# Attacks on Star Wars critics a diversion

*by Frank von Hippel*

THE DECEMBER 1984 issue of *Commentary* contained an article, "The War Against 'Star Wars,'" by Dartmouth College astrophysicist, Robert Jastrow, which attacks two technical critiques of President Reagan's Strategic Defense Initiative (SDI). One of the critiques had been written by a group organized under the auspices of the Union of Concerned Scientists (UCS) and the other by Ashton Carter for the congressional Office of Technology Assessment (OTA).[1]

The *Wall Street Journal* immediately picked up Jastrow's attack, in a December 10 editorial, "Politicized Science," which attacked the UCS and OTA reports as "less than scientific." The editorial ended with a note of concern: "It would be a shame . . . if the President fails to realize that his plan is supported by men such as Mr. Jastrow who have studied the problem carefully and scientifically." In fact, Jastrow had not himself done any scientific studies but was merely reporting somewhat breathlessly the criticisms of the UCS and OTA reports by anonymous "experts" at Lawrence Livermore and Los Alamos Laboratories.

The UCS group and Carter responded with letters to the editor of the *Wall Street Journal* published on January 2. A storm of letters supporting the editorial was then published in the January 17 edition. These included letters from: Lieutenant General Abrahamson, the director of the SDI organization; C. Paul Robinson, the principal associate director of Los Alamos National Laboratory; and Lowell Wood, the head of the X-ray laser group at Livermore National Laboratory.

At the technical level, the principal focus of the criticisms of the UCS report* was a calculation of the number of laser battle-stations that would be required in orbit to destroy Soviet ICBMs during "boost phase," the period of up to five minutes after launch while the rocket engine is still burning and before the multiple warheads and decoys are released. According to the *Wall Street Journal*, the original UCS estimate was 2,400 battle-stations, but "defense experts at Los Alamos say only 80 to 100 will do. The initial UCS error would make the difference between estimating a defense cost of say $50 billion and estimating at $1 trillion or more."

At the political level, the issue is the credibility of the technical critics of Star Wars. During the 1968–1972 debate over the anti-ballistic-missile system proposed by the Johnson and Nixon Administrations, two of the principal contributors to the current UCS report, Richard Garwin and Hans Bethe, helped to turn the scientific community against the proposed system, largely by showing in a *Scientific American* article how vulnerable it would be to countermeasures.[2]

Obviously, both sides of the new Star Wars debate remember this history. One side hopes to repeat Garwin and Bethe's success in having an impact on the policy debate with a technical assessment of the Star Wars proposal. On the other side, advocates of the SDI, whose leaders include advocates of the Johnson-Nixon ABM system such as Jastrow and Edward Teller, hope to render the critics ineffective by attacking their credibility.

THE UCS GROUP described a hypothetical battle station equipped with a hydrogen-fluoride laser producing a beam of infrared (2.7 micron) radiation with a power of 25 million watts. This beam would be aimed by a perfect (10-meter diameter) mirror able to focus the beam on a spot with a diameter of less than a meter at a distance of 3,000 kilometers with an intensity sufficient to burn through the shell of a booster within about seven seconds.

The number of such battle stations required to destroy all the Soviet ICBMs—assuming that they were all launched at the same time—would depend upon a number of factors:

- the total number of Soviet ICBMs—assumed by the UCS group in their original March 1984 report to be the current number, 1,400;[3]
- the duration of the boost phase—assumed to be 100 seconds;
- the average distance between the battle-station and the booster—assumed to be 3,000 kilometers;
- the distribution of the silos—assumed to be the same as the current distribution;
- the distribution of the satellites in orbit—approximated as uniform; and
- the "slew-and-settle" time required to move the laser beam from one target to another—assumed to be zero.

Some of these assumptions were generous. For example,

*I discuss here only the debate over the UCS report because the public discussion has tended to focus on it. However, on May 8, 1984, Abrahamson distributed to the press a set of criticisms of the OTA report. This was followed, on June 4, by a letter from Deputy Secretary of Defense William H. Taft IV to OTA Director John Gibbons, demanding that the OTA withdraw Carter's report. The OTA issued a sharp rebuttal to Abrahamson's list of criticisms and, on July 13, after having the OTA report reviewed by three high-level defense experts, Gibbons turned down Taft's request. The Defense Department does not appear to have pursued the matter further.

*Frank von Hippel, a physicist, is a professor of public and international affairs at Princeton University.*

**(Left to right) Hans A. Bethe, professor of physics emeritus at Cornell University and former chief of the theoretical division at Los Alamos National Laboratory; Richard L. Garwin, physicist and defense specialist at the IBM Thomas J. Watson Research Center; and Robert Jastrow, adjunct professor of earth sciences at Dartmouth College.** *(Bethe photo by Sol Goldberg; Jastrow photo courtesy Dartmouth News Service)*

the Soviets could increase the number of their ICBMs or deploy relatively inexpensive decoys that would mimic ICBMs during their boost phase. They could concentrate their missile silos in a single area, thus minimizing the number of battle-stations within range at any one time. "Fast-burn" boosters could be developed that cut the duration of the boost phase to 50 seconds. And the slew-and-settle time required to focus a 10-meter diameter mirror on a moving booster 1,000 kilometers away would not be negligible.

However, approximations made in the original UCS calculations were decidedly ungenerous. Most significantly:

- the battle-satellites could be placed into orbits which would increase their relative density at the latitudes of the Soviet missile fields by a factor of almost three;
- as the density of the battle-satellites increased, the average distance between battle-satellites and targets would decrease.

Similarly crude approximations seem to have been made in the original Los Alamos calculations, and both groups quickly refined their work. By the time the UCS report appeared in book form and, in a shortened version, in *Scientific American* a few months later, *all* its key assumptions were generous to the Star Wars concept, and the estimated number of battle-satellites had been reduced to 300.

In a new analytical paper,[4] however, Garwin has highlighted this generosity by pointing out that, were the Soviet Union to deploy 3,000 small, 40-second burn-time boosters in a region of 1,000 kilometers or less in diameter, and if the slew-and-settle time of the laser mirror were as slow as one-half second, the calculated number of battle-satellites would spring to 1,500. The Soviets would thus be forcing the United States to deploy an extra billion-dollar satellite for every few million-dollar boosters which they deployed—hardly an advantageous exchange for the United States.

It should be emphasized that the hypothetical system being debated by the UCS group and its critics was not an officially proposed design. Although such specific designs have been proposed by small groups of Star Wars enthusiasts, the enormous $26 billion budget that has thus far been requested is only for the first five years of a 10-year exploratory research program.

In the absence of a specific design, the critics have had either to postulate their own—and run the risk of being criticized, as the UCS group was, for ungenerous assumptions—or offer criticisms that would apply to any space-based system. At this stage, the more general criticisms are much more important.

PERHAPS the most fundamental technical objection to any Star Wars system would be its susceptibility to countermeasures. Indeed, this point is at the core of the UCS-OTA critique of the Star Wars proposal—just as it was at the core of the Garwin-Bethe critique of the ABM system proposed 15 years ago. From this perspective, the attempts of Star Wars advocates to focus on the details of the earliest version of the UCS calculations of the number of battle-satellites in the absence of countermeasures must be seen as a diversion. McGeorge Bundy, George Kennan, Robert McNamara, and Gerard Smith have made this point particularly well: the "inevitable Soviet reaction is studiously neglected by Secretary Weinberger when he argues in defense of Star Wars that today's skeptics are as wrong as those who said we could never get to the moon. The effort to get to the moon was not complicated by the presence of an adversary. A platoon of hostile moon-men with axes could have made it a disaster."[5]

Consider, for example, the battle-satellites' vulnerability to attack. The Star Wars program puts much emphasis on such orbiting satellites because, after the boost phase, the deployment of multiple warheads and decoys could make the defense problem virtually impossible, and almost all boost-phase schemes require battle-satellites. (Only one

directed-energy beam weapon has been proposed that would be light enough to be "popped-up" into space *after* Soviet ICBM launch had been detected. This is the nuclear-explosion-powered X-ray laser. However, as both the UCS and OTA reports point out, the X-rays from this weapon could not penetrate far into the atmosphere and a "fast-burn" booster could be designed to release its warheads below this level.)

A fundamental weakness of all ballistic-missile-defense schemes involving orbiting battle-satellites is that the satellites would be much more vulnerable to attack than their targets. Unlike the boosters, which would be available for destruction for only about a minute at an unpredictable time, the battle-satellites would be at predictable locations in predictable orbits. These billion-dollar machines could therefore easily be destroyed by ground-based lasers or something as simple as a cloud of small metal pellets put into a counter-rotating orbit. (Because of their high closing-speed, such pellets would carry hundreds of times as much energy as an equivalent weight of bullets.) Of course, one could at great expense transport thousands of tons of armor to each battle station, but then how could the sensors see and the lasers fire? In any case, this example shows how one simple countermeasure could either incapacitate a battle station or greatly increase its complexity and cost.

Other countermeasures could neutralize a defensive system without destroying it. For example, Jastrow has proposed a relatively low-cost but easy-to-counter design in a recent article in the *New York Times Magazine,* written in collaboration with Zbigniew Brzezinski, President Carter's national security advisor, and Max Kampelman, President Reagan's new arms control negotiator.[6] The proposed scheme would involve two layers: the first would consist of 100 satellites each carrying 150 interceptor rockets similar to that currently being developed for the U.S. antisatellite system. Those few satellites within range would attack Soviet ballistic missiles during their boost phase. As the UCS group has pointed out, however, a "fast-burn" booster that completed its burn within the atmosphere would also be an effective countermeasure to this system. The infrared sensors of the homing interceptor warheads would be blinded by friction heat as soon as they entered the atmosphere. The second layer of Jastrow's proposed system would be made up of 5,000 ground-based rockets, each of which could intercept a warhead (or decoy) above the atmosphere as it approached its target.

At a political level, there are equally fundamental objections to the Star Wars proposal. Perhaps most importantly, whether or not any Star Wars system was intended to serve only defensive purposes, the other side would not see it as such. And, in fact, such a system makes much more sense as an adjunct to a first-strike capability than as a shield from a first strike. Because of its inevitable vulnerability, a Star Wars-type system would be fairly easy to neutralize at the beginning of a highly orchestrated first strike. But, in the face of a disorganized retaliatory strike by an unprepared *victim* of a surprise attack, it might be more effective. The Star Wars system would therefore tend to destabilize the balance of terror by increasing the advantages of a first strike. The fact that the Star Wars program has been launched at the same time that the United States is embarking on a huge buildup of exactly the types of accurate ballistic missile warheads that would be most useful in a first strike must be particularly disturbing to Soviet strategic analysts. Indeed, Yuri Andropov said as much four days after President Reagan's original Star Wars speech:

> The strategic offensive forces of the United States will continue to be developed and upgraded at full tilt and along quite a definite line at that, namely that of acquiring a first strike capability. Under these conditions the intention to secure itself the possibility of destroying with the help of ABM defenses the corresponding strategic systems of the other side, that is of rendering it unable of dealing a retaliatory strike, is a bid to disarm the Soviet Union in the face of the U.S. nuclear threat.[7]

The Soviet Union will do whatever is required to prevent the United States from rendering it incapable of launching a retaliatory strike. And, in view of the fact that only one percent or so of the current Soviet nuclear arsenal could obliterate U.S. urban society, the United States could not possibly unilaterally eliminate its mutual hostage relationship with the Soviet Union. The United States can, however, unilaterally launch a defense-offense arms race which, in addition to wasting the skills of tens of thousands of scientists and engineers, would induce enormous uncertainty and paranoia among worst-case analysts on both sides. Staving off such a defense-offense arms race was, of course, the major achievement of the 1972 ABM Treaty.

The debate over the credibility of the Star Wars critics therefore masks a much more important debate—between those who, knowingly or not, are attempting to launch a far more virulent new phase of the nuclear arms race and those who are trying to provide the insight that would allow the United States and the Soviet Union to avoid this danger. □

1. John Tirman, ed., *The Fallacy of Star Wars* (New York: Vintage Books, 1984), based on studies conducted by a group co-chaired by Richard L. Garwin, Kurt Gottfried, and Henry W. Kendall. See also the article-length version, Hans A. Bethe, Richard L. Garwin, Kurt Gottfried, and Henry W. Kendall, "Space-Based Ballistic-Missile Defense," *Scientific American* (Oct. 1984). Ashton Carter, *Directed Energy Missile Defense in Space* (Washington, D.C.: Office of Technology Assessment, 1984).
2. Richard L. Garwin and Hans A. Bethe, "Anti-Ballistic-Missile Systems," *Scientific American* (March 1968).
3. *Space-Based Missile Defense* (Cambridge, Massachusetts: Union of Concerned Scientists, March 1984).
4. "Missile-Killing Potential of Satellite Constellations," draft, Richard L. Garwin, Jan. 2, 1985.
5. McGeorge Bundy, George F. Kennan, Robert S. McNamara, and Gerard Smith, "The President's Choice: Star Wars or Arms Control," *Foreign Affairs* (Winter 1984), p. 264.
6. Zbigniew Brzezinski, Robert Jastrow, and Max M. Kampelman, "Search for Security: The Case for the Strategic Defense Initiative," *New York Times Magazine,* Jan. 27, 1985.
7. Sidney D. Drell, Phillip J. Farley, David Holloway, *The Reagan Strategic Defense Initiative: A Technical, Political, and Arms Control Assessment* (Stanford, California: Center for International Security and Arms Control, 1984), p. 105.