

Plasma research can boost beam effort

by Dr. Shoichi Yoshikawa

Dr. Shoichi Yoshikawa is Director of Special Projects at the Princeton Plasma Physics Laboratory. Text abridged.

I am, myself, not a defense scientist, and am not privy to the types of classified research which have so far gone into beam-weapon research in the U.S. and Soviet defense programs. But I am a plasma scientist who has been working on development of controlled fusion for electricity generation for over three decades.

While my work on plasma science, has been directed toward achieving the peaceful generation of electricity from controlled nuclear fusion reactions—and thereby giving all of humanity access to a readily available and virtually unlimited supply of energy—because this research touches on the fundamental aspects of science it can also be applied to the realization of defensive beam weapons. For example, researchers at Princeton recently reported experimental results that indicate that we can produce an x-ray laser in the laboratory with a magnetic plasma. And, as Dr. Edward Teller has emphasized, x-ray lasers have great potential as anti-missile beam weapons.

As I noted before, one of the key problems in achieving effective beam weapons is that of attaining the required con-

centration of energy. Let me share with you some new possibilities which I have been working on that may have some applications to beam weapons—this must be finally determined in this particular case by further research and study. But this example shows how general plasma science can be applied to overcoming the types of problems encountered with directed-energy weapons.

One of the important inputs needed for many proposed beam weapons is that of a high-current, high-energy electron beam. Such beams could be used to power free-electron lasers or powerful microwave generators. But such beams tend to become unstable and difficult to handle. I am exploring ways in which such an intense beam could be embedded in a magnetically confined tokamak plasma. The plasma provides a sort of buffer to stabilize the beam while not destroying its energy concentration.

And even if this particular idea does not prove to have practical applications to beam weapons, it could provide a new and important tool for both fundamental science and industrial technology. The intense beams, for example, could be used to generate anti-matter on an unprecedented scale, and thereby provide us with a totally new physical situation. Anti-matter beams can be used to generate intense beams of gamma rays.

On the other hand, such a plasma embedded e-beam could be used to generate intense outputs of x-rays and synchrotron radiation. It may surprise you, but this will be one of the key inputs needed for mass production of advanced computer chips in the near future. The x-rays are used to print the circuits of the chip in much the same manner as laser printing, but with a far greater resolution.

In support of the beam-defense program

by Dixy Lee Ray

Dixy Lee Ray has served as chairman of the U.S. Atomic Energy Commission, and later, as governor of the state of Washington.

Self-defense is as deeply embedded in human nature as is the will to live. The defense of one's home, property, neighborhood, and nation are equally fundamental. The moral right to self-defense is recognized in law and is universally accepted. It is inconceivable that anyone can be against self-defense, and yet that is precisely the case with a number of self-appointed opponents to the President's proposal for a strategic defense to replace the outmoded and undefendable

policy of Mutually Assured Destruction. These opponents, and their allies in the liberal media, would have us believe that even to consider defending ourselves, even to study a possible defensive system, is itself an aggressive act.

No one denies that an exchange of nuclear warheads between the U.S. and U.S.S.R. would be horrifyingly destructive—if detonated on or near the surface of the earth or in the atmosphere. But those same nuclear warheads would be harmless if detonated in outer space. Pending a more perfect peace, is it not better to devise a system for exploding incoming warheads during their trajectory and before they can damage the earth? Isn't it better to erect a shield than to hope for change in an enemy that has heretofore proved implacable? Isn't it a far more moral position to hold up a defensive shield than to threaten retaliation?

I believe it is. And I believe that the President's Strategic Defense Initiative, which opponents persist as deprecating as "Star Wars," is the most hopeful and enlightened step that has been taken since the dawn of the nuclear age. It has my full support.