U.S. Airborne Laser Program survives gutting of the SDI

The original Strategic Defense Initiative proposed by President Reagan in 1983 adopted the major outlines of Lyndon LaRouche's conception: a broad-based program at the frontiers of science—"new physical principles"—aimed at strategic defense for all nations against nuclear missile attack. That SDI, which the Soviet leadership ruefully admitted was its downfall, has in recent years been gutted. While Russian scientific leaders now publicly propose a new cooperative anti-missile effort of plasma, laser, and microwave experiments, the United States today spends less on advanced laser, electromagnetic, and particle beam weapons research than it did in 1977. What remains of the "new physical principles" approach is largely the Airborne Laser Program of the Air Force. This status report is provided by individuals who have worked on that effort.

Since the start of the second Reagan administration, the nation's "Star Wars" organization, then the Strategic Defense Initiative Organization and now the Ballistic Missile Defense Organization (BMDO), was never given sufficient funds to pursue the missile defense system it really desired. The preferred system was, and still is, a system based on directed energy weapons. Not letting a good idea die, the U.S. Air Force (USAF) is now setting its sights on BMDO's ultimate goal.

Soon after it was inaugurated in 1983, the SDI began a vigorous program of research and development on x-ray lasers, neutral particle beams, space-based lasers, and ground-based lasers. The space- and ground-based laser programs were extremely broad in scope, covering virtually every conceivable technology required for a high-powered laser weapon. For example, among the options considered were chemical-gas lasers such as hydrogen fluoride, deuterium-fluoride and oxygen-iodine, excimer lasers such a krypton-fluoride and xenon-chloride, solid state lasers such as glass "doped" with neodymium, and free electron lasers, whose light frequency could be changed or "tuned."

Technologies to put a high-powered laser beam on a target at long range were also pursued. These included large, lightweight, coolable mirrors, highly accurate pointing and tracking systems, and techniques to effectively propagate a laser beam through turbulent atmosphere. Two significantly different, but very effective atmospheric propagation technologies emerged: adaptive optics and nonlinear optics.

But today, the BMDO has no significant laser program. Only a small, space-based laser technology program remains under BMDO's control, and although some significant technology development has been accomplished by Martin Marietta, TRW, and Lockheed, this program is in danger of being eliminated in fiscal year 1994. This is not to say, however, that the country does not have a serious laser weapon program. Since 1992, when all significant laser weapon development activities were transferred from BMDO to the USAF's Phillips Lab (which includes the former Air Force Weapons Laboratory) in Albuquerque, New Mexico, the Air Force has been moving steadily ahead to develop the laser system it has always wanted. Not a space-based laser or a ground-based laser, but an airborne laser (ABL).

The primary mission of the ABL is to "kill" ballistic missiles, but many other missions are also envisioned. Among these are air defense (defending against enemy aircraft), cruise missile defense, and battlefield surveillance. The last mission takes advantage of the "telescope quality" optics inherent to any high-powered laser. Another mission well suited to the ABL is the anti-satellite or ASAT mission (the neutralization of an enemy's satellites), although this is rarely advertised by the Air Force.

It is unlikely the ABL will have any utility against ground targets. For the laser-light wavelengths being considered (1 to 4 microns, or millionths of a meter), at best 40% of the laser power will transmit 50 kilometers down through the atmosphere.

The Air Force believes it could test fly an ABL demonstrator by the year 2001. Building on the past 10 years of BMDO laser development activities, the Air Force believes all ABL technology issues have been essentially resolved, although control of the laser beam "jitter" on an aircraft platform, and atmosphere propagation, still require demonstration.

Why an airborne laser?

Perhaps at no time in the past 20 years has there been a stronger consensus of support within the U.S. Department of Defense for systems capable of intercepting ballistic missiles in their boost phase, when they are rising through the atmosphere and just out of its upper regions. This consensus is the result of two facts. Within the next two decades, over 20 additional nations are expected to have theater ballistic missiles. Further, these ballistic missiles can easily be given the ability to deploy multiple warheads in sufficient quantities to

overwhelm terminal defense systems such as Patriot. A boost-phase intercept system capable of intercepting ballistic missiles before their warheads can be deployed is the only clear solution to this future threat.

The military's first combat experience defending against ballistic missiles removed any lingering doubts of the need for a boost-phase intercept capability. Even though the Scuds launched by Iraq during the Persian Gulf war were simple unitary missiles (they did not release multiple warheads), the Patriot system had a difficult time defending against them. If each Scud had deployed 10 to 20 warheads, Patriot would have been essentially useless.

Unitary missiles can be converted into multiple warhead missiles relatively easily, by replacing the single large munition in their nose cone by many small, deployable submunitions. The submunitions could be as simple as metal spheres filled with chemical, biological, or explosive agents. The submunitions would fly ballistically to their destination just as present Scuds do, and present terminal defense systems, such as Patriot, with large numbers of incoming targets. Patriot was not always successful in intercepting three or four simultaneously arriving Scuds; think how ineffective Patriot would have been against 50 to 100 simultaneously arriving warheads. (Aware of the ease with which missile-based terminal defenses can be saturated, the Army has recently proposed a *ground-based* laser system called Guardian for terminal defense. The Army expects it to provide an order-of-magnitude better firepower than anti-missile-missile terminal defense systems.)

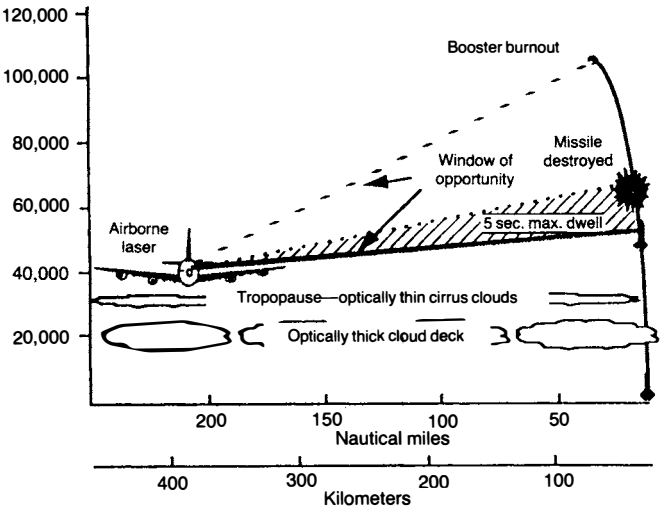
However, two conditions must generally be met before the submunitions can be jettisoned by the attacking missile. The missile must have finished its boost-phase; and the missile must have ascended to a high enough altitude, out of the atmosphere, so that atmospheric drag will not significantly alter the targeting of the submunitions. The missile is most vulnerable to destruction, along with all of its warheads or munitions, before these two conditions have been met.

The BMDO, Air Force, Army, and Navy have been jointly and individually studying boost-phase intercept of "theater" (short- to medium-range) missiles, since the last days of Desert Storm. The BMDO is ultimately responsible for what is deployed, and is leading a nine-month Boost-Phase Intercept Study to determine the best approach to developing a boost phase intercept capability. The study is nearly complete. It will recommend that the country develop an air-launched, hypersonic (Mach 15), heat-seeking interceptor named Peregrine, and an aircraft-borne laser weapon. Budgets should be decided in the next few months, at the conclusion of Defense Secretary Les Aspin's Bottom-Up review.

While the primary motivation for a boost-phase intercept system such as an ABL is its ability to intercept ballistic missiles before their submunitions can be deployed, a boost-phase intercept capability also provides other benefits. When a terminal defense system such as Patriot achieves a successful intercept, the resulting debris may contain harmful chemicals and biological agents, or undetonated explosives. This debris can fall on the area being defended and cause extensive amounts of damage and loss of life. With a boost-phase intercept, the debris falls near the launch point of the threat missile, and therefore may fall on the enemy's own territory. Faced with this potentiality, an enemy may be deterred from launching missiles containing chemical and biological warheads, since they present a serious risk to his own population.

FIGURE 1

How airborne high-energy lasers can kill missiles at long range



Source: Strategic Defense Initiative Office

Another significant benefit that boost phase intercepts bring to theater missile defense is a vast expansion of the area that can be defended from ballistic missile attack. For example, Patriot can only fly about 25 kilometers down-range when intercepting an incoming missile, and therefore can only defend a roughly 50 km area. Boost-phase intercept systems, on the other hand, can defend any location that an enemy missile is capable of reaching. For Scuds, which can travel 600 km down-range, this defended area can be a circle of up to 1,200 km in diameter, centered at the Scud launch point.

The baseline ABL concept

The need for an ABL is clear. The Air Force's baseline concept is depicted in **Figure 1.** A large aircraft, e.g., a B-747 or C-141, carries a chemical-gas oxygen-iodine laser of 4.5 megawatts power, "loitering" above the clouds in a figure-eight pattern at roughly 40,000 feet. An infrared camera, optically boresighted with the aircraft's laser, searches the tops of the clouds for the bright exhaust plume of an as-

cending missile. The surveillance camera can scan a full 360° around the ABL aircraft; the laser gimbal can swing 140° left or right from the nose of the aircraft.

When a target is detected, the aircraft is turned as needed as the laser's optics are rotated to point to the target. A low-power laser, or beacon, is then trained on the target nose cone, and the instantaneous reflection of the beacon back to the ABL is used to quickly measure the atmospheric turbulence. A "deformable," segmented mirror adjusts to compensate for the atmospheric turbulence. The high-powered 4.5 MW laser is then bounced off this mirror and illuminates the target for a few seconds until it is destroyed. The ABL is then ready for another shot.

At the current time, the Air Force's preferred laser for the first operational ABL is the chemical oxygen-iodine laser, first demonstrated at the Air Force Weapons Lab in 1978. The wavelength of its laser light is 1.315 microns, making it the shortest wavelength (highest frequency) high-energy chemical laser currently in existence. Lasing is achieved by injecting electrically heated iodine vapor into a flow stream of hot oxygen molecules produced by a chemical reaction of chlorine, hydrogen peroxide, and an alkali (lithium, sodium, or potassium) hydroxide. These chemicals are contained in special fuel tanks on board the ABL aircraft. A 25-kilowatt oxygen-iodine laser has been built at Phillips Lab. A 4.5 MW laser can be built by straightforward scale-up of the 25 kW device.

Alternative lasers, such as the free electron laser and the diode-pumped solid state laser, may be more attractive in the future. Both of these lasers could be powered by electrical generators driven by an aircraft's engines, removing the need for special fuel tanks and providing potentially more lightweight ABL designs. The ultimate goal is the free electron laser, since its "tunable" wavelength can be set to whatever is most appropriate for a given situation.

About five years of development is required to bring both of these lasers to the same level of maturity as the chemical oxygen-iodine laser. Unfortunately, the Clinton administration does not appear willing to fund a broad spectrum of laser development, relegating the development of these alternative high-powered laser systems to the distant future.

Atmospheric propagation: a critical issue

Perhaps the most critical airborne laser issue yet to be resolved is atmospheric propagation. To put a highly concentrated, high-energy ABL beam on a target through atmospheric turbulence, a coherent "beacon" must be emitted *from the target* and received at the ABL so that corrections for the turbulence can be imparted to the high-energy ABL beam. Obviously the target will not be carrying a beacon to aid in its own destruction. Therefore, the source of the "beacon" must be supplied by the ABL platform.

The current ABL concept calls for the ABL to have two lasers: a low-power beacon laser and a high-power kill laser. The low-power beacon laser will track the nose cone of the target (or perhaps some other well-defined edge or point on the target).

While the above beacon concept can theoretically provide one-way atmospheric distortion information to the ABL, the path and time corresponding to these distortions can never coincide with the path and firing time of the high-energy laser. The path of the reflected beacon will always "lead" the

LaRouche: Rejection of SDI spells disaster

Lyndon LaRouche, the conceptual author of the Strategic Defense Policy, made the following comments on July 14 as part of the weekly radio broadcast "EIR's Talks with Lyndon LaRouche." He was interviewed by Mel Klenetsky.

EIR: We have a situation at this point in Russia, where there is a debate that's going on. Last week we had a discussion about a policy that appeared in *Nezavisimaya Gazeta,* by an author, Vaganov, who lamented the fact that President Clinton did not accept Russian President Yeltsin's offer to mutually develop ballistic missile defense systems, a particular ballistic missile defense system.

In this week's *Nezavisimaya Gazeta,* you have the same author, Andrei Vaganov, writing an article with a diametrically opposed viewpoint, interviewing Alexei Kuzmin, the head of the missile attack warning and space control systems at Russia's Long-Range Radio Communication Research Institute, and Kuzmin says the exact opposite.

Kuzmin says that there should be no ballistic missile defense, he says that the discussion last week was not really what was going on, that there was no offer to Clinton.

It seems to me that we have a big debate going on in Russia, and it seems to me that we have an emergence of what you yourself called the Third Rome aspect in Russia. Is this what's going on?

LaRouche: To a large degree, it is.

The point is, that those who are proposing to take up the SDI on the one hand, are being opposed on the other hand by a group which accepts the Pugwash doctrine, still, of Mutual and Assured Destruction as the opposition to the Trust proposal made clear.

This opposition to the SDI was, in 1983 and today essentially the Russian imperial impulse which wished to use the balance of terror as a policy of long-range Russian

tactics. This is very dangerous; and the problem here, from the U.S. side, is that the United States and Britain and others, very foolishly and rather violently at the time, rejected my theses on the Great Russian Third Rome tendency.

As a result of that, they took a risk. That is, the United States side—and say the British side—should have accepted, back in 1983, my assessment of what the rejection of the SDI would lead to if we let it go that way, that it would lead to precisely this kind of situation.

What they did instead, in order to cause this Great Russian Third Rome tendency to come to the fore, was to allow people like George Soros, the "derivatives king," with his stooge, Harvard's Jeffrey Sachs, to impose this shock therapy/IMF conditionalities policy upon eastern Europe and on the former Soviet Union. In so doing, they built up a wave of hatred against the United States, a sense of betrayal, *solely because of* what George Soros represents. Then they activated the full potential of the Great Russian or Third Rome tendency (not immediately, but it was coming out), by their game of saying that Yeltsin is their asset, as earlier they said Gorbachov was their asset; whereas if they had *not* allowed Soros and other carpetbaggers to go into eastern Europe and Russia, but instead had followed my counsel and proceeded with what I call the Triangle program, once the Wall was coming down, then we would not have had this problem.

So the problem here essentially is *gross strategic incompetence* in the thinking of the leading intelligence and policymaking circles in the United States and western Europe, more so outside of Germany. In Germany, Switzerland, Italy, as well as in Austria, there is a little more intelligent current of thinking, but it's not manifest at the present time in the policy under this so-called EC policy rule.

But those qualifications taken aside, the essential thing is the strategic planning, the strategic thinking, of all of the leading circles in the United States, *has been consistently incompetent* and the rejection of my conception of the SDI, as this emerged over the 1984-1985 period; that rejection of my approach to this, has led to this very dangerous disaster. And these people had better change their ways, and learn that I was right and they are wrong not merely in a policy choice, but they're wrong in the way they think about the world.

They are wrong; and if they think that you can mix this idiotic, ideological idea of globalism and free trade of the so-called Project Democracy approach, that you can mix that with U.S. national security—you can't. We are headed toward a potential of a kind of World War III which parallels but is somewhat different than the previous two world wars of this century.

EIR: Can you please explain to people what the Third Rome is, and what the SDI was designed to substitute for, in terms of strategic policy? How is it different from Mutually Assured Destruction?

LaRouche: Mutually Assured Destruction was an imperial idea which was developed actually in Britain and imposed upon the United States through vehicles such as Bertrand Russell's 1955 agreement with the Khrushchov government in the meeting in which four Khrushchov representatives turned up in London for Russell's organization of world parliamentarians, to announce that they were embracing the Russell thesis. Since that time, the entirety of postwar U.S. and British policy, up through at least the announcement of the SDI, has been based on the Russell thesis.

We broke that with the SDI. That was my purpose, to break that, because there could be no solution to world problems unless we did break it. This is what Kissinger represents, this kind of MAD—Mutually Assured Destruction policy—which was Russell's idea. It was a British intelligence idea they sold to the Russians.

Now, the British looked at it from the standpoint of setting up a One-World empire. The Russians looked at it from the standpoint of flexibility for their playing their strategic games with a kind of temporary war-avoidance posture; so they bought it. But the Russian thinking was also an imperial thinking. They said, okay, we can be part of the empire, and we can cheat.

This kind of detente was brought to a certain conclusion by the 1958 Quebec Pugwash conference, and then later by the Camp David meeting between Khrushchov and Eisenhower, and the establishment of this two-system world empire, based on Mutual Assured Destruction. . . .

path of the high-energy kill laser by about one-thousandth of a second. Therefore, the atmospheric compensation concept will work only when the atmospheric distortions are relatively constant over the space and time between the path of the beacon and that of the high-power laser beam. The ABL program is in the process of conducting flight tests to verify that the above atmospheric compensation system will work.

The flight tests will also determine the power required in the beacon laser. Because very little of the beacon light hitting the target nose cone is reflected back to the ABL, the beacon must be powerful enough to produce a detectable and measurable reflection. On the other hand, the lower the needed power of the beacon, the more of the ABL's fuel is available for destroying missiles.