MILITARY STRATEGY

X-ray lasers and the Winterberg approach

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The world is about to face the second major scientific-technological revolution in strategic war-fighting capabilities since the A-bomb development of World War II. As Dr. Edward Teller has stated, this second revolution, the fusion-powered X-ray laser antiballistic missile (ABM), may actually negate the effects of the first, the development of the hydrogen bomb in the early 1950s, in that the advantage no longer lies with offensive nuclear weapons. With the realization of the X-ray laser, all ballistic missiles—i.e., those that travel near to or into space—can be easily intercepted and destroyed, so that effective defense in nuclear war has become feasible.

The immediate technical predicates of this X-ray laser development and other, even more awesome, thermonuclear-powered beam weapons have been highlighted in the book *The Physical Principles of Thermonuclear Explosive Devices* by Dr. Friedwardt Winterberg, published this month by the Fusion Energy Foundation, and in articles by the same author in FEF's monthly journal *Fusion* over the past year. These materials, together with other *Fusion* reports, demonstrate that major advances in this area directly depend on further development of concepts first perfected by the great 19th-century German mathematical physicist Bernhard Riemann, whose method runs completely contrary to modern "particle" physics. The X-ray laser breakthrough shows once again that, even in limited, secret military applications, Riemann's approach produces the most important empirical results in extending the frontiers of science and technology.

As Dr. Winterberg stresses in his book, the development of advanced weapons technologies is dependent on a civilian research program in the associated energy-dense technologies of nuclear fusion, using high-intensity laser beams, particle beams, and magnetic field schemes. These technologies and their research programs provide not only the scientific knowledge required for the development of new weapons systems, but much more critically, the manpower and industrial elaboration on which a successful military program depends. A civilian economy which itself is not pursuing the most advanced technological research will in a relatively short time stagnates and in so doing, threatens that country's national security in a more thoroughgoing way than any military deficiency. This connection between an aggressive pursuit of new technologies and their scientific underpinnings has been the relentless lesson of past unsuccessful attempts at either avoidance of new war-fighting technologies, on the one hand, or the narrow wunderwaffen approach to weapons development, on the other.

When reflecting upon nuclear war-fighting systems, one tends to be overwhelmed by the scales of energy involved. It is difficult to imagine the destructive effect of a 100-kiloton H-bomb, let alone a 25-megaton monster. In actuality a pebble may have sufficient inertia to completely obliterate a 20,000-mile-per-hour incoming missile *if* it could be made to physically intercept the warhead. Nuclear radiation with the equivalent energy of a match, if deposited within the fissile fuel of an H-bomb trigger, would be enough to turn the warhead into a low-yield dud. Even less energy would be needed to cripple the delicate electronic controls of an H-bomb detonator. In dealing with sophisticated weapons systems, scalar considerations are of secondary or tertiary significance.

The qualitative effectiveness of X-rays and high-energy subatomic particles, such as electrons and protons, as a potent antimissile force is due to several factors.

While ordinary lasers burn into the surface of the target, X-rays can penetrate into the interior of a missile, and produce a massive electrical current which, in turn, penetrates further and disrupts the electronic systems. Particle beams can penetrate to the center, and initiate a nuclear reaction which destroys the bomb's fuel. And the fact that these forms of energy travel at or near the speed of light greatly decreases the difficulties of intercepting a 20,000-mile-per-hour missile. The problem has been to cheaply and efficiently generate the required quality of X-ray or particle-beam energy.

The first type of proposed ABM systems were based on utilizing the X-rays generated by a 1 megaton H-bomb to cripple incoming warheads. While only minute amounts of X-ray energy deposition were needed to achieve this, simply blowing up a bomb gives a "kill radius," or range needed to knock out incoming missiles, of not much more than 30 kilometers from the point of detonation. This directly leads to a cascade of targeting, tracking, and interception problems. On the other hand, if the energy of the H-bomb could be focused in one direction or, even better, transformed into a beam, then the effective kill radius would be greatly extended and these other difficulties overcome.

This is particularly the case in the fusion-owered X-ray laser. Unlike other proposed laser weapons, the X-ray laser is almost impossible to defend against in terms of hardening the warhead or missile. And since the kill mechanism is almost instantaneously effective, many targeting and tracking problems encountered by other beam and laser systems are easily overcome with the X-ray laser.As seen in the figures, taken from Dr. Winterberg's August 1981 *Fusion* magazine article, titled "Nuclear and Thermonuclear Directed Beam Weapons," there are many different approaches to generating both nuclear explosives driven X-ray lasers and other types of beam weapons.

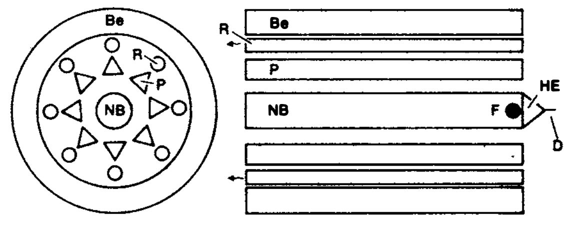
The current status of development

A prmary source for information concerning beam weapons, and especially the X-ray laser, has been the publication *Aviation Week*. Last winter it reported that Lawrence Livermore National Laboratories in Livermore, California had successfully demonstrated the scientific principles of an X-ray laser design. The Sept. 7 issue of *Aviation Week* reported in a news brief that Los Alamos National Scientific Lab in New Mexico is now moving toward the development phase of perfecting the X-ray laser as an ABM system. *Aviation Week* reports that the system would consist of 20 to 30 satellites, each with 50-ray lasing rods. Therefore, upward of 1,500 missiles could be intercepted in the most vulnerable stage of flight, i.e., the X-ray lasers would be directed toward rupturing the thin skins of the first or second stages of the rising missiles. This basing mode has two distinct advantages: first, the missile loaded with multiple warheads is killed as a unit, getting many birds with one stone; second, the kill range need only be several hundred miles.

But one major disadvantage is that the system must be deployed at least one hour before hostilities begin. Furthermore, the targeting and firing must be within minutes of the offensive missiles' takeoff.

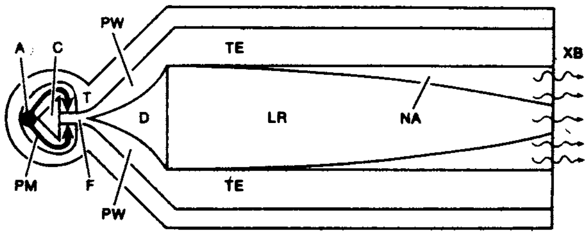
Aviation Week states that this system is projected to be deployed by the end of this decade or the beginning of the next.Other sources indicate that a longer-range mode of interception directed against the individual warheads may be more effective and far more quickly deployed. And as *EIR* readers know from our July 28 issue, Air Vice-Marshal Stewart Menaul of Great Britain reports concerning the X-ray laser: "It is just possible that the Soviets have developed such a system at their experimental site at Saryshagan."

One leading U.S. weapons scientist revealed the following historical anecdote when told by this author that Dr. Hans Bethe had stated that it would take at least decades to realize an effective X-ray laseer ABM system. "Did you know that Hans stated in secret testimony before the Congress in the early 1950s that our H-bomb development work put us 25 years ahead of the Soviets. According to Hans it would take the U.S.S.R. at least a quarter of a century to catch up with us." Within months of this testimony, the Soviet Union exploded the first actual H-bomb.

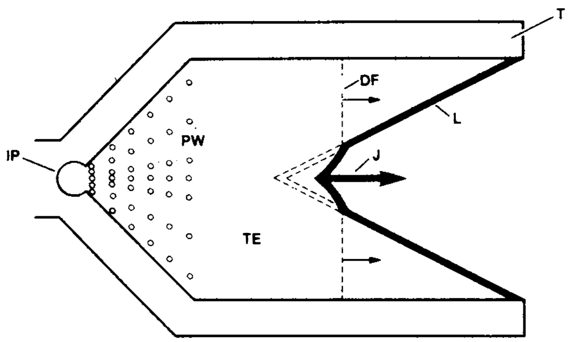


(a) Axial cross section **(b) Radial view**

NUCLEAR X-RAY LASER WEAPON USING NEUTRON BOMB
The cylindrical neutron bomb NB is placed within a cylindrical neutron reflector Be made of beryllium-9. The detonator D sets off a high explosive HE, which in turn explodes the fission trigger F for the neutron bomb. The prisms P surrounding the neutron bomb prevent the laser rods R from being vaporized prematurely. The neutrons from the bomb penetrate the laser rods, which produce laser beams of intense X-rays, to be directed at ballistic missiles, for example.



NUCLEAR X-RAY LASER WEAPON USING THERMONUCLEAR EXPLOSIVES
In this larger device, a thermonuclear explosive TE pumps one large laser rod LR. The fission explosive A creates a shock wave that is deflected by the deflection cone C, passing between it and the tamp T in Prandtl-Meyer flow PM. The thermonuclear shock burn wave from the thermonuclear fuse F is then shaped by the thermonuclear plane wave lens PW and the deflection wedge D. A coherent X-ray laser beam XB passes out from the laser rod LR, which has been pumped by the thermonuclear explosive TE. NA is the neutron absorber, which creates the conditions for an excitation wave propagating at the speed of light.



FAST PLASMA BEAM WEAPONS
A spherical thermonuclear detonation wave is ignited at ignition point IP and shaped into a plane wave with detonation front DF by the plane wave lens consisting of solid obstacles: TE is the thermonuclear explosive, T is the tamp, and L is the metal liner that is collapsed by the detonation front, resulting in a fast plasma jet J.

Courtesy of *Fusion* magazine