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SDI'S TRILLION DOLLAR DIVIDEND

INTRODUCTION

For the future, the promise of the Strategic Defense Initiative (SDI) is that the United States will be protected from nuclear holocaust. For now, SDI already is paying big dividends in research and technology advances. On the near horizon are spinoffs for the space program, civilian industry, and medicine. These include gains in sensors and radars, new ceramics and metal alloys, computer chips with increased capacities, and lasers of increased power and accuracy. Business Communications Company, a market research firm, estimates that the commercial marketing of SDI spinoffs by the private sector of the economy will total between $5 trillion and $20 trillion.[1]

Expectations of bountiful SDI dividends are realistic if the U.S. space program is a precedent. On May 25, 1961, President John Kennedy committed the nation to "achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to Earth." The Apollo Program cost over $5 billion dollars per year for the following decade. This intensive research and development project, which culminated in Neil Armstrong's "giant leap for mankind" on July 20, 1969, has produced 60,000 "spinoff" technologies for the civilian economy. According to the National Aeronautics and Space Administration (NASA), the estimated value of these technological breakthroughs is $600 million-$700 million per year.[2]

Space Propulsion and Medicine. Military programs will realize the most benefit from SDI research. Specific spinoffs may include improved radars and sensors and use of the

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This is the 49th in a series of Heritage studies on strategic defense. Previous papers included *Backgrounder* No. 628, "The Strategic Defense Initiative: A Shield, Not a Sword" (January 21, 1988) and *Backgrounder* No. 623, "A Timetable for Deploying Strategic Defense" (December 14, 1987).

1 *The New York Times Magazine*, August 24, 1986, p. 22.

2 Personal communication, NASA Technology Utilization Division, February 1988.

electromagnetic rail gun against enemy tanks. The civilian space program will be enriched by SDI advances in propulsion and sensing devices.

Important nongovernment applications of SDI research will be in medicine, where SDI research advances will be turned into practical products for the treatment and curing of eye and bone diseases, and in the advancement and modernization of American industry through the introduction of high-precision cutting machines and laser tools.

Though the primary purpose of SDI is and must remain the protection of the U.S. and its allies from Soviet ballistic missiles, SDI's technological breakthroughs also can be exploited thoroughly by other branches of the U.S. military and by civilian industry. The Strategic Defense Initiative Organization (known as SDIO), which oversees the entire project, should devise ways to spread the emerging technology as widely as possible while maintaining tight security control over highly sensitive discoveries.

Public's Right to Know. In 1986 the SDIO established the Office of Technology Applications to develop and direct a program to make SDI technology available to other branches of the military and federal agencies as well as private American businesses and researchers. Congress has passed several laws mandating SDI's technology transfer and the SDIO Office of Technology Applications has developed a system to make information on SDI advances available.

Private industry must be able to take advantage of the ever increasing pool of scientific data available through SDI. Congress should relent on its refusal to allow the SDIO to establish a public liaison office. The general public deserves to be educated about the benefits of SDI research and has a right to know that the tax money spent on SDI already is yielding dividends. And the Administration should use the "spinoff argument" more vigorously in the general debate over SDI funding. The strength of this argument is potentially enormous, especially against the unsubstantiated argument that SDI will cost the taxpayer too much.

RESEARCHING SDI TECHNOLOGY

SDI conducts research into a number of different technologies. Some, such as lasers and particle beams, show great promise as weapons against ballistic missiles but may require ten to fifteen years of research and development before deployment. SDI research indicates that other technologies will be available in the next five years to construct and deploy an effective SDI system at a reasonable cost.[3] The mainstays of such a near-term system would be kinetic-kill weapons (KKW), space and ground-launched rockets that destroy warheads and missiles by crashing into them.

Transferable Research. The SDI research office also is making a major effort to develop new types of sensors for detecting, tracking, and monitoring enemy intercontinental ballistic

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3 Grant Loebs, "Strategic Defense: How Much Will It Really Cost?" Heritage Foundation *Backgrounder* No. 607, October 2, 1987.

missiles (ICBMs). These tasks of SDIO's Surveillance, Acquisition, Tracking and Kill Assessment program (SATKA) are among the most crucial and delicate in the SDI system because of the high complexity of sensor systems and the high degree of accuracy needed to guide KKVs to their targets.

SDI's research efforts have been widespread and ground-breaking. Progress in miniaturization of electronic components, advanced propulsion techniques, surveillance and tracking systems, superconductor capacity, advanced data and image processing, as well as development of new production techniques and materials lead the list of SDI research successes. Many of the major breakthroughs achieved in SDI research are transferable to other applications, both military and civilian.

MILITARY APPLICATIONS OF SDI TECHNOLOGIES

Because SDI is a military project under the control of the Pentagon, the bulk of the early technical breakthroughs will be carried over into other military programs. The three military services are eager to take advantage of the wealth of new scientific data and practical technological developments generated through SDI research, and SDI-generated technology is already being put into use in weapons design by all of them.

The Air Force

Air Force air defense systems will be able to utilize several major SDI components. The North American Air Defense Command (NORAD) surveillance mission against enemy air attack would benefit directly from SDI's space-based optical and infrared sensors, which could detect and target enemy aircraft accurately as they penetrated U.S. air space. Ground-based anti-aircraft radar systems would benefit from the improved aerial surveillance capabilities provided by such advanced SDI technology as laser radars and new larger phased-array radars. SDI could provide ground-based sensors and kinetic energy weapons capable of tracking, targeting, and destroying encroaching Soviet bombers and cruise missiles.

Specific benefits of SDI-generated technology to Air Force systems would include:

♦♦ Improving the capability of NORAD to track enemy bombers approaching North America, using SDI radar technologies to improve the accuracy and coverage of NORAD radar systems.

♦♦ Increasing the efficiency of the Air Force and the Air National Guard in intercepting enemy aircraft by applying SDI infrared and optical sensor technology to increase the accuracy of air defense missiles.

♦♦ Using SDI guidance and targeting technology to improve the accuracy of U.S. air-to-air and ground-to-air missiles by increasing the precision of infrared sensors on the interceptor missiles.

◆◆ Applying SDI surveillance and tracking technology, such as space-based radars, to improve the Air Force's ability to monitor, track, and intercept Soviet missiles, aircraft, cruise missiles, and ground activities at Soviet air and missile bases.

The Navy

The Navy will benefit immensely from SDI technology. The Soviet threat to the U.S. Navy is growing from the increasing numbers of sophisticated Soviet ships at sea and the increased pressure the Soviets are putting on strategic and commercial waterways. To protect itself, the Navy currently utilizes a multi-tiered defense system much like that envisioned for SDI. The tiers consist of defenses appropriate to various distances, which increase in intensity as the threat gets closer to the naval asset being defended. This system depends greatly upon surveillance, communications, and accurately guided interception of hostile missiles and aircraft. Much SDI technology therefore is almost directly transferable to this naval defense mission.

Spinoffs from advances in communications, computer systems, and computer software now under development by SDIO will increase the Navy's fleet defense by tying the various ship-board and airborne components into a more closely knit system able to operate at high speed. SDI sensing systems, meanwhile, can improve undersea surveillance and sonar scanning of enemy submarines. Torpedoes and guided anti-torpedo weapons, as well as anti-mine torpedoes, and naval anti-missile defense systems will be made more accurate by SDI-improved guidance and sensor technology, including laser radars, a carbon dioxide laser capable of scanning objects as a radar does.

The Army

Most important to the Army are the potential SDI spinoffs applicable to conventional weapon modernization and anti-armor warfare. SDI's electromagnetic rail gun, for example, shows exceptional promise as an anti-armor gun. Army weapons experts agree that the next generation of Soviet tanks will be very hard to stop with currently available anti-armor weapons. The problem is to find a relatively lightweight weapon capable of penetrating increasingly more formidable Soviet armor on tanks and personnel carriers. The electromagnetic rail gun, under development by SDIO, propels bullets at extremely high speeds by using immensely powerful electromagnetic pulses. It may be the Army's anti-armor answer. The speed of projectiles propelled by rail guns is far greater than can be achieved using traditional rockets and shells, thus increasing their ability to break through Soviet armor.

Other technological benefits to the Army from SDI research include:

◆◆ Advances in high-speed computers and computer chips will enhance the capability of tanks to engage more than one target at a time. Typical targets include enemy tanks, trucks, and other vehicles. Advances in computer- controlled systems which enable tanks to fire shots in rapid succession, will enhance the accuracy and speed of armor operations by enabling tanks to shoot at more targets within a shorter period of time.

◆◆ The Short-Range Anti-Tank Weapon (SRAW), the Ground Launched Hellfire (GLH) missile system, and advanced mine detectors, all initially researched by SDIO, could enhance the Army's battlefield capability against armored forces and mechanized infantry.

◆◆ Satellite modernization and radars will improve the Army's satellite communications and the coordination of troop movements on the battlefield by providing accurate information more quickly to commanders in the field.

CIVILIAN APPLICATIONS OF SDI TECHNOLOGIES

Space Program

The civilian space program will be the most significant nonmilitary beneficiary of SDI technology. Because so much of SDI's mission focuses on space-based elements such as satellites, space-based sensors and radars, and space-based anti-ballistic missile systems, SDI scientists and program directors work very closely with the National Aeronautics and Space Administration. Relevant technology is thus spun off very rapidly. SDIO and NASA are working together on a big rocket (heavy-launch-vehicle) capable of carrying into space payloads in the range of 120 thousand to 150 thousand pounds. This big rocket's huge payload is essential to the launching and assembling of the heaviest space-borne elements of SDI, such as laser guns and particle beam accelerators, as well as to the construction of NASA's space station.

In addition to the big rocket, NASA will benefit directly from SDI research into lightweight structural materials such as very strong, metal alloy materials similar to particle board, which can take the place of heavier structural steel, aluminum, and graphite. Other dividends include durable lubricants, more efficient rocket propulsion systems, increased miniaturization of electronic circuits and computer circuits, and SDIO-developed superconductors of enhanced capacity.

High-Tech Industry

Through the SDIO Office of Technology Application, and under congressional and presidential mandate, new technology generated in SDI laboratories will be made available expeditiously to qualified U.S. companies and individual entrepreneurs. The SDIO Civil Applications program will disseminate information on SDI research data through a sophisticated computer data base (the SDI Technology Applications Information System or TAIS). This data base includes information about new and unique SDI-generated technologies and will be available to all qualified government, business, and academic clients who have been approved by the Department of Defense to receive advanced technology information.

According to Colonel James Ball, the Director of SDI's Technology Applications Office, new technical breakthroughs made by SDI scientists can be available for industrial use as soon as six months from the time they are made. This very rapid turnaround will contribute immensely to the value of the SDI civilian technology transfer program by allowing new discoveries to be put to use in the civilian economy very quickly.

Several SDI breakthroughs already have been earmarked for industrial use. Examples:

♦♦ Diamond Crystal Coating, a new method of efficiently utilizing industrial diamonds by depositing thin layers of diamond on cutting surfaces, will increase the precision of industrial saws. Industrial saws are used to cut a wide variety of patterns for consumer goods and industrial equipment.

♦♦ High-temperature carbon fiber ceramic materials for automobile and jet engine components may lead to higher performance, higher efficiency engines.

♦♦ The SPOCK supercomputer, a new computer technology that combines hardware, computer code, and semiconductor devices, may revolutionize artificial intelligence by speeding the processing time of computers.

♦♦ Lighter, smaller, more capable and energy efficient electrical components being developed by SDI will improve electrical engines, computer circuits, and electrical power supply systems.

♦♦ Numerous technologies derived from SDI research will be available to the consumer to improve "The Kitchen of the 21st Century." Possible advances include laser ovens and cooler, more efficient refrigerators and freezers.

Medicine

Perhaps the most promising nonmilitary applications of SDI technology are in medicine. The largest and most impressive medical program under SDI is the Medical Free Electron Laser Program (MFEL), which is being conducted at five regional SDI laboratories. This Advanced Free Electron Laser, about 1,000 to 10,000 times stronger than the next most powerful laser, has proved in laboratory tests to be able to vaporize diseased tissue with pinpoint accuracy, leaving the surrounding healthy tissue unharmed. The applications of such a laser are numerous. The precision surgery made possible by MFELs will be used in cancer surgery, eye surgery, bone surgery, and numerous other medical procedures that currently are either impossible or very dangerous for the patient.

Other significant medical applications of SDI technology include:

♦♦ Bioglass, a material developed under SDI to replace human bone without its being rejected by the body, could greatly reduce the danger of bone-graft operations.

♦♦ A new, safer, and less complex method of producing radioisotopes used to diagnose brain and heart diseases early and without risk has been developed by SDI researchers.

♦♦ A method of cleansing the blood in blood-bank supplies of such viruses as herpes, measles, and HIV — the AIDS virus — has been discovered in SDI labs.

The potential benefits of SDI to private industry are enormous and should be fully exploited. To further enhance the spread of SDI technology throughout the U.S. economy, Congress should allow SDIO to educate the public about the progress of SDI research. In arguing its case for SDI, the Administration should use the spinoff argument.

CONCLUSION

The Strategic Defense Initiative may offer the U.S. a means of ending the nuclear arms race by eliminating the threat of a successful Soviet first strike. SDI thus deserves support on its merits, as a way to safeguard the U.S. and the Free World from Soviet nuclear blackmail and attack. As SDI scientists pursue this goal, however, their intense and concentrated research also is yielding scientific breakthroughs of enormous value to U.S. conventional military programs and to U.S. industry and medicine. These benefits should be made known to the American public, to help SDI get the enthusiastic public support it deserves.

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