EIR Special Report

Can the U.S. catch up with the Soviets in beam weapons?

by Steven Bardwell

Technological developments of the past five years assure that within the next few years the traditional theories of deterrence will be destroyed. Two technological trends define what will replace these theories of deterrence: one overturns the MAD (Mutually Assured Destruction) doctrine and replaces it with a new, essentially defensive strategic doctrine, and the other leads toward "launch-on-warning" policies for both major nuclear powers, the consequent increase in the probability of accidental or inadvertent nuclear exchange, and a reliance on expanded, hair-trigger conventional forces deployments.

The immediate events ushering in the destruction of MAD are the deployment of the Pershing II missiles by the United States and the SS-20 by the Soviet Union. The deployment of a weapon with exceedingly accurate guidance, maneuverable reentry vehicle (MARV) capabilities, and short trajectories eliminates the possibility of *passive* defense for land-based missiles, and hence their role as a deterrent. In this situation, the only "rational" policy is one of launch-on-warning for land-based missiles. As the deployment of new weapons proceeds over the next several years, the threshold for war decreases dramatically, and the dangers of accidental nuclear exchange become larger and larger.

The alternative technological direction, pointing toward an assured defense posture, is exemplified by the recently reported success of a nuclear-driven X-ray laser, the latest in a series of recent advances in laser and particle beam physics and technology. The technologies necessary to neutralize, in a definitive way, the offensive supremacy of the ICBM are now in hand. Called by its proponents "assured survival," a military policy based on the ability to destroy nuclear-armed ballistic missiles in flight not only puts the defense many years ahead of the offense, but, more importantly, provides the technological tools in energy and industrial areas for addressing the causes of war, rather than only the means of conducting war.

This dramatic shift in world strategic military doctrine is *not* a question of political intent: The technologies that make MAD obsolete are already in deployment (the SS-20 and Pershing missile) or in advanced stages of development (the

Soviet directed-energy beam weapon). The only remaining question available for political decision is the response of the United States to this situation.

The technological possibility

In the same way that the United States made a leap in commitment that had no immediate connection to preceding research efforts when it resolved, "We must build the fission bomb," or when it said, "We must send a man to the moon in eight years," today Americans are in a position to revolve: "We must build a directed-energy beam weapon for ballistic missile defense within this decade."

To accomplish this goal would require a program with the national priority of the Manhattan Project or the Apollo Program, conducted under the administration either of a new agency (like NASA) or as part of an existing agency or group of agencies. The mandate given to that program must be based on linking all existing relevant laboratories, research groups, industrial concerns, and university programs for consultation. Next, a national laboratory dedicated to the beam weapon problem must be established (similar to the one proposed in Alabama Sen. Howell Heflin's bill for laser research).

Under this administrative mandate, a "technology limited" program should be initiated. The test for a crash program like this one should be whether the rate of the project is in fact limited by funds or by current technological knowledge. Such a program implies, of necessity, a corollary education and training program, much like the National Defense Education Act, if the required manpower is to be trained. Experts in the area of beam weapon research believe that scientific developments over the past two years make it possible to broaden the present *research* program in the direction of engineering development with the option for near-term (five-year time scale) deployment.

This research would require a two-step program:

1) Ground-based laser/orbiting optics system. A hybrid system, in which the laser (with its large fuel supply, delicate optics, and bulky optical components) is based on a suitable mountain top (above 14,000 feet, many windows exist for laser propagation into space, even at 10.4 microns), and whose focusing mirror (in the 10-meter diameter range) is in near-earth orbit, is a realistic first-generation goal, as it minimizes the physics and engineering problems involved in a beam weapon.

Summary of Objections to Beam Weapon Feasibility

Objection	Reply to Objection: First Generation	Reply to Objection: Second Generation
1) Laser beams cannot propagate through the atmosphere.	There exists chemical laser light of frequencies that lose less than 10% of their intensity in propagation above 14,000 feet.	Completely space based.
2) Lasers cannot melt or destroy real weapons.	Chemical lasers exist capable of delivering 100 joules per sq. cm.	X-ray lasers are many times brighter than any material is capable of withstanding.
3) Passive defenses (reflective coatings, etc.) render a laser ineffective.	Such retooling of missiles would take 5 to 10 years, by which time a brighter chemical laser or an X-ray laser would be available.	X-ray lasers are so efficiently coupled to matter that no passive defense is possible.
4) The countermeasures against beam weapons are cheap and easy to implement.	A first-generation system is **not** an interesting target since it is capable of destroying only a handful of missiles.	X-ray lasers are cheap and compact compared to the offensive weapons that they destroy. The offense is saturated, not the defense.
5) The sensing technologies do not exist to prevent saturation by decoys.	Long-wavelength infrared sensing devices have been demonstrated that can distinguish decoys by **mass.**	Same.
6) The tracking technologies do not exist with the required stability.	Next-generation gyroscopes meeting the required specifications have been demonstrated in the laboratory.	Same.
7) The pointing technologies do not exist with the required precision.	Satellite telescopes now routinely sight stars with sub-microradian tolerances and thus extremely high accuracy in civilian applications.	Same.
8) Beam weapons are too heavy and inefficient to put into orbit.	Irrelevant, since only the mirror needs to be orbited.	Fewer than 20 trips of the space shuttle would be required to launch the X-ray satellites for a complete area defense.

Such a hybrid system has the important advantage of requiring only technologies that have been demonstrated in the laboratory: Specifications for all the guidance, tracking, laser, computer, and optical technologies have been met in laboratory experiments (although, of course, no sort of weapons integration has been performed), and so the scaling up of these to a weapons system is entirely conceivable. Such a system could begin to be deployed five years after the commencement of an aggressive development program.

A beam weapon at this stage of development is *not* destabilizing and is a uniquely benign weapon. It does not threaten the Soviet Union at all (and hence the problems of ASAT, etc. are nonexistent); and, it protects all nations from the danger of accidental launchings. As a first-generation system, its mission is the same as the limited mission proposed for past ABM systems—defense against an accidental launch or launch by a third power like China. In either an area or point-defense mode, this stage of an accelerated beam weapon program would also serve as a test bed for a more advanced, second- or third-generation system capable of complete protection of the United States from ICBM bombardment.

2) Completely space-based, short-wavelength system. With the demonstration of a host of promising approaches to very-short wavelength lasers in the past two years, the advantages of the short wavelength laser can be confidently projected for a second- or third-generation laser system. The compactness, light weight, and lack of optics that characterize the nuclear-pumped X-ray laser, for example, make it the natural choice for the second stage of a development program. This beam weapon, in sufficient numbers, would make possible the area defense of the United States, a feat that could begin to be accomplished with the deployment of the first X-ray laser satellite in the early 1990s.

This phased approach provides a realistic way of getting "from here to there" based on known engineering considerations in the first stage, and does so in such a way that the knowledge gained in the first stage leads naturally to the solution of the similar problems posed in a more difficult context in the second phase.

The opponents of nuclear survival

A serious attack on the problem of nuclear war requires addressing three inter-related problems:

1) The amelioration of the causes of nuclear confrontation, specifically, a way of reducing the perception of the superpowers that their security is available only at the expense of the other superpower;

2) Mechanisms for prevention of nuclear confrontation proceeding to actual exchange of weapons;

3) A means for preventing the launching of a nuclear weapon, whether by design or accident, from being an irrevocable disaster and the initiation of all-out war.

The opponents of assured survival, most specifically the nuclear freeze movement, have proposed policies which would exacerbate the first problem by legislating away both the military and civilian development of the technologies which are necessary to world development; on the second question, they are silent; and on the third, positively hysterical. It is to the third that the military application of beam weapons is most relevant.

The attacks the opponents of assured survival have made on the proposal for beam weapons have taken two distinct tracks: the first, an attempt to question the scientific possibility or engineering feasibility of these weapons applied to ballistic missile defense, and the second, the question of their political advisability. As the most astute scientific observers have noted, the technical objections to beam weapons are based on either out-of-date information or on shoddy physics (or a pernicious combination of the two by people who should know better). The accompanying table summarizes the main technical objections and their relevance to the proposal described above.

The political issue

More revealing than the incompetent technical objections to beam weapons is the political motivation for those opinions. In a particularly ironic way, beam weapons exemplify the great fear of the neo-Malthusian policymakers opposing their deployment. As Lord Solly Zuckerman describes in his book attacking nuclear defense, *Nuclear Illusion and Reality*, "uncontrolled" scientific research has been the greatest source of "destabilization" since World War II. It is the fault, he says, of these scientists that the politicians have not been able to carry out disarmament, that the arms race continues, and that the world has been plagued with technologies like nuclear energy. If only there were a way of managing the seemingly unstoppable momentum of scientific and technological progress, he muses.

This is the real issue in the debate over beam weapons. At stake is the nation's commitment to scientific and technological progress, not only in the arms race but also in the civilian economy. The real parameters of the debate are that the U.S. economy could not survive a technology freeze, and that politically the United States would be forced to yield to a Soviet Union armed with anti-missile beam weapons.

The weapons of the future are now being developed in the Soviet Union, and will have an even more revolutionary impact on the civilian economy in the form of a "plasma revolution." A nuclear freeze in the United States will not stop this development.

But the outcome of the beam-weapons/freeze debate *will* determine both the immediate and the long-term future course of world politics and economics. If the United States goes ahead with a crash beam-weapons program, it will have the technological capacity to lead an expanding world economy; if the technology freeze is imposed, the United States will have relinquished power to the Soviet Union.