letters

Making nuclear war obsolete

Richard Garwin is highly critical of Robert Jastrow's book *How To Make Nuclear Weapons Obsolete* in his review. As part of his attack on Jastrow's support of the Strategic Defense Initiative, he contends that the book contains "bloopers." Although there may be validity in calling a couple of Jastrow's statements "bloopers," Garwin seems to be stretching hard to find most of them.

To take an example, the first one quotes Jastrow as stating that a missile launched from the Soviet Union takes 30 minutes to reach the United States. This is no blooper. It is a true statement. Garwin's complaint is that Jastrow should have stated that the flight time is 10–15 minutes from a submarine. This is the way Garwin would have put it. There is nothing wrong with Jastrow's choice of words. There are other places where Jastrow makes it clear what the missile flight time from a submarine is.

It is not worth the space in this brief letter to analyze what each man has said on each of these "bloopers," but it is interesting to consider why Garwin is so emotional in his attack. He claims that the book is "inconsistent and deceptive." This is because Jastrow failed to realize that Garwin's and Hans Bethe's statements against the workability of SDI referred only to a defense so good that it would effectively disarm the Soviet Union. Garwin's strong words make it clear that his analysis of the book is far from detached.

Garwin tries to put Jastrow in disagreement with President Reagan by noting Jastrow's statement, "our defense need only be good enough to guarantee the survival of most of our retaliatory forces." The President has emphasized the possibility of a defense so effective that it makes attack forces of little value. Actually SDI is currently only a research program. Its success will be measured by the cost of killing attacking missiles versus the attacker's cost of building more missiles. This research is only in its early stages. Garwin has the right to make his predictions of the effectiveness of the defense that can eventually be built, but no one should take his, or anyone else's, opinion too seriously. The devices that may eventually be deployed may bear no resemblance to those under discussion today. If the defense system proves to be ineffective, it will not be deployed. If it is partially effective, it can be used to protect our retaliatory forces and thereby enhance deterrence. I, for one, hope that it will prove to be so effective that essentially all of an aggressor's launched force can be destroyed at a cost per missile appreciably less than he must pay to add a missile. If this last situation arises, ICBMs with their nuclear warheads will, in a sense, become obsolete.

My impression from the record of the International Seminar on Nuclear War held at Erice, Sicily, in 1983 is that Garwin opposes SDI because he supports the doctrine of mutual assured destruction. This doctrine forbids any defense because all populations must be held as hostages. In my opinion we already have evidence of the failure of MAD. We Americans thought that World War II had shown war to be so terrible that the Soviet Union would join us in making use of the machinery of the United Nations to outlaw armed invasions. The large investment by the Russians in their armed forces, their invasions of Hungary, Czechoslovakia, Poland and Afghanistan, and their support of the invasion of South Korea by North Korea have shown that we were wrong. The threat of mutually assured destruction should have enhanced their desire to cooperate. It evidently has not been sufficient.

From this evidence for the failure of MAD, I draw the conclusion that we must take measures to survive a possible nuclear attack. Sooner or later someone will make a mistake in their willingness to attack others, and nuclear war may result. In that case any form of defense that we have deployed will be desirable. This, of course, includes SDI, shelters and evacuation.

The intensity of emotion that Garwin shows is understandable when we consider that the debate under way is one involving the lives or deaths of millions of Americans. Nevertheless it is critically important that we discuss deci-

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sions concerning our national defense with the highest possible degree of scientific detachment if we are to arrive at the most reasonable courses of action.

ARTHUR A. BROYLES
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1/86

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In his review of Robert Jastrow's *How To Make Nuclear Weapons Obsolete*, Richard Garwin is correct in implying that "Soviet acquisition of a defense with a promise of later reductions in their offensive force" would be regarded as highly threatening to the United States, and would undoubtedly be met by an increase of US offensive forces. This process could very well be destabilizing and could lead to an escalation of the arms race.

Garwin, however, ignores another possibility—namely that Soviet deployment of defensive interceptors would be accompanied by a *simultaneous* reduction in Soviet offensive missiles. US policy makers, faced with this contingency, would have to decide whether they prefer fewer Soviet offensive missiles aimed at the US and a partially effective Soviet defense, or more Soviet offensive missiles with a defense that the US chooses to overwhelm. As US citizens living in a town that is probably high on the Soviet target list, we would much rather be faced with fewer Soviet offensive missiles, even if these are protected by interceptors. We would hope that US policy makers would also prefer fewer Soviet offensive missiles and would not automatically escalate the US offense in response to such Soviet actions.

Thus there are both a stabilizing and a destabilizing way to introduce defense. Deployment of defense without simultaneous and compensating reduction in one's own offense is destabilizing; deployment of defense with simultaneous reduction in offense is at least theoretically stable, and could lead to winding down of the offensive-arms race. This process of defense-protected build-down has been described elsewhere, for example in the article by Zbigniew Brzezinski, Max Kampelman and Jastrow mentioned in Garwin's review.

Such a defense-protected build-down, though it could be initiated without modification of the ABM treaty, would eventually require modifications of the treaty should the number of interceptors exeed the treaty limit of 100. We would hope that analysts such as Garwin will exercise their considerable talents to formulate acceptable exchange ratios (the number of interceptors allowed for each missile dismantled) for a modified ABM treaty. This task is admittedly difficult, but we believe that analysis of such possibilities deserves the most serious attention. In short, we are not convinced that Garwin's ultimate confrontation of 1000 strategic warheads on each side (suggested in his review), though stable, is good enough. Defense-protected build-down appears to us to afford a possible way out of a permanent dependence on mutually assured destruction.

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I read Richard Garwin's review of Robert Jastrow's book *How To Make Nuclear Weapons Obsolete* with great interest. Garwin, in his review, takes Jastrow to task for alleged errors. For example, Garwin states that an 8-ton shielding load on a missile similar to the Soviet SS-18 would result in an offload of only one out of ten warheads. Jastrow's book states that all ten warheads would be lost. I asked our systems-analysis contractors to check these calculations. They concluded that Jastrow's calculations, reported in *How To Make Nuclear Weapons Obsolete*, are correct. Quite simply, Garwin is wrong.

It is essential that our leading physicists provide the country with technically correct information. This is the only way we can make informed decisions about the future defense of our nation.

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1/86

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In seasons when professional objectivity is especially stressed by political partisanship, those organs of professional discourse that "keep their cool" by maintaining standards of professional communication and dispassionate peer review become as relatively rare as they are sorely needed. It was therefore distressing to see PHYSICS TODAY fall away from the mark as seriously as it did in the December issue when it published Richard Garwin's review of Robert Jastrow's book *How To Make Nuclear Weapons Obsolete.*

It is a principle of several millenia's age in human affairs that "no man is an apt judge of his own cause." Richard Garwin is an extremely well-known protagonist in the political arena into which Robert Jastrow's book ventured and is also very widely known

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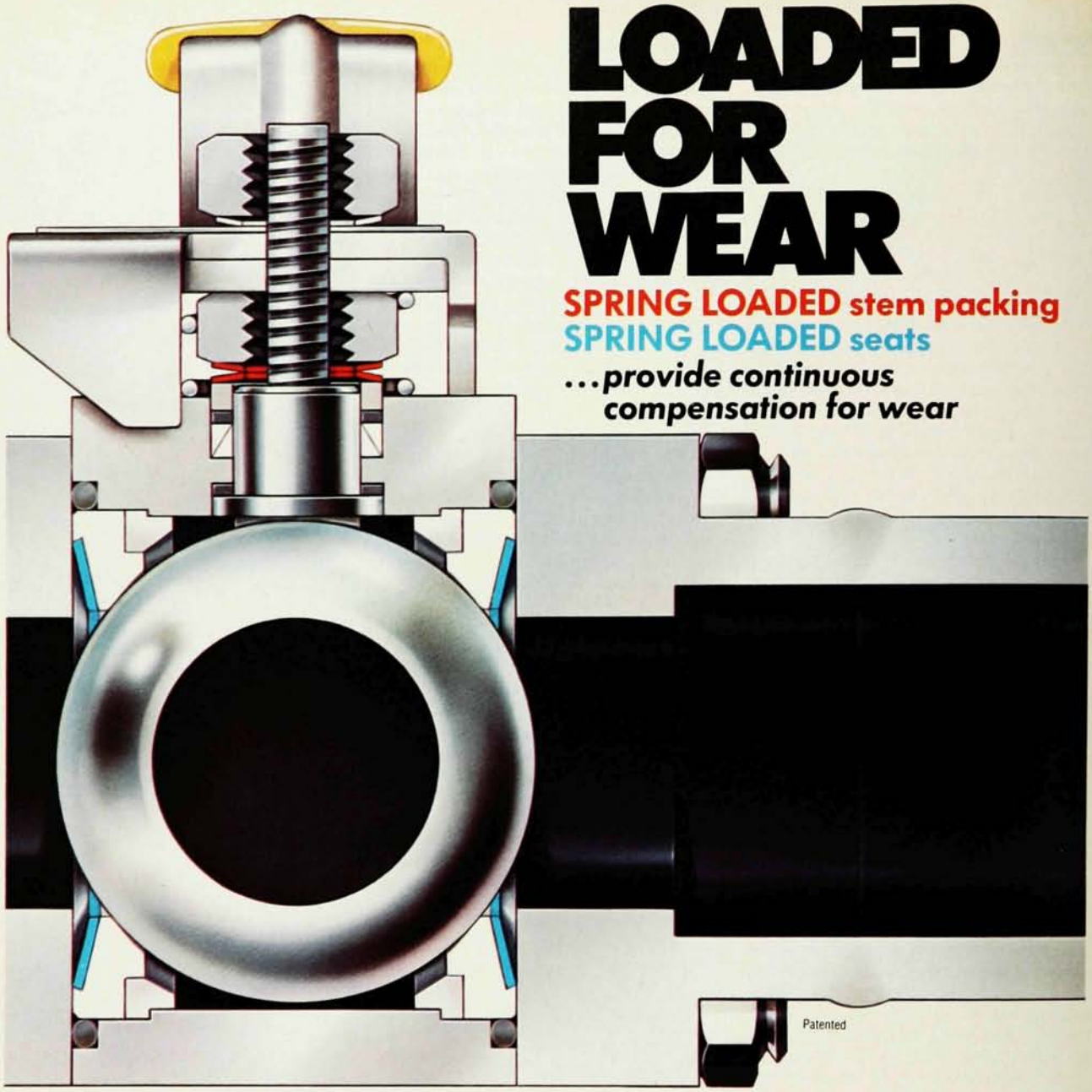

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to be a personal political opponent of Jastrow. To license Garwin to review Jastrow's work in any of the senses in which PHYSICS TODAY book reviews are normally read is farcical to knowledgeable readers but possibly profoundly misleading to the less well informed.

It is also thoroughly objectionable to see technically flawed arguments injected into a PHYSICS TODAY book review, as Garwin did in raising his extensively discredited calculation of armoring ICBMs versus offloading their reentry vehicles. The American Physical Society is justifiably proud that its journals are comprehensively peer reviewed, and it is correspondingly bizarre that PHYSICS TODAY—the community's trade magazine—has commenced to merchandise repeatedly exposed errors while evading the peer-review process via its book-review mechanism.

With a membership of 30 000, The American Physical Society can readily provide the editorial staff of PHYSICS TODAY with an adequate population of book reviewers who are at once technically competent in any pertinent subject area and reasonably detached from whatever political strife may bedevil it. There can be no excuse for repeating the lapse of editorial judgment that occurred in publishing the Garwin review of the Jastrow book.

LOWELL WOOD

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GARWIN REPLIES: Arthur A. Broyles reads "emotion" into my review. If there is emotion, it is the distress one feels at a PhD exam that does not go right with the candidate. "Inconsistent and deceptive" represent not emotion but a judgment—one that readers can test for themselves. Whether Jastrow "failed to realize that Garwin's and Hans Bethe's statements . . . referred only to a defense so good that it would effectively disarm the Soviet Union" is unknown to me. I object that Jastrow does not *acknowledge* this point, which we made forcefully in the *Commentary* letter that he cites.

Broyles should reread my review to see that my complaint is with Jastrow's assertion that early-warning satellites "only give us a thirty-minute warning," when for the universally assumed simultaneous launch of Soviet ICBMs and SLBMs the warning would occur at best 10–15 minutes before explosion.

Finally, I do support the survival of the US and its allies by the preservation of a capability for assured destruction of the Soviet Union if they should destroy us. I yearn for a world in which no society is vulnerable to the aggression of another, but our desire for peace and protection should not blind us to the need for a sufficient but not excessive force, on which our survival will depend for the foreseeable future. As the Joint Chiefs of Staff have long recognized, arms control can contribute in an important fashion by limiting the forces on the other side and so allowing security at the lowest level of potential destruction.

Alvin M. Weinberg and Jack N. Barkenbus find "not good enough" a stable confrontation of 1000 offensive warheads on each side. Indeed we can hope to do better, but more readily from that posture than from the present one. "Defense-protected build-down" would be an option for a defense that protects unambiguously only the missile silos, but with a boost-phase defense that goes far beyond silo defense and has more in common with silo attack, it is *not* "theoretically stable."

Robert Jastrow dissents (January, page 9) from my review of his book and criticizes some of my own publications. I respond first to points in the review to which he objects:

▶ *Diffraction effects.* Not only is Jastrow's example *wrong*, his discussion (page 86 of his book) is misleading to a nontechnical person and appalling to a physicist: "When the laser beam is reflected by a mirror, some of the light in the beam spills over the edge of the mirror into the surrounding space. This tends to spoil the beam's perfection. . . ." *That* is not the source of diffraction spreading!

▶ *Shielding an SS-18.* In his letter Jastrow says "8 tons of shielding reduces the payload of the SS-18 by approximately 4 tons," but that is not quite what he says in the book on page 73:

> If the skin of an SS-18 missile, for example, were made another tenth of an inch thicker, the extra weight of the stronger casing, added up over the entire surface of the huge rocket, would amount to eight tons. But eight tons is twice the weight of all the warheads on the SS-18. If you tried to strengthen the SS-18 in this way, it would not be able to carry any warheads.

But at a meeting of AAAS in New York on 28 May 1984, he said otherwise: "Shielding an SS-18 with 4 tons of ablative material (1–2 g/cm^2) would reduce the 8-ton payload by 50% . . . the right thing to do is simply to deduct the ablator weight from the payload." He "explained" his position in a letter to Herbert Lin on 27 June 1984: "The basic rocket equation states that one must subtract from the payload all weight that has been added to the first stage even though the first stage is discarded after burnout." He insists that *each* rocket stage provide the same

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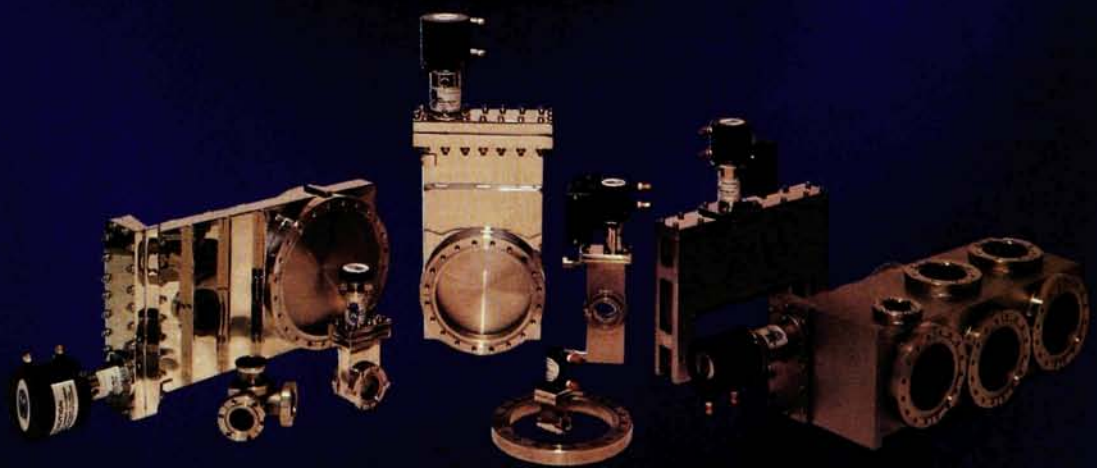

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velocity gain to the payload for the armored rocket as for the naked one. Clearly it is here that Jastrow has gone wrong; for a two- or three-stage rocket, a payload reduction equal to the first-stage shielding weight would restore the velocity gain of the first stage but would result in a large increase in last-stage velocity gain.

(Abrahamson and Jastrow both err in claiming that "Garwin says 8 tons of shielding spread over the skin of an SS-18 reduce its payload by the weight of one warhead, which is roughly 350 kilograms." I said in my review: "An eight-ton extra load on the first stage of a rocket does not require an equal reduction in payload to reach targets at the same range. At a public session of AAAS in May 1984, I showed Jastrow that the normal two- or three-stage rocket need offload only one out of ten warheads or thereabouts to compensate for the extra load." *Four* tons was Jastrow's shielding then, and he said it cost 4 tons of payload. My 1984 estimate would have given two warheads offload to compensate 8 tons of first-stage shielding—not all ten warheads, but not one warhead either. His approach would have given 8 tons of penalty for 8 tons of shielding.)

What are the facts underlying this murky trail from error toward SDI-certified orthodoxy? Consider an SS-18 with shielding mass S added to the skin of the first stage. Some payload reduction C will restore the 7-km/sec total velocity gain $V_r = V_1 + V_2$ assumed available from the two-stage missile before adding the shielding.

Assume, for example, a 220-ton SS-18 with an 8-ton payload—say a 4-ton bus plus ten 0.4-ton MIRV warheads. Assume the missile has a velocity gain of 3.5 km/sec in each stage, before hardening. With the payload reduced by C tons, the required velocity gain of the first stage, $V_r - V_2 < V_r/2$, can now be achieved with some S tons of shielding added to the gross weight of the missile and discarded with the first-stage tankage. If we assume the rocket exhaust speed V_e is 3 km/sec (a specific impulse of 300 sec), we can calculate the fractional dead weight (non-fuel mass) in each stage that limits the velocity gain. The first stage has mass M_1, of which a fraction f is dead weight (engines plus tanks). Similarly, the stage-2 mass is M_2 and its mass empty is fM_2. For payload mass P and rocket gross mass G without laser armor,

$$G = M_1 + M_2 + P$$

In the absence of first-stage armor the velocity gain of the first stage is

$$V_1 = V_e \ln(M_1 + M_2 + P)/(fM_1 + M_2 + P)$$

and

$$V_2 = V_e \ln(M_2 + P)/(fM_2 + P)$$

For the parameters assumed so far, we calculate $f = 0.149$, $M_1 = 178.05$ tons, $M_2 = 33.95$ tons.

The reader may verify that the following table properly represents a consistent payload reduction of C tons for a first-stage armoring of S tons:

C (tons)	S (tons)	V_2 (km/sec)	V_1 (km/sec)
0.0	0.00	3.50	3.50
0.4	2.58	3.56	3.44
0.8	5.36	3.63	3.37
1.2	8.36	3.70	3.30
2.0	15.13	3.85	3.15
4.0	39.05	4.30	2.70

Interpolating, we see that 8 tons of shielding can be carried on the first stage by offloading about 1 ton—one-quarter of the warheads—some 8 times less than what Jastrow's principle would require. Considering that one does not have to carry bus-maneuver fuel for a warhead not carried, the warhead penalty would be smaller than that estimated here.

The discussion at the AAAS meeting was about Jastrow's claim that "four tons of ablative material will reduce the 8-ton payload by 50%." The present calculation shows that the 4 tons of shielding requires 0.6 tons of payload (reentry vehicles plus bus fuel) to be offloaded to maintain SS-18 range—*not* the 4 tons claimed by Jastrow. Indeed, 4 tons of payload reduction will allow 39 tons of first-stage armor.

If by terming me a "personal political opponent of Jastrow" Wood means that Jastrow has often taken in a highly political and personal way the opposite side of questions in fields in which I have long worked, Wood is right; but he has confused victim and perpetrator. Wood carries into the pages of PHYSICS TODAY his own campaign attempting to discredit me. On 20 May 1985, the *Wall Street Journal* published a letter from Wood containing a broader attack: "[Garwin's] public statements against strategic defense aren't taken seriously by his colleagues in the defense community." A few of my colleagues who have been involved in such work wrote the *Journal* as follows on 17 June 1985:

> Lowell Wood's letter . . . attacked Richard Garwin's condemnation of the Administration's Star Wars proposals by a personal attack on Dr. Garwin himself. As associates of Dr. Garwin, we wish to assert that Dr. Wood's remarks and implications about Dr. Garwin's lack of credibility among his colleagues are wrong. Dr. Garwin has been and remains for us a figure of extraordinary ability, integrity, and credibility.

The letter is signed by Luis Alvarez,

continued on page 142

letters

continued from page 15

Sidney Drell, Norval Fortson, Marvin Goldberger and Malvin Ruderman.

Wood "doth protest too much" in writing, "No man is an apt judge of his own cause." In the book, Jastrow says:

> I am particularly indebted to Dr. Gregory Canavan of the Los Alamos National Laboratory, Dr. Lowell Wood of Lawrence Livermore National Laboratory, and Major Simon P. Worden of the Department of Defense, who have generously given of their time in many long discussions and meetings over a period of more than a year. I have also profited greatly from conversations with General James A. Abrahamson of the Department of Defense. . . .

In his Senate testimony (22 April 1985, Senate Appropriations Committee) Jastrow states: "What about myself? I am not trying to do my own analysis. I am only translating into lay understandable terms the research being done in weapons laboratories and the Pentagon." Thus, Wood is pleading *his* own cause, both personal and programmatic.

Major Worden is Military Aide to General Abrahamson, director of the SDI Program Office. He was also Military Aide to James C. Fletcher, who led the group of some 50 industrial and government scientists and engineers that produced in August 1983 the report commonly known as the Fletcher report. In early 1984, at the very inception of SDI, Worden managed the preparation of an attempted refutation—I'll call it a critique—of *Directed Energy Missile Defense in Space, A Background Paper of the Office of Technology Assessment*, which was presented in Congressional testimony on 25 March 1984. The background paper, prepared by Ashton B. Carter, was very critical of the prospects for effective space defense. Wood and Canavan contributed to the critique. The director of OTA asked an independent committee to read both the background paper and the critique, which was communicated by Deputy Secretary of Defense William H. Taft IV, who requested that OTA withdraw the published background paper. On the basis of the reports of that committee—Charles H. Townes (Berkeley), Lieutenant General Glenn Kent (USAF, retired) and William J. Perry, former undersecretary of Defense—OTA wrote Taft as follows: "There are no technical errors or flawed assumptions [in the background paper] that would seriously mislead either a lay or a technical reader." It was the Worden critique that was characterized[1] by Major General John C. Toomay as "not a competent document. It contains falsehoods, irrelevancies and misinterpretations." Two of the critique's arguments are perpetuated by Jastrow in his book and his complaint: those pertaining to the cost of fast-burn boosters and to satellite numbers.

▶ *Cost of fast-burn boosters.* Jastrow ascribes to Fletcher a quoted cost of "at least $100 million per warhead" for a fast-burn booster. On page 74 of the transcript of his Senate testimony Jastrow estimates the cost as "$100 million per warhead, perhaps $200 million." My own numbers come from contractor studies done for the Fletcher committee. (A letter, dated 29 July 1983, from E.A. Fitzgerald, McDonnell–Douglas Corp, to the Fletcher study cites design number 16 for a two-stage, solid-fuel, single-RV missile with 50-sec burnout at 80-km altitude as costing $11.1 billion for 1000 missiles, including research, development, testing, engineering and 10-year spares. A second letter from Fitzgerald, dated 26 July 1983, states, "It includes all costs except the manpower to operate and maintain the system and the transporter or silo in which the missile is based.") Jastrow charges that "in Garwin's discussions of the fast-burn Midgetman as a Soviet countermeasure, he set the cost at $5 million per warhead initially, and then raised it to $10 million per warhead." In our March 1985 letter to *Commentary*, cited by Jastrow, we asked, "What would be the cost trade-off if the Soviets were to deploy a cluster of 3000 small three-warhead fast-burn ICBMs at a cost of about $50 billion?" That $5.6 million per warhead is entirely consistent with my nominal $10 million per warhead for a *single-warhead* Midgetman. (The McDonnell–Douglas letter of 29 July 1983 reads, "It appears that using 3 RVs per missile could save about one-third of the cost of 3 RVs each on separate missiles. . . ." With some economy of scale in building 3000 missiles instead of 1000 as in the previous example, a reduction in cost from $6.7 million to less than $5.6 million per warhead would be expected.) And unless the US is assumed to strike first, the Soviets can avoid the high cost of survivable basing for their counter to SDI.

▶ *Satellite numbers.* A study by the Union of Concerned Scientists (March 1984) estimates that 25-MW, 2.7-micron lasers with diffraction-limited 10-m-diameter mirrors in orbit at 1000-km altitude would have to number 2400 if deployed uniformly worldwide to destroy 1400 Soviet boosters in 100 seconds, assuming booster hardness of 200 MJ/m^2 and a range of 3000 km to the target. Within a month, an errata sheet for that report and my Senate testimony specialized the deployment to orbits of 60° inclination (resulting in

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a factor of 3 enhancement of local firepower over the Soviet Siberian silos), and we cited a requirement of 700 lasers at the same altitude and range. By August 1984 we had included in that estimate the prospect of firing for a shorter time at closer targets, as would be possible if the boosters two or three decades hence were spread across the Soviet Union as they are now. The new estimate was 300 lasers at 1000-km altitude. More general and precise calculations are in a recent article of mine, which does indeed contain[2] a "79-laser" estimate for zero-altitude deployment against something like the existing deployment of Soviet boosters, but more relevant is the *reactive* Soviet threat, in which the boosters would be deployed in a region the size of Ohio. Then 3000 single-warhead fast-burn boosters would exhaust an optimum constellation of 2000 lasers of 3-sec re-targeting time or 1000 lasers of 0.1-sec re-targeting time.

Ironically, Canavan's calculations contained in the critique of 4 June 1984 and his further calculations of August 1984 (one month and four months after the Senate testimony in which I reduced by a factor of 3 the number of required lasers by concentrating them over the silos instead of deploying them uniformly worldwide) continued to assume uniform worldwide deployment of satellites. The factor of 3 "error" Canavan incurred was concealed by a real factor of 3 error caused by his averaging the "kill rate" for a laser against targets at different distances rather than adding the required kill time.[2] (Canavan's satellites numbered 144 for boosters of *half* the hardness that we assumed, and for which we estimated a requirement of 300.) Canavan and Worden had committed the deputy secretary of Defense to the principle that the required number of laser satellites increased only as the square root of the number of enemy boosters to be killed—a "virtue" propagated worldwide by the efforts of the SDI Office, even though its derivation was faulty and it holds in no relevant parameter regime.

▶ *The submarine deterrent.* For many years in articles and Congressional testimony I have advocated the development and deployment of smaller submarines, each carrying fewer warheads than the ones on which we rely at present. What does the formal report of the Scowcroft commission say about antisubmarine warfare? I reproduce *in toto* the paragraph headed "Anti-submarine warfare":[3]

> The problem of conducting open-ocean search for submarines is likely to continue to be sufficiently difficult that ballistic-missile sub-

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marine forces will have a high degree of survivability for a long time. Nevertheless, the prospect of concentrating all of the submarine-launched missiles at sea in a few very large submarines raises some concern. Communication links with submarines, while likely to improve, will still offer problems not present for land-based systems.

SDI's Worden has often invoked submarine vulnerability in support of SDI. Jastrow's unnamed "Pentagon nuclear planners" (PHYSICS TODAY, January, page 9) may or may not be knowledgeable, honest or unbiased. In any case, we have the judgment of Walter Munk, who in a public meeting in December 1984 summarized 20 years of his work for the US Navy both on behalf of US capabilities in ASW and in the interests of improving the survivability of our strategic submarine fleet. His analysis of nonacoustic threats to submarines has led him to the view that there is no significant emerging vulnerability on that score. He believes that the US submarine fleet is *less* vulnerable than it was a decade ago, and that this trend is continuing. Drell and I conducted a study for the Defense Department with the assurance "that all relevant ASW information would be made available to us so that, in particular, our study would not be vulnerable to criticism that some of our conclusions would be altered if only we knew information to which we were denied access."[4]

▶ *Satellite survivability.* The techniques ascribed to Edward Teller in Jastrow's rebuttal are employed in my attempt to design survivable warning and communication systems.[5] They are suitable for small and cheap satellites—not for costly laser battle stations.

▶ *Countermeasures.* The views and powers of Mikhail Gorbachev are unknown to me and probably to Jastrow. I know that *I* would respond to SDI systems with countermeasures and increased offensive forces, and that is also what the Soviets *say* they will do. Stephen Meyer of MIT has recently published[6] an apt article on the topic, which I recommend.

▶ *Launch costs to orbit.* The space shuttle was committed to provide a cost of $50 per pound to low Earth orbit. The actual charge is some $1500 per pound and the operating cost about twice that, without repayment of investment or R&D. Former NASA historian Alex Roland cites[7] the early promises of NASA officials of $5-per-pound costs. The US aerospace industry has done great things, but it has *not* fulfilled the promises of the shuttle enthusiasts—who include former

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NASA Administrator Fletcher and former Shuttle Program Manager Abrahamson.

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RICHARD L. GARWIN
IBM Thomas J. Watson Research Center
2/86 *Yorktown Heights, New York*

APS and SDI

Let us define SDI-1 as a population defense of such incredible efficiency and reliability that it would truly make nuclear weapons obsolete and SDI-2 as a ballistic-missile-defense system similar in purpose to the ABM systems of Presidents Johnson and Nixon (and in violation of the treaty Nixon finally agreed to).

SDI-1 is what President Reagan continues to describe to the public and to the Soviet leaders as SDI. But any competent physicist knows SDI-1 is impossible as long as the Soviet Union stays in the arms race. To call a spade a spade, it is a scientific hoax. I believe The American Physical Society has the urgent duty to warn the public and the President of what is perhaps the greatest scientific hoax in the history of our country. Remaining silent gives the impression that it is not a hoax. Even worse, forming an APS study committee without first warning the public is a signal to the public that APS thinks that SDI may well make nuclear weapons obsolete.

Because it is possible that the President has not received clear and competent scientific advice, it is important for him to see that the organization that represents American physicists is so strongly opposed to SDI-1. The American public, which depends on the advice and leadership of their President, certainly has not received competent advice. In fact, the latest public-opinion polls show the public is in favor of proceeding with SDI. The hoax is of such enormous magnitude that the public is now in the process of being cheated out of over 10^{12} dollars. Even more important than this loss of money and resources is the loss to our national security and the loss of new possibilities of arms reduction. I feel it is mandatory that the public receive scientific advice it can trust—via an APS public warning of the hoax that is now in progress.

I am using this letter to request the APS Council and officers to issue a public statement along the above lines before the results of its narrow and limited SDI studies are known. The following is a suggested wording of a proposed public statement that I have submitted to The American Physical Society Council for action at its next meeting:

> The Council of the APS feels it has the responsibility to warn the public and officials of our government that no amount of effort and cost could provide a nuclear weapon defense of population so efficient and reliable that it would make nuclear weapons obsolete; at least not as long as the Soviet Union stays in the arms race. Furthermore, anyone who claims the possibility of such an invincible shield against all forms of delivery, whether he knows it or not, is engaging in a scientific hoax which could ultimately lose the US taxpayer over a trillion dollars.

JAY OREAR
Cornell University
11/85 *Ithaca, New York*

WILLIAM W. HAVENS JR REPLIES: At the APS Council meeting, 26 January 1986, council member Michael Fisher introduced a motion prepared by Jay Orear. Following lengthy discussion, Thomas H. Moss, chairman of POPA, proposed the substitute motion "that the APS President appoint a special committee to examine the desirability of an APS Council statement on SDI and if a statement is desirable draft a proposed statement." The committee is to report its recommendations to the council for consideration at the next council meeting, on 27 April 1986. The substitute motion was approved by the council and all of us will have to wait until 27 April to find out what the APS Council will decide on this important matter.

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Star Wars petition

In his article on the nationwide campus anti-SDI petition drive (November, page 95) William Sweet quoted Lisbeth Gronlund and John Kogut as saying that few physicists would be eager to publicly defend SDI, or "Star Wars." While this may well be true at Cornell and Illinois, those of us who organized