such as the Soviet SS-21.

The conference's industrial displays also demonstrated the superiority of Western production capabilities. For example, the Soviets had developed the designs for the radio frequency quadrapole particle accelerators currently utilized in a neutral particle beam SDI project. But the Soviets were unable to perform the high-tolerance machining needed to make the metal accelerator quadrapoles. Similar advantages were shown in the case of large-scale optics, as seen in LAMP mirror program.

Many of the advanced technologies already realized by the SDI could revolutionize Western economies, if they are proliferated throughout industry. The cheap minicomputer control and sensing systems described by Dr. Lowell Wood could be readily and economically applied to virtually every production process.

But these potential applications are not limited to the intensive variety; they are also of the extensive variety. Very advanced control and location systems have been developed

FIGURE 5
BM/C³ systems description



Key requirements

- **Architecture**
  - Minimum coordination
  - Rigorous + complete design
- **BM/C³ system properties**
  - reliable
  - durable/survivable
  - evolvable
  - testable
  - robust
  - secure
- **Technology requirements**
  - high performance processors
  - validated algorithms
  - jam resistant, secure communications
  - trusted software

Functions

Command and control	Battle management	Communications
• Maintain positive control	• Establish and maintain tracks	• Manage communications network
• Assess situation	• Assign weapons to target	• Operate communication links
• Manage engagement		

The Battle Management/Command, Control, Communications (BM/C3) system would have the responsibility to monitor and control the activities of all elements of a Strategic Defense System. Information from surveillance satellites, sensors and radars would be relayed to the battle managers. The information would then be processed, and target assignments communicated to space- and ground-based weapons. This complex communication system must be able to rapidly assess data concerning a ballistic missile attack and provide timely, reliable information to the command structure in a hostile environment. Once a defense response has been determined, the BM/C3 system must carry out the response, assess its effectiveness, and revise the response if necessary. The BM/C3 would have to be able to withstand enemy jamming and nuclear radiation.

for the relaying of laser beams to and from space-based mirrors. This same technology can be immediately applied to deploying laser radars and laser communication systems. Space-based laser radars (Lidars) will be capable of detecting single molecules and locate those molecules with a precision measured in microseconds and micrometers. This capability alone will revolutionize geology and man's ability to locate resources.

With regard to communication and high-volume information transfer, the possibilities are astounding. Today, communication is carried out via material wires, including optical fibers, and via radio waves broadcast through the air. Material media limit the volume and location of communication. Radio and microwave transmitters are volume-limited, because their signals are broadcast in every direction. It therefore follows that the number of channels that can be utilized simultaneously is quite limited. (They interfere with each other.) But in the case of directed laser beams, only the receiver that it is pointed at, can hear the broadcast. Also, because of the higher frequency and greater coherence of laser light waves, a laser pulse can contain a far greater amount of information than a radio pulse. For example, it is theoretically possible to contain the entire contents of the Library of Congress within a short laser pulse communication that would otherwise take years to transmit via radio waves.

Directed energy

Many reports were made to conference participants on major progress in development of directed energy systems, such as lasers and particle beams. Studies were also presented which showed that even the most primitive directed energy systems would dramatically improve the overall capabilities and robustness of any SDI missile defense system, even at the earliest stages of deployment. At the same time, congressionally mandated budget cuts are threatening to virtually gut this entire element of the SDIO effort.

The neutral particle beam Integrated Space Experiment (ISE) has been indefinitely postponed, literally putting this program in the deep freeze at the same time that the actual technology and science for neutral particle beams has been leaping forward at rates far beyond even the most optimistic projections of just a few years ago. In fact recent lethality tests have demonstrated that just a few dozen neutral particle beam accelerators deployed into space orbit could provide an extremely robust missile defense.

Dr. Gregory H. Canavan, assistant leader for the physics division of Los Alamos National Laboratory, presented the results of recent detailed studies of the capabilities of various directed energy systems. As was noted in other conference presentations, actual field tests of possible countermeasures to missile defense, and target acquisition, discrimination, and tracking, have shown that these areas have been previously, greatly overrated as difficulties facing SDI. In this context, relativistic directed energy weapons—that is, weapons that deliver their punch at the speed of light over great distances—have firepower and other potential capabilities much greater than previously thought.

Much to his own surprise, Dr. Canavan found that even the most primitive types of lasers, long-wavelength, space-based chemical lasers, would have a dramatic impact on

missile defense at even the lowest levels of deployed firepower. In particular, directed energy weapons (DEW) can be utilized in multiple roles in a missile defense system. Operating at low powers, DEWs can be utilized for active target acquisition, discrimination, and "painting" of targets for interception by other defense systems. DEWs could be utilized within all phases of the offensive missiles' trajectories and therefore enhance the performance of every layer of the missile defense.

But it is in terms of the scaling that directed energy shows its true superiority. Detailed studies have shown that while KEW systems must scale linearly with the increase of the number of offensive missiles and can be overwhelmed by increasing the density, in time and space, of the missile launch, directed energy systems are relatively insensitive. That is, the number of space-based lasers needed to defend against an increased number of missiles would be roughly proportional to the square root of the number of new missiles deployed and insensitive to whether they are all deployed at the same location for a high-density launch.

The Los Alamos neutral particle beam

A second surprise derived from these studies was the actual status of of the neutral particle beam accelerator.

To attack a rocket in its boost phase or a warhead in its midcourse flight through space requires the ability to deliver lethal energies over long distances. Most missile defense systems rely on delivering these lethal energies to the surface of the target, whether that energy be in the form of a collision, such as is the case with KEW, or with a laser pulse. High-energy, relativistic beams of particles, on the other hand, deliver their energy punch to the interior of the target. That is, a beam of neutral hydrogen atoms moving at near the speed of light can penetrate many inches through the toughest metals and deliver most of their energy to the interior of a target.

Actual lethality tests have shown that such particle beam interactions destroy the electronics—even hardened electronics—of nuclear weapons and their re-entry vehicle subsystems with very low levels of delivered energy. In fact, particle beam kills can be achieved at energy levels many orders of magnitude less than that required for weapons acting on the surface of the target.

In summary

It is obvious that the predominantly optimistic tone of the conference about the technological success of the program in easily solving what appeared to be serious problems five years ago, is well justified. Despite the inherent superiority of directed energy weapons, the "brilliant pebbles" described by Dr. Wood, are a capability that certainly should be deployed as rapidly as possible. Here, as elsewhere in the program, the five-year timetable for development is budget-rather than technology-constrained, and could no doubt be compressed with any serious commitment to the program by Congress.

But we are also left with ironic confirmation that the same scientific and technological capabilities which were directed to perfecting this new generation of kinetic energy weapons would have been put to better use, had the directed energy program been prioritized instead.

Throughout the conference, speakers referenced the ability—or claimed inability—to meet the "Nitze criterion," set by defense specialist Paul Nitze, for "cost-effectiveness in the margin." That such a criterion could be taken seriously, underscores the same flawed mentality which allowed the shift of SDI away from rapid development of the most advanced capabilities, in favor of the apparently easier and more cost-effective solution. "Cost-effectiveness in the margin" refers to whether it is more expensive for the enemy to increase his offensive capability than it is for us to increase our defenses. Thus, the decision to deploy an ABM system is determined by whether each additional intercontinental or submarine-launched ballistic missile is more expensive to deploy than its counterpart ABM component. This is the approach of systems analysts, rather than that of a general staff intent on developing the capabilities needed to win any foreseeable war.

In war, the aim is to win. War is an expensive business, but the stakes are very high as the loser soon finds out. He may have amassed systems which were extremely cost-efficient, only to find that his "spendthrift" opponent was not involved in a competition over who had the cheapest and biggest weapon in his arsenal, but in deciding what configuration might be needed for delivering a knockout blow, or waging a devastating flanking operation.

In one sense, however, we agree with Lowell Wood. As LaRouche pointed out when he designed the policy which was to become the Strategic Defense Initiative, the United States has a capacity to rapidly absorb new technologies into its civilian economy, thereby achieving a surge in productivity. Soviet culture precludes this flexibility, so that the development of advanced technologies for military use becomes a tax on the economy. This problem is presently becoming manifest in the current unrest throughout the East bloc.

The present pace of military build-up is a severe burden to the Soviet economy. This may make them more, rather than less, likely to look for decisive military advantage in the near term. Any perceived weaknesses in the West should make the Soviets extremely dangerous. But in the medium term, it means that we can sustain a far more rapid pace of military build-up than they. This means that despite their presently commanding lead in many areas of SDI and space research, we are in an excellent position to leap ahead, providing that the will to do so exists.