How anti-missile systems can be a 'science driver' for U.S. economy

by Marsha Freeman, Science & Technology Editor

It is being increasingly recognized that the United States has no choice but to embark on a crash directed energy beam ballistic missile defense system to ensure its security into the next century. Still to be understood, however, is that the military impact of the development of beam weapons will be overshadowed by the economic and civilian impact of such a program.

A program to develop deployable beam-weapon systems within a decade will require a mobilization of scientific, engineering, and technical manpower not seen since the heyday of NASA's Apollo effort to land men on the Moon. But the adequate economic and industrial infrastructure to implement such a program may soon be destroyed if drastic measures are not immediately taken to reverse the depression gripping the nation's economy.

Political economist Lyndon LaRouche, in his March 1982 white paper on the role of beam weapons in national defense policy stressed this connection:

> The first line of development in in-depth defense potential of the United States is directing of hundreds of billions of dollars of low-cost medium- to long-term credit for rapid technological progress of U.S. agriculture and other goods-producing and transportation industry, in an increasingly energy-intensive and capital-intensive mode.
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> This must define a shift in the composition of the employment of the nation's labor force, toward a goal of 50 percent of the labor force employed in a high-technology goods production and transportation for agriculture and industry. . . .
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> The matriculation of qualified scientists and engineers must reach ratios per member of the total labor force comparable to those of the Soviet Union today. Federal funding of research and development in areas relevant to hard and biological technology must not only be restored but greatly expanded over recent levels, combined with generous tax-incentives for private research and development in such categories.

Such a set of policies provides the only realistic context for the development of beam weapons. The current depression-collapse of U.S. industry threatens America's national security. But a scientifically oriented set of programs for beam weapons development and the colonization of space can provide a "driver" for the training of highly skilled manpower, investment in new, more productive industries, and the rebuilding of basic industrial infrastructure which would lead the nation back onto the path of economic growth, and, through transfers of technology to the developing nations, eliminate the causes of war.

The development of beam weaons, along with a new mission orientation for the civilian space program, will transform the U.S. economy in the same way the NASA programs changed the civilian economy from 1965 to 1975, a process described below. Even in purely economic terms, the answer to the question, "Can we afford to develop beam weapons?" is: "We cannot afford not to."

Development of beam weapons for the military requires the brute-force solution of problems in plasma physics and related sciences.

The solution to the problems of laser beam production, transmission, pointing, and pulsing needed for defensive beam weapons will accelerate the use of lasers to produce commercial fusion energy.

Harnessing thermonuclear fusion energy, which heats a plasma (charged gas) of hydrogen to millions of degrees, will bring an end to the media-created age of "limited resources." The process of fusing light hydrogen nuclei releases vast amounts of energy, the energy needed to produce electric power, process raw materials, desalinate water for agriculture, and create new materials and manufacturing processes.

Fusion fuel, which comes primarily from seawater, is virtually unlimited. The availability of cheap and abundant energy technologies and fuel to all nations of the globe, particularly the energy-starved developing sector, will spur global industrialization and development, eliminating, along with the poverty and misery of much of the Third World, the major impetus toward war.

A crash beam-weapons program will rejuvenate the nation's secondary and higher education systems, which have been experiencing a catastrophic collapse of standards and performance, by inspiring young people to study science and engineering. This educational renaissance is sorely needed. A study done by the Fusion Energy Foundation estimated that an additional 20,000 engineers are needed annually in this decade to begin to develop the beam weapon and its related plasma technologies, and that this force will have to be supplemented by a quadrupling of the number of nuclear, plasma, and high-temperature physicists graduating over the next decade. A major upgrading of science education at all levels would be a prerequisite for the training of this level of scientific manpower.

Aside from the direct impact of beam weapon development in the closely related fusion area, and in the overall upgrading of scientific capabilities through new manpower, this program will have indirect spinoffs in all existing industries and will create new ones.

Laser technologies, which are already used in medicine, and the metal-working, textile, construction, and communications industries, will benefit. The ability to produce high-power, high-quality laser energy with reliable and compact machines will vastly expand the industrial applications of lasers.

Charged particle beams, which will be used in later-generation beam systems, have been used experimentally in cancer treatment. Further development of particle-beam systems can serve as a "driver" in producing fusion power.

The engineering of high-powered magnet systems will be an important development task for beam-weapons research, since these systems are an important way of confining and controlling particle beams. Magnet systems are also used to confine plasmas in fusion production and have important applications in industry. The development of magnetically levitated trains for transportation, the perfection of the use of magnets to separate polluting materials from our water, and many other 21st-century technologies, will depend upon the commercialization of high-powered superconducting magnets.

Beam-weapon developers will have to master the technique of delivering high-intensity pulses of electric power to the system. Researchers in the technologies of laser, or inertial fusion face the same problem. Up until now nearly all of the work done on pulsed-power technology has been in the fusion program.

Beam-weapons engineering requires the use of materials able to withstand very large, sudden pulses of energy. The perfection of such materials can be expected to have at least as great an impact as did the development of new and exotic materials in the space program. The nuclear industry, which requires materials that can withstand very high temperatures, would be a prime beneficiary.

The tracking and control technologies required for the successful operation of a beam weapon will have wide application in industry for the optical tracking of production processes, infrared monitoring of energy use and soil management, control of fast production processes, and totally automated manufacturing. The "robots" developed by NASA for the unmanned planetary probes stimulated robotics research and development on Earth. At the current time, in the United States, only NASA can take men into space, and this capability must be vastly expanded for an effective defensive beam-weapons system. NASA, in turn, will reap tremendous benefit from a crash beam-weapons development program.

The systems required for the launch, deployment, and use of beam weapons in space can also be used for space stations, in-orbit space vehicles, and support operations for settlements on the Moon. For over ten years NASA has had plans to build a space station to serve as an in-orbit laboratory and a launch pad to the Moon and other planets, but has not been given the go-ahead to begin construction. Now, an effort bolstered by research and development of beam weapons can help catch up on lost years, and once again put the United States in the lead of space exploration and development.

The economic impact of NASA

A look at the economics of the NASA era in the United States makes a convincing argument in favor of a beam-weapons-based "science driver" approach to lifting the economy out of the deepening depression. Conservative estimates indicate that the money returned to the economy (and the Federal Treasury directly) from the development of the multi-million dollar-per-year satellite communications industry alone, has more than paid for the government's investment in space programs.

In addition to this huge communications industry, which makes possible intercontinental telephone communications, global television and data transmission, and other services, the use of space for weather prediction and resource management has revolutionized the way the Earthbound environment and natural resources have been developed.

Hundreds of millions of dollars per year are saved in storm damage through the use of weather satellite information. A single global "snow inventory" each winter can save world agribusiness $50 million a year, by providing data which allows farmers to plan for flood control and irrigation based on expected snow melt in the spring.

The use of data gathered by remote-sensing satellites, such as NASA's Landsat system reduces the cost of exploration for new oil and mineral resources, provides inventories for farmers on snow cover in the winter, crop damage from disease and blight, and water management overall.

The accelerated transfer of this technology to the developing countries would enhance water-management capabilities, locate new resources, and, eventually, create the capacity for world-wide management of agriculture.

In the near future, products that cannot be manufactured on Earth at all, or that are so expensive when they are produced on Earth that they are not now available widely, will be manufactured in the near-zero gravity of space, a new industrial territory opened up by the NASA program. New medicines and organic materials difficult to produce on Earth will be available to treat and possibly cure diabetes, hemophilia and other life-threatening and chronic illnesses.

Space manufacturing will develop the new metal alloys needed for high-temperature processing using advanced nuclear and fusion energy sources. Larger and more perfect crystals for the electronics and other industries will be produced.

By themselves, these new industries created by exploiting the unique environment of space, "pay" for the NASA programs. But the indirect impact to the economy has been even greater, and more important. These are the so-called "spin-offs" from space exploration which have been developed by industry using technological breakthroughs funded by NASA.

New materials, such as refractory ceramics and new alloys which withstand the temperature extremes of space flight, are used in everything from nuclear power plants to everyday kitchen implements. Developments in electronics, including miniaturization and sophisticated automation techniques, have streamlined the functioning of industry and shortened the time (thereby increasing the productivity) of almost everything we do.

The machines that monitor all of the vital bodily functions of the astronauts who walked on the Moon, now monitor premature infants in incubators, and have provided heart monitors and miniaturized pacemakers for thousands of people.

The same qualitative impact, magnified many times, will result from the development of beam weapons combined with the recommitment of the civilian space program to establish a permanently manned station in space toward the goal of colonizing the Moon and other planets.

However, studies done by Chase Econometrics and confirmed by independent studies using the Fusion Energy Foundation's econometric model show that there is a much greater impact that the development of a qualitatively new technology has on an economy. This impact is, strictly speaking, not measurable by adding up all the new products and new techniques that a new technology introduces; it is the *increase in productivity* throughout the economy as the result of the combination of higher manpower skill levels and new scientific knowledge entering industrial production. One study of this induced productivity effect estimated that U.S. productivity increased 0.1 percent for every billion dollars spent on the space program. This change in productivity alone represented an additional $3 billion to the GNP every year it was present. An interesting comparison is possible between the expenditure of a $1 billion aliquot of the federal budget on a high-technology R&D oriented program (like the Apollo program or the development of a beam weapon) and its expenditure on transfer payments, bureaucratic services, or the like. The Chase Econometrics study showed that the expenditure of this money on high-technology R&D actually *lowered* inflation, while the other expenditure had the opposite effect, raising inflation by 0.2 percent.

Four types of directed-energy weapons

by Mary McCourt

In his *EIR* multi-client report, *Beam Weapons: The Science to Prevent Nuclear War,* Dr. Steven Bardwell describes the types of beam weapons on line for development. Each type, laser beams, particle beams, microwave beams, and plasma beams, is, Bardwell states, "in principle capable of generating the required power and energy [to reach and disarm its target] in a form efficiently absorbed by the missile." A beam weapon effectively disarms a nuclear warhead. A hydrogen bomb can be detonated only by an initial powerful atomic-bomb explosion capable of setting off a chain reaction in the lithium-deuterium fuel. A beam weapon, by pumping energy into the very delicately balanced triggering mechanism, prevents the initial explosion and essentially turns the warhead into a "dud." The missile, like a satellite, might fall to the earth, but it can no longer be detonated.

Scientists agree that laser-defense battle stations, even with the lowest level of laser-beam technology, can be defended from other beam weapons themselves. But a missile cannot be effectively defended from the beam without such massive protection that it would lose both the necessary speed and distance.

Laser-beam weapons

Laser beams, particularly the chemical laser, will likely be the first deployable beam weapons developed. A laser is a beam of very intense, single wavelength electromagnetic waves, either of light or high energy X-rays. Such a weapon can be focused very precisely because either the light or X-ray wavelengths all have the same frequency and phase. The five different types of lasers, which can be applied to fusion energy as well as beam weapons, are all being researched at U.S. laboratories.

The **chemical laser,** which could be developed for military deployment within five years, uses a gaseous medium in which a chemical reaction is induced. The product of the reaction emits laser light. The Soviet Union used such a laser last year in tests that downed a ballistic missile.

In a **gas laser,** a burning gas such as a hydrogen and fluorine mixture is suddenly compressed, and the energy distribution that results from the compression is then stimulated to emit single-frequency light waves at very high energy. Both the United States and Japan are currently using huge gas lasers for nuclear fusion development.

An **electron discharge laser** uses replaceable energy