Science & Technology

Scientists show anti-missile defense cheaper than new Soviet missiles

by Paul Gallagher

To build and deploy a multi-layer anti-missile beam defense for the United States and its allies by the end of the 1980s, will take a crash scientific and technological effort. In this crash effort, as in the buildup of high-technology war-production capability in the United States in 1941-42, nominal cost is no object. Resulting productivity increases across the economy will redouble the industrial/economic capabilities expended on the program.

After this first stage of a "crash effort," the full victory of anti-missile defense over nuclear attack will depend on our ability to add incremental improvements to the anti-missile shield, at a lower real economic cost than the Soviets would incur to increase the size and penetration capability of their nuclear-attack force.

Now, a document has appeared, by beam-weapon scientists, analyzing the prospective battle of economic efficiency between the Strategic Defense Initiative, on the U.S. side, and the Soviet threat to build more numerous and powerful ICBM systems to saturate it.

Comparison of Analyses of Strategic Defense, issued in February by four scientists at Los Alamos National Laboratories, follows up last year's report in which the same scientists demolished the various "technical impossibility" objections. The Los Alamos team dryly reports that these critics (notably the Congressional Office of Technology Assessment and the so-called "Union of Concerned Scientists"), have admitted that their calculations of thousands of impossibly-bright space-based beam weapons needed to knock out a Soviet launch, were completely wrong. The critics' new calculations, *which they have not publicized,* are in almost exact agreement with those of Los Alamos and Livermore Labs.

First, even if the U.S. boost-phase defense were to limit itself to lasers in low-Earth orbit, the goals for laser power and mirror size which the SDI is now pursuing, would be adequate to overwhelm a large-scale Soviet missile launch (1,000-1,400 missiles). And this assumes that the Soviets themselves meet a very expensive goal: ICBMs with metal skins 20 times "harder" to laser light than current ICBMs.

If the Soviets were to make their ICBMs also *twice as fast* in rising, burning out, and deploying their warheads, then the SDI defense would require only about 60% more beam weapons, not twice as many. If the Soviets then doubled the number of such ICBMs launched, we would only require 50-60% more beam weapons again. Another doubling of the rising speed of Soviet missiles: another 50-60% increase in SDI deployment, and so forth. This approximate ratio, the Los Alamos group demonstrates, arises from the geometry of the battle itself, if the beam weapons are deployed to attack boosters at the range appropriate to the lasers' power, frequency, and mirror arrays.

Thus, each doubling of the offensive threat, once a beam defense is deployed, raises the requirements for the defense by significantly less than double. If each beam-weapon system costs less than 25 times as much as an ICBM (now about $100 million), the buildup favors the defense.

Critical importance of mirrors

Second, the beam defense, after deployment, can be rapidly improved by the deployment of large numbers of "fighting mirrors." The defense wants to reduce the time the beam weapon takes, after knocking out an ICBM, to fix on another—"retarget time." With higher power, brightness, and frequency, lasers can do this simply by attacking from farther away—from orbits of 600 miles to beyond geostationery orbit (22,000 miles), or from the Earth's surface. At such greater ranges, the "retarget angle" is smaller, as if one were moving one's eyes from one distant object to another, rather than from one object to another directly in front of one's eyes. Thus, the retargeting is potentially faster—the key, is to accomplish the retargetting not by moving the large, primary mirror of the laser itself, but by moving a smaller, secondary mirror deployed nearer to the ICBMs' paths. This is a "fighting mirror," in SDI parlance.

This places a high priority on the industrial capability of the United States, Europe, and Japan to mass-produce large mirrors of the necessary very great smoothness and precise curvature. This is one of the biggest bottlenecks in building the SDI. A program to establish mass-production techniques for such mirrors beginning this fiscal year, is one of the SDI programs both houses of Congress are trying to "zero out."

Third, a Soviet launch of their entire ICBM force from a single area—in order to overwhelm and "punch through" the defenses in that flight corridor—would have more serious consequences for their own attack.

Such a "point launch" is often cited as a sure way to saturate beam defenses: The Soviets would build many thousands of silos, but one concentrated region of silos would house all of their missiles. A massive expenditure, obviously, but anti-SDI spokesmen claim that it would force large increases in the density of beam-weapon deployment to handle a launch of the entire Soviet ICBM force "at any point in the defensive line."

The Los Alamos team demonstrates that the effectiveness of the "defensive line" is a matter of geometry, not numbers. For example, if additional layers of beam defense are deployed over the next 10 years at higher orbital altitudes, even a few such high-orbit, high-power beam weapons could devastate a "point launch." The beam weapons would retarget very rapidly, like a man with a semi-automatic weapon firing at densely-bunched attacking soldiers.

They show that a point launch, even with very fast-burn boosters in very large numbers—"the most advanced threat possible"—still only requires that the defense coverage be increased by four times. "The penalties paid by the offense for that factor of four, which extend beyond the boost phase to all phases of the engagement, cannot even be fully evaluated." The Soviets would have to develop and deploy a new generation of "very fast-burn, fully-hardened boosters. Moreover, they would have to abandon current bus technology and develop and deploy an approach that gives a nearly simultaneous release of all [warheads] and decoys at 100-150-kilometer altitude, losing accuracy for the RVs and deception for the decoys."

"Simultaneous point launch means nonsimultaneous arrival" at targets in the United States, which makes later interception by the defense easier, particularly in the final phase of defense. "Point launch greatly increases the vulnerability of the missiles to a variety of nuclear effects—the silo field can be prevented from launching its missiles by an attacker detonating nuclear weapons above the field—'nuclear pindown.'"

Most significantly, in a point launch, "a single *nuclear-powered* directed-energy weapon [x-ray laser] could put the entire offensive launch force at risk."

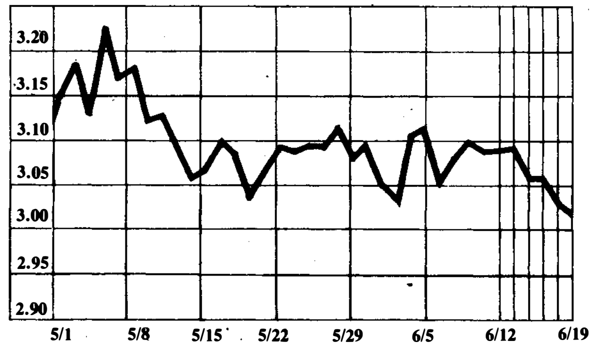
The "point launch," the scientists show, requires that only one additional beam device be deployed, or ready for deployment, for every six missiles added to the attack. The added devices deployed would "break even" with the added attack forces, even at costs of $2-3 billion each. Thus, the defense would retain the advantage in the "defensive weapons technology race."

The author, Paul Gallagher, is Executive Director of the Fusion Energy Foundation.

Currency Rates

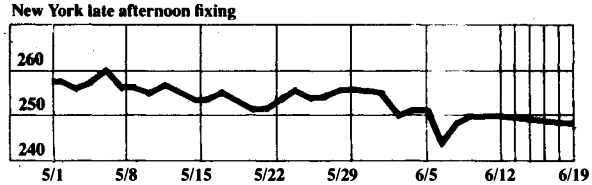
The dollar in deutschemarks

New York late afternoon fixing



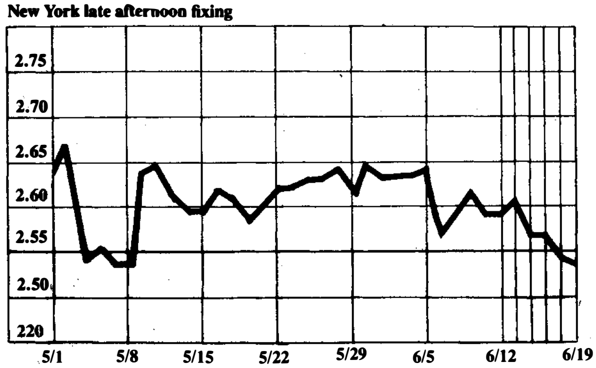
The dollar in yen

New York late afternoon fixing



The dollar in Swiss francs

New York late afternoon fixing



The British pound in dollars

New York late afternoon fixing