

# SPACEWATCH

# Fortnightly

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## START Without SDI Limits?

Reagan Administration hardliners celebrated a victory when President Reagan and General Secretary Gorbachev released their official joint summit statement last week. Gorbachev agreed to get on with the business of strategic arms reductions, and let Congress and the White House fight the battle over limiting SDI and preserving the ABM Treaty. But a separate peace on START will be fragile, for the links between offensive and defensive arms control are fundamental, and cannot be wished away while cutting a deal.

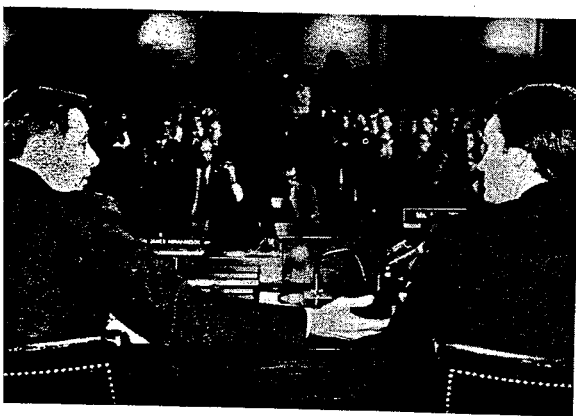
Arms negotiators love dancing metaphors. "It takes two to tango," they are fond of saying. But no matter how smooth the footwork when reducing strategic offensive arms, attempts to conclude a START agreement while ignoring the defensive side of the strategic equation will prove shortsighted and futile, as Star Wars comes back to haunt the talks.

"We still consider that the introduction of massive defenses would lead to deterioration of strategic stability," said Dr. Roald Sagdeyev, an adviser to Gorbachev on arms control, at a press conference last Thursday.

At the summit, the Soviet delegation proposed to end the legal debate over "broad" versus "narrow" interpretations of the ABM Treaty by setting specific limits on the performance of SDI technologies, said Sagdeyev. "We were looking for more flexible formulas" to link ABM Treaty compliance to a possible arms agreement, said Sagdeyev. But Reagan Administration officials rejected any specific limits on SDI. "The U.S. administration did not want to look at this problem in a constructive way," he said.

In the end, the Soviet delegation agreed to sidestep the issue, perhaps counting on Congress and SDI's own technical problems to kill the more ambitious elements of the program. US officials fairly gloated when describing their success in protecting SDI. "There's nothing in the statement that would give him [Gorbachev] the basis for declaring it a violation of the ABM Treaty if we were to conduct experiments under the broad interpretation," a senior Administration official told the press on Thursday.

The Soviets, he agreed, had "thrown in the towel." By stonewalling on SDI, the administration seems to be carrying on negotiating tactics that it feels brought success during the talks on intermediate-range nuclear forces (INF). (Continued on Page 2)



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moderated by E.J. Markey. (121487SWEN)

NOTE: Spacewatch Fortnightly will be taking its semi-annual publishing break. The next issue will appear on January 11, 1988. Best Wishes for the Holiday Season.



## TREATY WATCH

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Both Reagan and Prime Minister Thatcher appeared anxious to take credit for the INF Treaty. In their view, NATO's determination to go ahead with the deployment of Pershing II and cruise missiles despite public protests brought the Soviets back to the negotiating table.

This version of events is comforting to the extent that it puts Western leaders where they like to see themselves, in the driver's seat of history. But it is a dangerous delusion, because it obscures valuable lessons from the long and tortuous trail to the INF treaty.

Simply put, the primary contribution of the United States to the INF treaty consisted in showing up at the table with a negotiating position in 1981, and not walking away in 1986 when the Soviet Union decided it wanted a deal.

Away from the table, the United States deployed nuclear missiles in Europe in 1983, provoking a Soviet walkout. That deployment is now celebrated in the West as the step that made the current agreement possible. But without new Soviet leadership, the US missiles would more likely have torpedoed any chance of an agreement.

Reagan Administration officials now admit that they never expected or intended the Soviet Union to accept the initial US negotiating position. And the US never budged, making no significant concessions during the entire course of the talks.

Under Gorbachev, meanwhile, the Soviet Union dropped one demand after the other. The rapidly growing French and British nuclear arsenals will remain untouched by the treaty. Soviet SS-20 missiles based in the Far East will disappear, along with Soviet superiority in shorter-range missiles. Most surprisingly, the Soviet leadership accepted verification measures of unprecedented strictness and intrusiveness -- so strict, in fact, that the US backed away from some of its own proposals when Gorbachev unexpectedly accepted them.

The INF treaty was achieved on American terms, but at the initiative and insistence of the Soviet Union. President Reagan and the rest of NATO played an essentially passive role.

If a US president had made a similar series of concessions, Congress would be in an uproar. But Soviet leaders have apparently decided to live with a deal in which, at least in arms accounting terms, they get the short end of the stick.

Why? Is the Soviet leadership desperate to redirect spending from military to civilian projects? Perhaps, but the fiscal benefits of eliminating these nuclear forces are tiny. Nor can one seriously think that the US has suddenly learned how to bludgeon the Soviets into diplomatic submission just as the Reagan presidency comes to a finish.

The key to the Soviets' new-found flexibility, and to the INF accord, is an apparent shift in attitudes. Statements by Gorbachev and other Soviet leaders on "reasonable sufficiency" in

defense remind Westerners of Robert McNamara's attempt to reform the Pentagon in the 1960s, as he asked the armed services, "How much is enough?"

Other themes in recent Soviet writings, and in Gorbachev's public remarks last week, are reminiscent of the "common security" ideas promoted by Olof Palme, former prime minister of Sweden. National security cannot be a zero-sum game, said Palme, for a nation can truly guarantee its own security only through cooperative arrangements that also promote the safety of its potential enemies.

This approach to arms control and security policy is prevalent throughout much of Western Europe, most prominently in West Germany. Defense intellectuals in the US generally dismiss such ideas as "utopian and unrealistic." But in the wake of the INF accord, it may be the "realists" who are out of touch with reality.

If Western governments refuse to explore the implications of these Soviet statements, a historic chance may be missed. Simply trying to take advantage of Soviet flexibility -- driving ever harder bargains in future negotiations on strategic nuclear arms, Star Wars, and conventional arms -- will waste valuable time. At worst, such tactics could discredit efforts to achieve real progress in relations between the Soviet Union and the United States, inviting a tragic backlash. □

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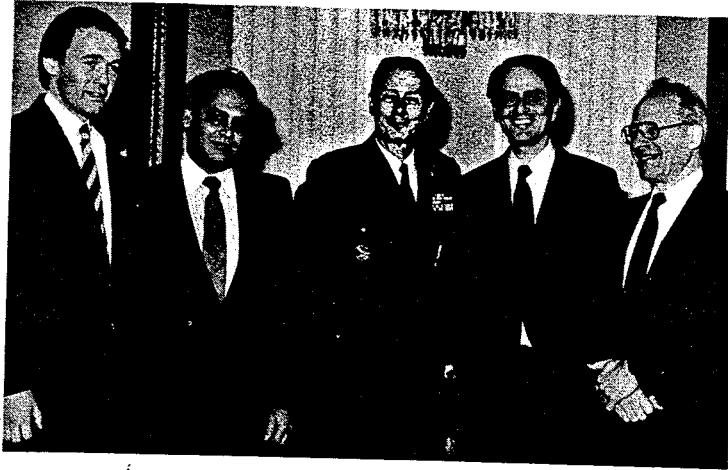
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## Is The Strategic Defense Initiative In The National Interest?



From Left-to-Right: Rep. Edward Markey (D-MA), Mr. Richard Perle, Lt. Gen. James Abrahamson, Dr. Carl Sagan and Dr. Richard Garwin. [All photographs by Stacy Duncan.]

DR. CARL SAGAN  
DR. RICHARD L. GARWIN

*Versus*

LT. GENERAL JAMES A. ABRAHAMSON  
THE HONORABLE RICHARD N. PERLE

*A Debate Moderated By*  
THE HONORABLE EDWARD J. MARKEY

Tuesday, November 17, 1987  
Cannon House Office Building  
Washington, DC

### PROCEEDINGS

REPRESENTATIVE MARKEY: Ladies and gentlemen, friends, and colleagues. I want to welcome you here today to the debate on the question: Is the Strategic Defense Initiative in the National Interest?

To address this topic, we have with us two men who might be characterized as the architects of the President's Strategic Defense Initiative, and two of the program's most formidable critics.

Each of our participants holds an impressive set of credentials, and unparalleled advocacy skills.

There is little doubt that they will do credit to their respective points of view. This debate has been organized by SPACEWATCH, a nonprofit research and investigative organization.

As the founder of SPACEWATCH, I want to thank the staff under Eric Fersht for their capable organizing effort to bring us all together. This event could hardly be more timely.

Three weeks from today, President Reagan and General Secretary Gorbachev will be in the midst of a major summit meeting here in Washington. While the primary purpose of the summit will be to conclude a long awaited treaty to eliminate intermediate- and short-range missiles in Europe, it will also set the stage for other critical negotiations. For the INF treaty is just the tip of the iceberg of arms control measures needed to reduce the enormous strategic nuclear weapons arsenals of both superpowers. Whether the Strategic Defense Initiative proves to be a bargaining chip or an impediment to achieving deep reductions in strategic nuclear weapons remains to be seen, but our hope is that this debate will provide a provocative prelude to the Washington summit.

Moreover, I would hope that our distinguished panelists will provide insights and some effective debating points for those of us who will wrestle with these difficult questions in the Congress and, equally important, to those who will be running in 1988 for the Presidency of the United States.

At this debate we intend to disprove a pessimistic axiom written by British critic Cyril Connolly, who once said, "Where there are two alternatives: one intelligent, one stupid; one noble, one ignoble; one serious and sincere, one undignified and one false; one far-sighted, one short; we invariably

choose the latter."

We have agreed to the following ground rules for this debate:

By a flip of the coin, we have agreed that the speaking order will be as follows: We will open with Richard Perle, then to Richard Garwin, then to James Abrahamson, and then to Carl Sagan. Opening statements will be limited to five minutes, and we will be strict about adhering to these time limits. In the front row we have a timer who will signal the Chair and the speakers when the clock is down to 30 seconds.

For rebuttals, we will reverse the speaking order allowing no more than four minutes for each panelist.

Following the rebuttals, we will allow questions between the panelists. In the original order, each panelist will be allowed one question directed to one or both of the opposing panelists. Responses will be no more than two minutes.

And finally, each speaker will be given three minutes for their closing statements, and the closing statements will be presented in reverse order of the opening statements.

Then it will be the audience's turn. Everyone should have received a card upon entering the room. If you would like to put a question to one of the panelists, write your question on the card and the panelist you would like to address it to, and also your name. There will be Spacewatch staff members with name tags to pick up the cards throughout the debate. I will then put the questions to the panelists. We will try to hold as much time as possible for your questions.

Without any further delay, let me introduce our panelists:

Dr. Carl Sagan is the David Duncan Professor of Astronomy and Space Sciences and Director of the Laboratory for Planetary Studies at Cornell University. He has played a leading role in the Mariner, Viking and Voyager expeditions to the planets.

In addition to more than 600 published scientific papers and popular articles, Dr. Sagan is author, co-author or editor of more than twenty books, including *Broca's Brain*, *Comet*, *Contact*, and *The Dragons of Eden*, for which he was awarded the Pulitzer Prize. His Emmy and Peabody Award

winning television series Cosmos became the most widely watched series in the history of American Public Television, and has now been seen in 60 countries by over 300 million people. The accompanying book, also called Cosmos, was on the New York Times bestseller list for 70 weeks and is the best-selling science book ever published in the English language.

Lieutenant General James A. Abrahamson is Director of the President's Strategic Defense Initiative Organization. He is responsible for managing and selecting key research and development programs designed to eliminate the threat posed by strategic nuclear ballistic missiles, and to increase the contributions of defensive systems to U.S. and allied security. The General is a command and test pilot with more than 3000 flying hours.

He has a Bachelor of Science degree in Aeronautical Engineering from the Massachusetts Institute of Technology and a Master of Science degree in the same field through the Air Force Institute of Technology at the University of Oklahoma. In addition, General Abrahamson holds three honorary doctorate degrees in Engineering from New York University, from Utah State University, and from Rensselaer Polytechnic Institute.

The Honorable Richard Perle. From 1981 until May 1987, Mr. Perle served as Assistant Secretary of Defense for International Security Policy. From his office at the Pentagon, he was responsible for theater and strategic nuclear weapons policy, trade and technology exports, European and North Atlantic Treaty Organization policy, and negotiations between the United States and its western allies and the Soviet Union.

Since leaving the Department of Defense, Secretary Perle has become a Resident Scholar at the American Enterprise Institute in Washington, D.C., and a contributing editor of U.S. News and World Report. He has concluded a contract with Random House for a political novel that is intended for publication in 1988.

And finally, Richard Garwin, who was born in Cleveland, Ohio, and received a Ph.D. in Physics from the University of Chicago in 1949.

After three years on the faculty of the University of Chicago, he joined the IBM Corporation in 1952, and is at present IBM Fellow at the Thomas J. Watson Research Center, Yorktown Heights, New York; Adjunct Research Fellow at the Kennedy School of Government, Harvard University; Andrew D. White Professor-at-Large, Cornell University; and Adjunct Professor of Physics at Columbia University. In addition, he is a consultant to the U.S. Government on matters of military technology and arms control.

He has published more than 200 papers, and has been granted 34 United States patents.

So that is our panel. It is a distinguished one. We look forward to a lively and enlightening debate, and we will begin with an opening statement from Richard Perle.

## OPENING STATEMENTS

MR. PERLE: I must say, Mr. Chairman, as I look at the audience that I



*Mr. Richard Perle, former Assistant Secretary of Defense for International Security Policy.*

am reminded of the story of Machiavelli on his death bed. A Priest was summoned and arrived at Machiavelli's side, and he leaned over and said, "Do you renounce the devil and embrace the Lord?"

No response.

He repeated the question a second time, without response, and a third time.

Finally, after the third time, Machiavelli slowly lifted his head from the pillow and he said, "Father, this is no time to be making new enemies."

At the risk of making enemies, I intend to discuss today the view that the Strategic Defense Initiative is indeed in the national interest, and I will do so under five broad categories:

First, the current situation; what is the Strategic Defense Initiative; something about the Soviet program; something about defensive systems conceptually; and finally, some remarks about the future of technology.

The current situation is easy to describe. As of today, the United States is wholly incapable of stopping a ballistic missile fired at our territory, even a single ballistic missile, even a missile fired by accident, even a single missile fired by, let's say, an errant Soviet submarine commander. No capability whatsoever. We would have to watch it complete its trajectory and reach its target.

It is unprecedented in human history that a threat as obviously large as the threat of a nuclear weapon striking our territory should go without any response whatsoever. It represents unprecedented indifference to the need to provide the minimal insurance against the possibility of an accident or a miscalculation.

For those who believe that the most probable nuclear war is a nuclear war launched and initiated as part of the plan to achieve political purposes, or for those who believe that an accident could take place, it seems to me basic common sense to deal with both contingencies, including what I happen to believe is more likely, which is the possibility over time of an accident.

Now what is the Strategic Defense Initiative as a response to this situation? It is first of all a research and development program. No decision has been made to deploy the fruits of that research and development program, nor could one intelligently be made before the research and development and testing and evaluation is complete.

The program is aimed at determining whether we have the technological and financial resources to develop and perhaps eventually deploy a defense that would strengthen our national security and give us reasonable insurance against the possibility of an accident.

But we can't answer that question until the research, development, testing, and evaluation are complete. I find it surprising that men of science, without waiting for the answers, without waiting for the research to go forward, have made up their minds.

A strategic defense that might result from the program of research and development that we have underway need not, in my judgment, be a perfect defense, although there are those who believe it must. A partial defense would protect us against an accident or a miscalculation. A partial defense would strengthen deterrence by protecting the critical elements of our open deterrence posture.

The Soviets have a strategic defense initiative. They don't advertise it, but they have been hard at work developing technologies very much along the lines of those that we have underway, and indeed they invest massively in defenses. Conceptually, we do a great deal of a defensive nature. We put concrete around our missiles so that they can't be destroyed, or we make them mobile, or we hide them under the oceans in submarines.

I see no fundamental difference in concept between these sorts of passive defenses that we all recognize as vital to maintaining an adequate deterrent and the active defenses that could serve as a last resort, as a device capable of intercepting ballistic missiles when all other passive defenses, and if the nature of the U.S. deterrent has failed, to deter, or if an accident takes place.

Finally, let me say that I find it difficult to believe that we can stop the march of technology now and forever. We are almost arrogant to believe that. The Soviets are at work, and will continue their program. We couldn't verify the termination of their program if they claimed to do so, and to believe that in the year 2050, let's say, we will be where we are today with respect to defensive technology is to ignore the lessons of history.

So the issue before us is whether we will be part of the effort to develop this technology and explore our options, or whether we will drop out of this effort and leave it to others to make their decision and their determination, and perhaps to emerge with a monopoly of strategic defense capability.

Thank you.

REPRESENTATIVE MARKEY: Our next panelist is Dr. Richard Garwin for an opening statement.

DR. GARWIN: Well, let us return to the origins of the US SDI, the March, 1983 speech by President Reagan where he noted that deterrence of

nuclear war has worked and will continue to work, but that it is morally preferable to rely on defense. We need, however, a defense so good that we can threaten no one; then we can give up our own nuclear weapons and it won't matter whether the Soviets retain theirs. If they use them against us, they will do us no harm. They will rust. They will become impotent and obsolete.

Four days later, Secretary of Defense Caspar Weinberger said that we were seeking not any kind of partial defense but a total and reliable defense, and he saw no reason why we couldn't achieve it.

Four years later, this February, in his testimony Secretary Weinberger said that the Administration seeks a completely effective system which will be a thoroughly reliable defense, and will be able to destroy Soviet missiles as they come out of their silos, and if any should be missed, then at the separation phase, and so on, we would destroy them; we would protect entire continents. It would not be designed to protect missile sites or anything of that kind, but would protect populations.

Well, those are great hopes and great promises, and that is how the SDI began. But the President is ill-served by continuing with the pretense, that has also deceived Secretary Weinberger, that the President's goal is still the goal and the promise of the SDI. Indeed, that goal is now stated by the SDIO organization as enhancing deterrence of nuclear war, whereas the President's aim was explicitly to replace deterrence.

The President's goal was to be able to give up persuasion of the Soviet leaders not to attack us or our allies, instead rendering a nuclear attack harmless. Last year in a debate with me in Baltimore, General Abrahamson's special assistant defined quantitatively what SDI must accomplish for its leaders to believe that they have successfully carried out their mission and deterred nuclear war.

He said the Soviets could right now destroy 6000 military targets in the United States with their strategic nuclear weapons. He said that if SDIO could show us a way to limit the number of Soviet warheads which destroy targets in the United States to 3000, then the Soviets would be deterred; not accomplishing their military goals, they would never attack.

But what about defense of populations that we have heard about that was the President's goal? Would we defend our cities? No, he said, there is no military benefit to the Soviets in destroying U.S. or allied cities, so they would not strike them, and we would not need to defend our population.

According to SDIO, the Russian Bear has become the Soviet pussycat. Apparently, SDIO says, we are to forget about preventing Soviet compulsion-coercion of the U.S. or its allies. We are supposed to forget about the threat that Secretary Perle has been stressing for the last 15 years. By that logic, nuclear war could be reliably prevented and freedom preserved by our unilaterally giving up our entire military. We would have no more military targets to be destroyed, therefore no threat of war.

More realistically, there is now the very real prospect of deep cuts in the Soviet nuclear weapon force, beginning with 1500 warheads to be eliminated in the INF treaty to be signed in three weeks here in Washington, and a cut of 50 percent or more in strategic nuclear weapons. This is a surer way and a quicker way to preserve those military targets in the United States than by continuing with a research program which is bound to fail.

Now am I against strategic defense? Absolutely not. I think the unprecedented indifference that you heard about from Secretary Perle, ignoring the threat of the missiles fired by accident, of a single missile fired by an errant Soviet commander, ignoring the threat to the Minuteman, is caused by the fact that the leaders of the United States have not had presented to them limited programs to accomplish these limited options soon and economically.

Over the decades I have been much involved in this sort of thing and have proposed, for instance, close-in defense of the Minuteman silos, taking advantage of the fact that a Minuteman silo survives if you can keep the nuclear warheads more than a couple of hundred yards away. There has been no interest in this government or in previous administrations because they do not regard the threat to Minuteman as real.

In 1983, President Reagan's Scowcroft Commission on Strategic Forces said that Minuteman vulnerability could well occur, but that the overall force would be invulnerable and deterrence assured because of the presence of the submarines and the aircraft.

As for the accidental launch of any number of Soviet missiles, we can solve that problem in a year—and I have written about it for many years—by retaining on the Soviet missiles in operation, as well as on our own missiles, the command-destruct link you saw work so well on the two solid rocket boosters in the Challenger accident.

The same is true against a terrorist launch of single ICBMs. We have a weapon already in place that is called the "CIA." If we need a backup, it can be the Minuteman II to perform a nuclear intercept thousands of kilometers away.

Thank you.

REPRESENTATIVE MARKEY: Thank you, Doctor. Our next panelist is General James Abrahamson.

GENERAL ABRAHAMSON: Throughout this debate, what you often hear, in my judgment, are oversimplistic arguments on a very, very complex subject. I must start with a description of what the program truly is, and build on what Richard Perle has outlined; and, secondly, reject what I consider to have been the simplistic arguments.

In fact, Dr. Garwin is often defining for me what my objective is. The objective is very clear. The objective was laid out in the President's program, and has not been modified.

It was a three-fold challenge that the President laid out. The first one was, isn't there a strategy that might be more effective for all the unknowns of the future, a strategy that would not keep the nation naked to the worst weapon that has ever been developed in history?

Secondly, that a strategy by itself is insufficient, to prevent war. In fact, the strategy must be supported by true technical developments so it can be implemented.

Finally, a very important element right from the start — to use our technical prowess to enhance the ability to achieve meaningful arms reductions in the process.

It is the combination of all three of these elements that truly is the Strategic Defense Initiative. It is not merely an attempt to build lasers, or to go to war in space.

The technique that is often used to debunk this concept is to reach way out into the future, and to take three basic kinds of things. The first one is to define a poor system, one that we can afford. The Union of Concerned Scientists has often done that.

If you go through their various reports, from the first one in March of 1984 — where they defined what it is we are trying to build, and said that for a particular kind of laser, it would probably take something like 2,400 battle stations. Over time they have finally come to the point, for those same conditions, that in fact it is not 2,400, but is on the order of — as Dr. Garwin indicated in his Nature article — 46 to 50 battle stations.

Then he shifted gears, changed the fundamental problem, and went back to the 2,000. By the way, Dick, when I was in school it really wasn't effective, when I got the answer wrong, to change the problem. I usually didn't get any credit for that. The same kind of reasoning has occurred in several other places, but let me move on.

In some cases, they make a simple analysis, which is either irrelevant or wrong, and use that in the arguments to say that it cannot be achieved. Again, the Union of Concerned Scientists, in laying out their discussion on the neutral particle beam, scientifically made a dramatic error. They made this an impossible achievement, which in fact is incorrect.

Finally, they say that it can't survive. One of the ways in which they approach this is that they do a theoretical analysis, which is practically — and operationally — not significant.

All of those are arguments that are often used. But, frankly, those are details. The fundamental principles that each of you should consider is: Do we forever wish to rely only on a vision that is dominated by a single weapon, and having our country — and perhaps their country — laid open to that weapon?

The single most important characteristic of any deterrent strategy — and, by the way, in my last debate with you, Carl, there was a final assertion that what we are dealing with here is destabilizing — what we must do is look to the single most important characteristic of any deterrent strategy.

That is: Does it, when the crisis develops, when the misunderstandings develop, does it discourage a first strike with these powerful, powerful weapons? Or does it encourage it?

I would like to leave two challenges with the other members of this panel. They are to explain how it is that defenses truly are destabilizing. Secondly, to explain how it is that they will deal with the fact that the Soviets have such an aggressive program, searching in each of these fundamental areas.

Remember, the Soviets have been invaded. They understand just how it is that a nation cannot survive, particularly under a surprise attack. They learned that in 1942, and in the first world war.

So, if you would please explain what your proposal is to deal with what the Soviet challenge is in strategic defense. I won't go into all of the details of that, but for those of you who would like to see it, there are some booklets on the side that explain it. ["The Soviet Space Challenge," November, 1987, US Department of Defense.]

REPRESENTATIVE MARKEY: Thank you, General. Our final opening statement will be presented by Dr. Carl Sagan.

DR. SAGAN: Thank you, Congressman Markey.

There are almost 60,000 nuclear weapons in the world; nearly 25,000 of them are so-called strategic weapons, which are designed to go from the homeland of one nation to the homeland of another.

There are only 2,300 cities on the planet Earth, if you define a city as having 100,000 people or more. This is one of many ways of indicating the grotesque disproportionality between the power of the nuclear arsenals of the United States and the Soviet Union, and any conceivable use.

It is very likely that in the case of a so-called central exchange between the United States and the Soviet Union, the death-toll will be several billion people.

Given these stark and unprecedented perils, it is natural to try to find a way out of this trap that the United States and the Soviet Union have set for themselves and the rest of the planet: jury-rigging, booby-trapping the planet Earth with 60,000 weapons of unprecedented ferocity and destructive power.

The idea, therefore, of defending against a massive attack by the potential adversary is attractive, and was reflected in the President's March 23, 1983 speech, in which he explicitly talked about population defense – not enhancing deterrence, not improving the balance of terror, not shooting down an errant missile, or one launched by a terrorist group or a rogue nation – but defense of the continental United States.

This has clearly been the intent of the President and the recently-retired Secretary of Defense. But, because this is so difficult to manage, both technically and fiscally, there is a temptation to shift the ground, to invent more modest objectives. That is why we now hear from Mr. Perle and Gen. Abrahamson of these other objectives.

This is sufficiently serious that it has been called, on the floor of the Senate, a bait-and-switch tactic. The public is drawn in by the prospect of being defended even against a massive Soviet attack. And, when they are in the used car salesroom, then they are offered something much more modest. The hope is that no one will notice.

SDI is fine, if it is perfect – that is, if no significant number of Soviet warheads leak through the shield. The most optimistic numbers you can hear from technically competent advocates of Star Wars is 70, 80, or maybe even 90 percent of incoming Soviet warheads destroyed.

Take the more optimistic number. If 90 percent are destroyed, 10 percent get through; 10 percent of, say, 10,000 Soviet warheads is 1,000 warheads. One thousand warheads is much more than is needed to obliterate the United States.

The shield leaks. This is different from the usual presentation, say, on network television where what you see is two or three warheads on lazy, arcing trajectories, each of which has the letters "CCCP" on them, so we know whose they are.

[Laughter.]

DR. SAGAN: Then, screen left, comes a spiffy laser battle station, with the proud letters "USA" on it, so we know whose that one is. Then there is a noise like bzzt, bzzt, bzzt; a few flashes of light; the three Soviet warheads are surgically removed from the screen; and that is that.

[Applause.]

DR. SAGAN: This is the video arcade version of SDI. It has dominated the thinking of most Americans on this issue. A more accurate representation – this painting by John Lomborg to the right – demonstrates an overtaxed U.S. SDI system, shooting down some fraction of the incoming warheads, with hundreds or thousands of warheads penetrating the defense and landing on U.S. territory. That's what all those little orange mushroom clouds are.

That you don't see on network television representations of Star Wars or SDIO's.

There is a delusion of perfection. If you look at the weapon systems and doctrines that have been procured during this Administration, and look at the immense numbers of embarrassing failures – if you look at the 241 deaths of the Marines in Lebanon; or the 37 deaths on the U.S.S. Stark; if you look at the shuttle disaster; or, if you like, Chernobyl – it becomes very

clear that the near-perfect reliability required for Star Wars – and the same contractors who were responsible for all those other systems will be responsible for Star Wars – is simply not achievable.

That is its most serious defect; that it won't defend us. It has many other defects, but that is its most serious one.

REPRESENTATIVE MARKEY: That concludes the period for our opening statements.

We now move to the rebuttal period. The speakers will be recognized in reverse order. For a four-minute time period now we will recognize those speakers, and we will begin with Dr. Carl Sagan.

We will leave it to the decision of the various teams, and their choice is to have Dr. Garwin begin on the rebuttal period.

We will recognize Dr. Garwin for four minutes.

## REBUTTALS

DR. GARWIN: Thank you. Let's bring us back to a discussion of the SDI program, for which General Abrahamson has been in charge of spending some \$5 billion; and for which the Fletcher Committee, in 1983 – which wrote the technical blueprint for the research program – said that some \$70 billion would be required. 70 billion dollars, over about ten years!

That is what we are discussing, and the things that are being said now; not what people may or may not have said before. I want to address a couple of the questions that have been raised.

For instance, in December of 1986, the former head of System Design Studies for the SDI joined with four colleagues to publish a proposal for early deployment of an SDI defense. Incidentally, it had 2,000 defensive satellites, but of a different type than those that General Abrahamson was talking about.

Two years ago President Reagan signed a National Security Decision Directive, Number 172, which said that no SDI system could be considered for deployment unless it was adequately survivable and cheaper to build than to overcome by more offense.

Why is that? This addresses the question that General Abrahamson asked, about how our defense is destabilizing. The State Department published an official explanation of this NSDD 172. It said that if defenses were not adequately survivable, they would provoke attack on the system. Provoke nuclear war, rather than prevent it.

If it were cheaper to build than to overcome with more offensive weapons, it would stimulate a nuclear arms race in offensive weapons, rather than quench one.

I see, however, the same kind of head-in-the-sand, ostrich behavior toward this question of survivability and cost that led to the Challenger disaster, and to a number of other failures in centrally directed programs.

It is worse this time, because we are not up against nature – cold launch weather. We are not up against the engineering realities of a supersonic transport airplane. We are up against the cleverness, and determination, and resources of the Soviet Union. If it wanted to have its weapons negated, it could just throw them away. Obviously, it is worth a great deal to the Soviets, as it is to us, to maintain the effectiveness of their nuclear weapons.

Let me address another question, as to why the Soviets have such a large program in defense, and in every one of these areas discussed in the SDI. First, they don't. The defense literature itself says that there is no evidence that the Soviets – although they work in neutral particle beams for fusion research, and so on – no evidence that they have a weapon program in neutral particle beams.

They do not have the space-based ABM experiments thus far that we are proposing. They have had, in the distant past, anti-satellite tests, as we have had; and they have a deployed system for defense against ballistic missiles in the Moscow area – their one site permitted under the 1972 ABM treaty – just as we had a better system that operated for the year 1975-76 in Grand Forks, North Dakota.

The key to the question, though, of destabilization, is in the other part of General Abrahamson's request to me. The Soviets know the perils of a surprise attack, and that is exactly why they fear a U.S. SDI.

That is exactly why Caspar Weinberger said that a Soviet SDI program would be the worst strategic nightmare he could imagine, because a system incapable of defending against a first strike might be very good at defending against a retaliatory strike – the little that is left after the other side has been disorganized.

REPRESENTATIVE MARKEY: Next we turn, in rebuttal, to Richard Perle.



MR. PERLE: Thank you, Mr. Chairman.

Dick Garwin believes that arms control is a superior way to diminish the threat that we face. But, arms control and SDI are not necessarily mutually exclusive. I can recall not long ago when the Soviets said there would be no agreement on intermediate forces, unless we abandoned SDI. We, in all likelihood, will sign precisely such an agreement when the summit takes place in Washington.

Moreover, our proposals to reduce offensive forces met with Soviet rejection, until the President launched the Strategic Defense Initiative. I am glad to see that Dr. Garwin believes in limited defenses; so do I.

But I am touched by Professor Garwin's confidence in the CIA's ability to deal with all contingencies. It is not a confidence that I share; and I see no reason why we shouldn't have the insurance that would go with knowing that, if a missile should be launched at us, we would have some capability, some chance, of preventing it from doing the destruction it would otherwise do.

Dr. Garwin says that the SDI program is bound to fail. What is it that is bound to fail? All research and development in this area? Even the development of limited defenses, of partial defense?

Even a defense that might strengthen deterrence by depriving the Soviets of confidence that they could launch an attack against us, and have enough of their weapons to reach their targets to diminish -- unacceptably -- our capacity to respond?

How do we know it will fail? History is littered with the intellectual debris of people who believed that things could not be done. For men of science, I find this certainty -- not skepticism, but certainty -- that our research and technology effort must fail truly astounding.

Dr. Garwin believes that there is no evidence that the Soviets have an SDI program; but I can assure you that the Soviets are investing heavily in a broad array of technologies, all aimed at determining what kind of strategic defenses might be deployed. The evidence on this is overwhelming.

Some of you may have noticed that, in his remarks, Carl Sagan refused seriously to respond to the notion that there are objectives and purposes of the SDI program other than the construction of a perfect defense.

He much prefers to erect, as a straw man, the concept of the perfect defense, and then attack that. I don't believe that one need assume a perfect defense in order, seriously, to face the questions of whether we should be without any defense. Is there not something in between perfection and absolutely nothing that makes sense, that is in our national security interest, that might protect lives if a disaster should happen?

He accuses the proponents of SDI of having switched objectives, as though a program could have only one objective, and the most demanding objective. Most military programs have multiple objectives and that is as true of the SDI program as it is of many others.

One of those objectives is to strengthen deterrence by diminishing the Soviet capacity to execute an effective attack. Another one -- a vital one, in my view -- is to deal with precisely the kind of accident that Dr. Sagan referred to in another context.

He reminded us of Chernobyl, he reminded us of the Challenger accident. Yet he would sit here and deny us even a research and development program, knowing that accidents can happen; and, I regret to say, that over the long run, accidents will undoubtedly happen.

There is, indeed, a video arcade vision of SDI. But it is Carl Sagan's, not that of the program managers. The program is exploring a broad array of technologies. We don't know whether it can be done. We are withholding judgment about whether it can be done, but we will never know until we try.

If we reduce a broad and serious program to a cartoon, then I can understand how one would be discouraged from proceeding forward. That isn't the program that we have embarked upon.

I think we all have to answer the question of whether we are prepared, so airily, so breezily, to take the risks of having no program whatsoever, with whatever consequences that may entail.

REPRESENTATIVE MARKEY: Thank you.  
Next, in rebuttal, Dr. Carl Sagan.

DR. SAGAN: Thank you.

I think we are seeing an important shift in the opinions of those outside of the White House who are supporting SDI. Note the concentration in General Abrahamson's and Mr. Perle's discussion on enhancing deterrence.

It is as if they have acknowledged that defending the civilian population is impossible. It is an admission of the failure of the President's vision. And, if there is a cartoon representation of SDI, it is Ronald Reagan's. I think if Messrs. Perle and Abrahamson wish to distance themselves from the President's vision, they should do so explicitly.

On the issue of enhancing deterrence, that is certainly desirable. But is SDI the most effective, the most reliable way of enhancing deterrence? There are many other ways to do it: mobile land-based missiles; fleet ballistic missile submarines; de-MIRVing; and other new technologies. By no means is it clear that anything like SDI is the best way to enhance deterrence.

As for research and development, of course there should be research and development. But nothing like the \$3 to \$4 billion cost that we have today. I would like to say something about the cost

of deployment.

Naturally, the advocates of SDI do not wish to put a dollar tag on what the full-up system will cost. But former Secretaries of Defense of both political persuasions have made estimates in the \$1 to \$3 trillion dollar range, which gives us some idea of what we are talking about. This is the amount of the national debt.

General Abrahamson, in one of our past debates, has stated that if it was anything like \$1 trillion, he would recommend to the President not to go ahead. That is a very important and straightforward statement from him.

The kind of expenditures we are talking about in the present fiscal climate are a prescription for economic ruin. The United States, in the last six years, has gone from being the largest creditor to the largest debtor nation in the world.

The present national debt is not only larger than that of any previous Administration, it is larger than the sum total of all previous Administrations, back to the time of George Washington.

The United States has spent each year, an increment to the Defense Department budget, during the Reagan Administration, which just equals the increment in the national debt. It is not very difficult to see that there is some connection between the two.

As a result of these sorts of expenditures -- a rhetoric opposing fiscal irresponsibility, a reality embracing it -- the United States is now, in many respects, something like an underdeveloped nation.

We are seventeenth in the world in infant mortality. One-quarter of the population is functionally illiterate. Patent applications are steeply down. (They would be much more steeply down if not for Richard Garwin.) There are homeless in the streets of every major city; 20 million people go hungry every day. There are half as many advanced degrees in science and technology granted in the United States each year as there are in Japan, with



half our population. The United States is fourteenth in percent of the population with safe water. And on, and on, and on. The question is whether national security amounts to merely developing more gadgets.

Dwight Eisenhower cautioned us: "The problem in defense spending is to figure out how far you should go, without destroying from within what you are trying to defend from without."

[Applause.]

**REPRESENTATIVE MARKEY:** Finally, in rebuttal, General James Abrahamson.

**GENERAL ABRAHAMSON:** Dr. Sagan, I thought that was a very interesting outline of many problems that this nation and other nations have. But I thought that this was a debate about strategic defense.

Talking about baiting and switching: I haven't got the foggiest idea what the relationship is between education and payment, and SDI.

[Applause.]

**GENERAL ABRAHAMSON:** That is the real issue here. In order to deal with the real issue and the investment, it is important to understand what we are spending on the research program. The research program consumed, over the last three years, less than one percent of the Department of Defense budget and less than one-quarter of one percent of the total federal budget. If the implication, Carl, is that by eliminating SDI you are going to solve all those problems, you are a brilliant problem solver. I hope, very much, that you would be elected to a position of responsibility to do that.

[Applause.]

**GENERAL ABRAHAMSON:** I think there is one more key element that must be outlined. Notice when we say we are attempting to enhance deterrence, nobody has explained why defenses cannot enhance deterrence.

After all, the first objective is to prevent that nuclear war. The contention that we have moved away from the President's vision is Dr. Sagan and Dr. Garwin telling me what I am doing; I know what I am doing. I know what the President wants me to do.

I have my direction, and it is very, very clear. In the first direction that came out, it said that SDI will enhance deterrence. After all, it is intended, as a first objective, to prevent war. I think that it is very important to illustrate that, merely because we recognize that there is nothing perfect in this entire world, that does not mean that we do not support the President's objective of working to make a very thoroughly reliable, or an effective, defense possible.

Let me deal with one more key element of this, and one it is important to recognize. The differences between what we are saying here are not so great as one might say.

In both cases, we are saying there should be a research program. In both cases, that research program should be aimed at defense. In the case of Dr. Garwin, he has said it should be concentrating on terminal defense: the attempt to defend weapons, in order to enhance deterrence.

In fact he has offered several ideas. Something called Swarmjets. He has also offered a unique idea, and that is burying bombs across the northern territory of the country and blowing it up in such a way that the dust will stop the warheads on the way in. That is a last ditch stand, I must say, as one looks at it.

The real difference here is the thrust of the program. One more time, I would say we are searching for the most efficient way to do two things: prevent war, by interfering with their strategy; and, if the tragedy were ever to occur, to find a way to protect as many human beings on this planet as we could – as the creativity of engineers, and as the resources that the Congress allows us – not only now, but in the future. We are dedicated to making it affordable, and cost effective at the margin. Those are the criteria that can be applied to the overall program.

The really good news is that we are making progress on all of these fronts. We are making progress in the strategy. The technical progress is immense at this point. I invite many of you to come and look at that. Spend as much time as you do listening to both sides of the debate, seeing what the real progress is.

We have the most open program in history. The last challenge the President laid out was one where, for the first time in history, we have the prospect of true arms reductions – in spite of all the worrisome efforts that the critics of the program have said will make it impossible.

For the first time, we can have real reductions. We have real negotiable

proposals on the table. That sounds to me like a successful strategy. And a good news story.

## QUESTIONS BETWEEN PANELISTS

**REPRESENTATIVE MARKEY:** Thank you, General, very much.

That concludes the opening statement and rebuttal period. We are now going to move to a period of questions, wherein the panelists can ask one another questions. The limitation will be this: collectively, each side will be given two minutes, to be decided upon by that side as to how they will use it in order to respond to any of the questions which are posed.

We would ask, in anticipation of that, that all of you out there who have been given cards to write your own questions, that you begin to pass them down to the center of each one of the aisles. The staff will come down and pick up your questions, so that they can also be posed to the panelists.

Let us begin at this time, with a question by Richard Perle to Dr. Garwin and Dr. Sagan.

**MR. PERLE:** Carl, for how long do you think it is prudent, safe, and wise for us to go on without any capacity whatever to interfere with even a single, accidentally launched missile?

Recognizing, as you did, that we should have an SDI program, but not at the \$3 to \$4 billion level: What level do you think is appropriate? How would you organize that program?

**DR. SAGAN:** First of all, I think we have heard – CIA aside – from Richard Garwin on ways to do it which don't involve SDI. For example, the fusing of warheads by radio signals on U.S. and Soviet strategic missiles, so that, if there is an errant launch, they can be destroyed in flight.

This, of course, assumes the goodwill of both sides. If there is not good will, it is unlikely they will fire only one ballistic missile. The other method that he mentioned was the use of Minuteman boosters and warheads to destroy missiles not so fused – either by the Soviet Union, or by some other nation.

The idea of a terrorist group having a nuclear-armed ballistic missile is slightly ludicrous. SDI does not respond to the most likely delivery systems of terrorist groups or small nations, which are nuclear weapons in embassy basements in Washington, motor boats in harbors, or light aircraft.

As far as a prudent level of SDI funding goes, I would think something around a billion dollars a year might not be excessive.

**REPRESENTATIVE MARKEY:** The next question will be posed by Dr. Garwin to General Abrahamson and Richard Perle.

**DR. GARWIN:** General Abrahamson, in a September 21 report from the Department of Defense to the Congress, it says, "Because it cannot be expected that the Soviet threat will remain static, a defense that could be ef-



*Dr. Richard Garwin, IBM Fellow at the Thomas J. Watson Research Center.*

fective if deployed in the mid-1990s may not be effective if deployed significantly later. Consequently, such delays could result in the loss of deployment options."

I gather, then, that there is a race imagined between the deployment of



a strategic defense and the evolution of the Soviet strategic threat. Your chief scientist told us last year that SDI would be feasible only if it could be done in a totally revolutionary management fashion, taking half the time of a normal program.

You, yourself, I believe, have said that the launch cost to orbit has to be reduced from your \$1,500 per pound for the space shuttle by a factor of 10 or so. You would be working with exactly the same contractors as on the space shuttle and other defense programs, some of which Dr. Sagan mentioned.

How will you, and they, achieve a ten-fold reduction in launch costs below what you were able to do when you were in charge of the shuttle program? And do that responsibly, and predictably sooner than the Soviets can react? How can you assure the nation and our allies that that can be done?

**GENERAL ABRAHAMSON:** Dick, I am delighted you asked that kind of a question. I am afraid I will have to answer it, since you are arguing by analogy, with my personal history.

I was responsible for the Maverick missile in the early days. That was when I was in charge of it – the lowest cost, and most effective missile within its specifications that had ever been produced.

The lowest cost, most effective fighter that the United States has produced is the F-16. In fact, I brought that on-line in three years. I didn't do it alone; I was fortunate enough to have a national team of exactly those contractors that you are degrading.

I would say that, when you refer to the space shuttle – first of all, when I was in charge of it, it was a safe program. Secondly, it was very clear from the start that the space shuttle was in a generation of technology that would not offer the cost effectiveness that we would need, not only for this system, but for others in the future.

Therefore, we are embarked on precisely that, and that is the good news of the program. I can give you example after example of that. The research is not scientific research, primarily of the kind that is often suggested: creating a new laser, or something of that. Although part of it is that.

Let me give you one example of a good news story of exactly that kind. In every one of these missiles, or in every one of our systems, we would have to have an inertial measurement unit: something that tells the missile where it is pointed, and how it is pointed.

We have now achieved what I consider to be an economic breakthrough in that area. In the past, all of these units cost on the order of \$100,000. We now have one that will promise, in production, to be on the order of \$5,000.

I can give you any number of those; but that is part of the good news story.

The answer is, we will find a way, or we will not propose it until it is ready.

**REPRESENTATIVE MARKEY:** We will stay with General Abrahamson, as he poses a question to Drs. Garwin and Sagan.

**GENERAL ABRAHAMSON:** I think that I have already asked the key question, and Dr. Garwin countered by talking about a type of stability that I think is often confused. There are several types of stability.

One is called arms race stability. That is what is often used in these discussions. Perhaps the most important, and the one that is characteristic of any of these that I talk about, is crisis stability. The one where we have a situation – not where it is merely an accidental launch; or maybe it is, in fact, a terrorist operation – but where the real issue is: How do you take away the incentive to strike?

You have not answered my fundamental question. Could you describe how it is that, relying exclusively on offensive missiles forever – with all the technical and political unknowns of the future – would truly offer us the level of crisis stability the world deserves?

**DR. GARWIN:** We really can't rely on offensive missiles always. We will have some defense, if it is necessary. But the defense for these limited jobs has to be put up against other means of accomplishing the same goals.

That was the recommendation of the Scowcroft Commission: No defense in our future. But single warhead ICBMs in survivable basing – either in silos or mobile; smaller submarines, to permit the reduction of nuclear weapons, without having all our eggs in a single submarine basket.

The problem is that we want to escape from the fact of vulnerability. One escape is into fantasy. We know people like that. But that is not an option

for a democracy which wants to take care of itself, and even contribute to the well-being of the rest of the world.

That is why I propose that we have an annual one billion dollar non-SDI program. The SDI has too much advertising, too much demonstration, and not enough performance. It should be oriented to investigating whether there are any new ideas out there.

The ideas that have been proposed thus far have been found wanting. If you say "maybe somebody will think of something new," maybe. We want to be the first to do so. But we should not think of it as a \$70 billion program oriented toward deciding whether deployment is possible or not.

**REPRESENTATIVE MARKEY:** Finally, Dr. Carl Sagan for General Abrahamson and Mr. Perle.



*Dr. Carl Sagan, Director of the Laboratory for Planetary Studies at Cornell University.*

**DR. SAGAN:** Thank you. I want to see if I can succeed in drawing the distinction I have been pushing at a little bit further.

The President, on more than two dozen occasions, has stressed that SDI is either (a) for population defense; or (b) is non-nuclear. It is true that he proposed SDI without significant discussion with his advisors (when Secretary of Defense Weinberger heard about it, two days before the public announcement, his comment was: "It's not a bomb, is it?"), and this might explain some of his confusion.

What I would like to ask is: Is it true what the President says, that it is for population defense and it is non-nuclear? Is that what SDI is working on? Or is the President somehow misinformed?

**MR. PERLE:** Again, Carl, you are posing this as a choice between alternatives when, in fact, it is entirely possible, indeed it is intended by the SDI program, to explore a variety of approaches and a variety of objectives.

You asked the question earlier that if we wished to put distance between ourselves and the President, why not say so explicitly. My own view is that the President's long term vision of the comprehensive defense is just that – a long term vision.

In the practical world of the near future, I think we are unlikely to accomplish that. But you go to the extreme view of saying that, because you cannot accomplish a perfect defense in the long term future, we should have no defense now.

That strikes me as dangerous and unwise. The program aims at a layered defense, with varying degrees of capability undoubtedly evolving over time. I believe that, from the earliest deployment of the strategic defense, we would have the enormous benefit of knowing that we had some significant capability to deal with the kind of accident that you made a persuasive case is likely to occur.

Dick Garwin wants to do it with Minuteman II missiles. I can remember talking to Dick Garwin 15 years ago about the effectiveness of a program of ballistic missile defense that was tailored specifically to that purpose. His view was as pessimistic then as his view is today.

Yet he thinks you can take an ICBM and easily convert it into an anti-ballistic missile device. If he would apply that standard of assurance and confidence to the SDI program, he might trade places with General Abrahamson.

But the fact is that the multi-layered approach offers every opportunity

to produce some early defenses that are partially effective, and depending on the evolution of technology, it may be possible someday to reach that more comprehensive goal.

But you do not have to accept – and I think it would be foolish to accept – that only a comprehensive defense is worth pursuing. And, if it can't be pursued, that we should have no defense at all. That is the essence of your position.

GENERAL ABRAHAMSON: I think I do need to add a comment. It is continually posed that a partial defense, or a defense that is built in phases – one step at a time towards the President's long term goal – is either to defend strategic weapons, or people.

That is not the case. If it were exactly the kind of terminal defense, and limited to the terminal defense – as Dr. Garwin has indicated – that might be the case. Then we would have to make a choice: do we put those terminal defenders around a city? Or do we put them around a Minuteman field?

That is precisely the function of a layered defense. To ensure that we can attack the ballistic missiles at the most efficient area. That is when they are just getting started. And layers behind that.

What we defend depends on what the Soviets are shooting at. We will, indeed, be defending people. We will be defending people right from the start. It won't be a perfect defense.

But, in the long run, we will continue in a responsible way. The responsible way to build anything as radical as this, is a step at a time; to get experience in that first step, and then build toward a second step. And enhancing the technology at each step of the way.

## QUESTIONS FROM THE AUDIENCE

REPRESENTATIVE MARKEY: Let us just conclude at that point on the question period, and move on to questions from the audience.

We will begin with a question which is posed to the Abrahamson-Perle side. We will give them two minutes to answer, and then two minutes to the other side to also comment upon what they have heard.

The first question is this: Since the Soviets are, and are likely to remain, adversaries, why isn't SDI likely to provoke the Soviets to deploy additional offensive weapons, in order to offset U.S. defense deployments, and to enhance their own deterrent forces?

General Abrahamson? Mr. Perle? Two minutes.

GENERAL ABRAHAMSON: If we were limited, and limited in our thinking to terminal defenses of the kind that Dr. Garwin is talking about, that would be exactly the case. A single layer, with a single, countable number of responsive missiles, all they have to do is add a few missiles in order to change that.

That is very different from a layered defense. For example, five layers with only 60 percent effectiveness at each layer – and, by the way, this is an example; that is all it is, but we have very real possibilities of building to that level at this point; it is quite clear that it is possible – would require instead of just one or two, or three additional missiles, we are talking about 293.

It is impossible for them, within their economic constraints, to deal with a layered defense by doing precisely that. Therefore, they would – they are logical people on the other side, logical adversaries – they would pick the approach that would not break the bank for them.

MR. PERLE: I might add to that. The question accepts implicitly the notion that the Soviets insist on having offenses at the level that they now have them, and that they would not be content with any lower level of offense capability.

Yet, as we look at the Soviet offensive force – thousands of warheads on ballistic missiles, in particular – many of us believe that that force is vastly larger than the Soviets need for deterrence.

If that is the case – and, by the way, the Soviets themselves said that they would be prepared to reduce their forces – if, in fact, the existing Soviet offensive force is excessive to their needs, over and above what is required for deterrence, then they would need not respond to the extent that what we were taking away from them was that additional and quite menacing capability, that I believe they are not entitled to have.

REPRESENTATIVE MARKEY: Dr. Garwin and Dr. Sagan: two minutes in rebuttal.

DR. GARWIN: It is not I who said that defenses are destabilizing. It is the Reagan Administration, in explaining the President's action. And I will just say it again: Unless the defense is adequately survivable, it is likely to start a war rather than prevent a war.

Unless it is cheaper to build than to overcome, it will cause an offensive arms race. If you don't accept those statements, Secretary Perle and General Abrahamson, argue with President Reagan, the Defense Department and the State Department.

What you appear to be saying is that you are confident that you can satisfy those requirements. I see no sign of that. I see, inside the SDI, a willingness to assume away the threat by postulating a straw man response – to fire all the Soviet nuclear-armed interceptors simultaneously, because that is the least effective way for the Soviets to do it, rather than holding them for when the targets are within range.

I see a continuing misconception that space mines have to be covert to be effective, ignoring the fact that they have always been proposed as overt. Once you find out that there is a space mine that says "I am a Soviet space mine," there has been no proposal what to do about it.

It makes no sense to say, "We will find out it is a Soviet space mine." So I believe that ignoring the requirement, assuming it away, is the way to disaster. That is why I think that the research in ballistic missile defense ought to be done without an SDI organization.

DR. SAGAN: It is certainly clear that if the Soviets wish to maintain a high probability of a certain fixed level of damage to the United States, and if they believe that a deployed SDI will be able to shoot down a certain number of their warheads, then there are several options open to them.

One is to increase the number of warheads until it compensates for the capability they imagine for the U.S. SDI. Since this involves existing technology, and would be much cheaper than SDI, we give the Soviets a clear advantage by deploying SDI.

In addition, the Soviets have opportunities to underfly SDI. Even if SDI were miraculously to work, it wouldn't touch ballistic missiles on depressed trajectories; it wouldn't touch low altitude aircraft; it wouldn't touch cruise missiles; it wouldn't touch motor boats in harbors.

Finally, the Soviets have – if SDI is deployed – a strong incentive towards decoys, and so-called penetration aids and fast-burn boosters and space mines. For all those reasons, the response to SDI available to the Soviets looks to be cheaper and technologically readier than SDI itself.

REPRESENTATIVE MARKEY: The next question goes to Dr. Sagan and Dr. Garwin. Science entails constant technological advancement. Since SDI involves the pinnacle of American technology, how can you – as scientists – justify suppressing it?

DR. GARWIN: General Abrahamson said the work is not science, it is engineering. What I want to do is to go back into a much smaller program where science and imagination hold sway. I wouldn't mind having a general program for reducing the cost of everything we do in the Defense Department, as well as in the government.

I think it is great if we can get this promise of a \$5,000 inertial guidance system into production. I think it would be wonderful to use it in our strategic offensive missiles as well as in the defense.

But that is not an SDI goal, that is a technological goal. Science I am in favor of. Cheaper products I am in favor of. I just don't think this ought to be done under the mask of a long term response to the President's dream – one man's dream – while delaying the near-term accomplishments in ballistic missile defense that we could obtain if we did not have a research and development only program.

REPRESENTATIVE MARKEY: Dr. Sagan?

DR. SAGAN: When you wave \$1 trillion at the U.S. aerospace industry, and scientists and technologists, you will produce what one general officer described as a feeding frenzy.

What happens is that any such goal, whether it can be accomplished or not, whether it is feasible or daft, deflects a large fraction of the available U.S. scientific and engineering talent away from other tasks, away from improving deterrence in other ways, away from conventional arms work, and especially away from the civilian economy. In that way also, SDI can work to erode national security.

Just one other thing. I was asked earlier by General Abrahamson, what was the connection between education and SDI? Why do I put at the feet

of SDIO all of these worrisome underdeveloped nation indicators that are beginning to apply to the United States.

The reason is that all the indicators I mentioned can be addressed by money and by science. Education can be improved with money. You say SDI is only a small fraction of the Department of Defense budget, and an even smaller fraction of the Gross National Product. Yes, that is true right now. But if you succeed in getting into deployment, then the budgets – as everybody acknowledges – will go way up. Not only will money be taken away from education, but scientific and engineering talent will be withdrawn from education and from the civilian economy.

That is how all those indicators are connected with SDI.

**REPRESENTATIVE MARKEY:** General Abrahamson, Mr. Perle, we will be a little bit lenient on the time you have for rebuttal.

**MR. PERLE:** I am a little disappointed, I have to say frankly. I came here expecting to hear a spirited argument about SDI. What I think I am hearing, from the other side, is nitpicking about how much money we are spending.

They are for SDI. They are for having a strategic research program. They just want to spend less money on it than we do. If you believe Carl Sagan, we are going to lower the infant mortality rate if we just divert funds from SDI into I-don't-know-what program.

The simple fact is that SDI is affordable and manageable, particularly if one looks at the enormous investment that we now make in offensive forces, and can look forward to a future in which we can reduce that emphasis on offensive forces, and use the consequent budget reductions to finance SDI.

It is all very well to talk about a trillion dollars in some future program. But that is not the program we are operating. No request has been made for a trillion dollars. Unless the research and development – which is of much more manageable proportions – indicates to us that we have a financially sound and technically competent program, there would not be any proposal to deploy, much less a proposal to deploy at a trillion dollars.

I think we are being burdened with responsibility for a program that doesn't exist. Yet, when it comes down to the crucial issue – which is the concept of whether it is wise to go undefended – I find that the other side has conceded the point.

Both Garwin and Sagan believe we ought to have a defense; they would just do it differently from the way we would do it.

**GENERAL ABRAHAMSON:** In those differences, there are quite a few differences – as I commented earlier – between what is theoretically possible and what is operationally effective.

Clearly I agree – in fact, I am in violent agreement with both of you – that we must have a survivable kind of system. Dr. Garwin raises one of his most favorite of all kinds of issues: space mines. It is a serious problem. It is one that we do deal with.

We deal with it very, very intelligently. We spend a lot of time and effort working on it. He also knows that much of it we are not allowed to talk about. However, let me just deal with part of this issue, so that you understand the difference between the way it is simplistically offered in the theoretical sense and the reality of this particular kind of a countermeasure.

I only offer this as one example. Often, Dick has explained that an orbiting satellite, if it is an SDI satellite, always goes in the same path. Therefore, it is easy to put a space mine up there.

The image in your mind that comes out of that is perhaps something like a Persian Gulf mine: that they just kind of sit next to one of our satellites, and there it sits. We don't do anything.

In fact, we make our satellites so that they can maneuver. We give them hardening, so they can handle nuclear weapons, at least up to a reasonable radius. Those areas are ones we are making progress in.

Dick then says, "Aha, but a space mine is simple. You can put more fuel on, and thus can always stay with this maneuvering satellite." Let me tell you from my experience, the last space shuttle mission that I had was the first time that we repaired a satellite in space.

Crippen flew a very nearly perfect kind of rendezvous with the Solar Max satellite, and it took nearly all the fuel for maneuvering that the space shuttle had as we did it.

Secondly, even if you can come into that position, which Russians have the capability to do, then the game is not even yet, still. It is never perfect. Once again, let me to go my experience as a fighter pilot.

You have watched the Thunderbirds or the Blue Angels. As they fly, it

looks very smooth as they stay in formation and move with the system. But I can tell you that the people who are on the wing, the wing men are sitting there working like mad, putting all kinds of control inputs into this.

The assertion that Dr. Garwin and the Union of Concerned Scientists often make at the theoretical level is far from the reality of the operational situation.



**Lt. Gen. James Abrahamson, Director of the Strategic Defense Initiative Organization.**

**REPRESENTATIVE MARKEY:** Thank you.

The next question goes to General Abrahamson and Mr. Perle. Under what circumstances would you accept a ban on the deployment of SDI, in return for deep cuts in Soviet offensive weapons?

**MR. PERLE:** Of course, one has to define the terms in order to answer that question. I don't know what is meant by deep cuts. But the proposals that are currently being discussed, in which offensive nuclear weapons would be reduced to the order of 6,000, would still – in my judgment – leave enormous scope for horrendous damage.

To go utterly undefended in the face of nuclear forces of that scale would, I think, be dangerous and unwise. I would certainly not agree to ban strategic defenses in exchange for a reduction of that scale.

The President, at the Iceland Summit, proposed to the Soviets that we would be prepared to delay the deployment of strategic defenses until after a period of disarmament, during which all the offensive ballistic missiles on both sides would be eliminated.

He made the point, which seemed to me logical – and I hope this is responsive to the question – that, in the absence of strategic offensive ballistic missiles, no one would have anything to fear from the deployment of the strategic defense, since it would have nothing to shoot down – unless the other side cheated.

The Soviets – flatly and categorically – rejected that proposal, giving some serious rise to the question: Why are the Soviets so dead-set against the United States continuing a research and development and testing program that looks very much like their own?

**REPRESENTATIVE MARKEY:** Two minutes.

**DR. GARWIN:** I think the Soviets are so unhappy about the U.S. SDI because they don't like to sign an agreement with an insane partner. Because they think that the SDI will not work against a Soviet first strike, and they ask what we want it for. There is no real explanation why.

Let me quote Secretary Perle, back from 1973, in a debate in which we both participated. He says, "If the Minuteman is vulnerable, there is no need to fear that the Soviet Union would actually launch such an attack. But the political consequences would be dangerous."

How to get out of it? He said, "The best procedure would be to defend strategic missile complexes with ABMs. The effect of such defense on deterrence survival would be substantial. As an alternative, however, we should press the Soviets to bring their strategic forces down to the level of comparable U.S. forces."

That is what we are talking about now. The 50 percent reduction would be only a first step toward much deeper cuts. But those deeper cuts will

not happen if the residual forces are disarmed because of deployment of a strategic defense.

I already quoted Secretary Weinberger as saying that a Soviet SDI would be the worst strategic nightmare he could imagine. Former Secretary of Defense McNamara, in the 1960s, said if the Soviets deploy a nationwide ABM defense with 5,000 nuclear-armed interceptors, we will build 50,000 nuclear warheads to counter it if necessary.

The step-at-a-time defense is precisely the recipe for increasing the Soviet offensive force; and, at every moment, increasing the potential destruction if nuclear war comes.

REPRESENTATIVE MARKEY: Dr. Sagan?

DR. SAGAN: I think we have to bear very clearly in mind what would our response be if the Soviets were developing an SDI system of the sort that we are talking about, and we had to face the possibility that what they had in mind was a devastating first strike against the United States, with their SDI system used to mop up the residual retaliatory capability of the United States.

That is precisely the circumstance that they have to face with SDI. They are quite properly worried about that, as we would be also. SDI is therefore destabilizing. Therefore, there is the making of a bargain here. Each side forgoes SDI, and is at least freed from major concern about an intentional first strike. But also it would lay before us an historic opportunity — it may not occur again — for massive reductions in the strategic arsenals on both sides. Considering the absurdly large number of such weapons, it would be foolish not to take advantage of that opportunity.

REP. MARKEY: The next question is to Dr. Garwin and Dr. Sagan.

Richard Perle has stated that there is evidence of an overwhelming level of Soviet SDI research. Do you agree that it is possible to document the level of Soviet SDI-type research?

DR. GARWIN: I heard Ambassador Warren Zimmerman, in the fall of 1985, explain to a group about this size that the Soviet Union put about 50 percent of its military budget into strategic defense. That sounded extreme, and somebody from the audience asked whether he was sure, and what was his source. He said, after thinking, yes, he was sure. His source was a recent CIA study about which he couldn't say anything more.

But I happen to have with me the unclassified testimony of Robert Gates and Larry Gershwin from June 26, 1985. They said that the Soviet Union spends about equal amounts on strategic offense and strategic defense; together, about 20 percent of their military budget.

So here this honest, capable man — whom I knew personally — was misleading the audience. He said 50 percent of the Soviet military budget goes to strategic defense. But the actual number from the document he was quoting is 10 percent.

I have no reason to doubt that the Soviets spend \$30 billion a year, in our money, on strategic defense. But that includes their vast air defense program, operating 10,000 radars, 10,000 interceptors, 3,000 fighter aircraft; their civil defense program, with \$3 billion a year, or so; the operation of their permitted ABM system around Moscow; and, yes, some research on SDI.

The answer to which is not a U.S. defense, but our countermeasures program, which runs at about one part in 20 of our current SDI program. That is not a countermeasures research program; that is a countermeasures deployment program.

I am not troubled by the Soviet SDI. They have a very substantial effort in numbers. If you believe in numbers, then you really ought to worry about the agriculture gap, because we have two percent of our people on the farm, and they have 30 percent.

[Laughter.]

REPRESENTATIVE MARKEY: Dr. Sagan?

DR. SAGAN: I would just like to underscore the fuzzing that is often done by American spokespersons, between Soviet anti-missile defense, and Soviet strategic defense — which is largely Soviet anti-aircraft defense, which in turn is due to the very great preponderance of U.S. strategic intercontinental bombers over the much smaller Soviet force.

REPRESENTATIVE MARKEY: Mr. Perle?

MR. PERLE: I hope those of you who were listening caught the word "yes" buried down deep in Dick Garwin's answer. Yes, he said, the Soviets do have a strategic defense initiative. It doesn't trouble him. But the fact that they have one certainly ought to lead us to the question of whether we can afford to be without one.

Carl Sagan wants to make sure that nobody misunderstands the statistics about Soviet defenses. In order to make sure we don't, he has pointed out how much they spend on defense against aircraft, and a variety of other defenses.

Dick Garwin used the figure \$30 billion. It is fair to ask, isn't it, what does this tell us about the Soviet view of whether it is right and proper and legitimate to have a system of defenses.

As you listen to official Soviet spokesmen, who decry the notion of defending one's forces — and, in-

deed, we have just heard the other side in this debate decry the notion of mounting a defense — look at what the Soviets are doing.

At every area in which they have been capable of mounting a defense, they have done so. A defense against our bombers; defenses, to the degree they can, against our submarines; a variety of measures intended to assure that their strategic deterrent can survive attack — and, perhaps, to do more than that.

We ought to be doing precisely the same thing, in the most effective way we can, providing for defenses. On the other side, they would have us do it entirely by relying on offensive forces, and only those defenses other than SDI.

I think the only conclusion you can come to is that, on the other side, they just don't like the SDI program.

REPRESENTATIVE MARKEY: That concludes the period for questions.

Now we are going to go to concluding statements. Each participant will be allowed three minutes for a concluding statement. We will begin with Dr. Garwin.

## CLOSING STATEMENTS

DR. GARWIN: Secretary Perle is right. I don't like the SDI program. It was born in fantasy, and those carrying it out are acting like the admirers of the Emperor who had new clothes.

We don't actually have to be naked to nuclear weapons. We can wear a small amount of clothes. But what is bad is to believe that you are fully covered when you are not.



*Dr. Richard Garwin, Dr. Carl Sagan and Rep. Edward Markey.*

I would like to take a little of my closing time to point out that the leader of the SDI program has mistakenly attributed to me a couple of comments. He says I want to put nuclear weapons in the ground and blow them up in the northern territories. No. Not unless you believe the northern territories are one mile north of each silo, where we would have a small nuclear explosion which would never go off, because there would never be an attack if there is an effective defense. This is the same argument as the SDI makes, except that this would really be an effective, countable defense.

He points out that the shuttle has great difficulty maneuvering to achieve a position with respect to a satellite. I am not proposing a manned, reusable space mine. That is the trouble with the shuttle. It carries a very small, almost vanishing percentage of its mass into orbit as maneuvering fuel. A space mine can carry 50 percent, or 70 percent, as maneuvering fuel. It has no other mission.

I really do believe that the SDI has to look at the threat as it will come. If they think that the best kind of space mine is a manned, maneuvering space mine, costing \$1 billion and carrying a percent or two of maneuvering fuel, then they don't understand the space mine threat.

One reason why SDI will not be found to be adequately cheap and survivable is the fast-burn booster. The Soviet Union built missiles, as did we, that are liquid fueled. If they go to solid fueled missiles, which they already have, the number of satellites which can participate in the attack on the missiles in boost phase will drop from something like 13 percent to one or two percent, with the missiles that the Soviets have now. With the fast-burn boosters that the Fletcher Committee considered, not a single one of the defensive satellites could destroy a Soviet missile in boost phase.

The three main problems are space mines, overt space mines; fast-burn boosters; and the third is nuclear-armed antisatellite weapons which the Soviets already have. They are called GALOSH interceptors.

They are deployed around Moscow. They could make as many of them as they like. They would come up against the defensive satellites at the time of a first strike, if you believe there will be one anyhow, and they would destroy them.

They would carry decoys so that they could not be injured by the small rockets, which are the defending satellites' only means -- for the next 10 or 20 years -- to destroy boosters.

In fact, it is unlikely that these warheads would even be seen by the defensive satellites. So we really have to look at this. We shouldn't look at it only in controversy like this. We ought to get together and discuss these matters.

It would help if the SDI would read my papers.

Thank you.

[Applause.]

REPRESENTATIVE MARKEY: Now, for his concluding statement, General Abrahamson.

GENERAL ABRAHAMSON: I think the important thing about the entire issue is, number one, we both believe in some defenses, some investment here. That is critical. There is a complete difference about what it should be, what the investment should be in terminal defenses or layered defenses. There is a great deal of difference between the assessment of progress and, perhaps most importantly, about where we can potentially go.

The difference is that these are criticisms which are aimed at the potential of the future, where we have thousands and thousands of people across the country who are out there making the changes, and making the future happen. So that, when a deployment happens, it will indeed meet the criteria that the President outlined.

Those criteria are very clear. We haven't projected any kind of a difference from those criteria. Those are, first of all, let it be militarily effective. Second, that it be survivable. Thirdly, let it produce arms-race stability by making it less expensive to build one of these systems than it is to counter it by building more of the same.

I would like for you to imagine just a little bit -- Dr. Sagan introduced an imaginative picture here -- think of what an SS18 truly is. It is about nine stories high; it is a huge machine. It weighs nearly half a million pounds.

Just the raw material and the cost in that particular system is immense. We are working now for these space-based interceptors. Not exclusively on space-based interceptors, but on those systems that will be something about three feet high, and that will weigh on the order of 150 to 175 pounds.

Will that be cost effective at the margin? There is no question. Just from the overall kinds of technology, and the differences that we can produce,

there is no question that we are working in an area where we have an advantage.

We will not bring forward a proposal to deploy until it makes sense, until it meets those criteria. But I can assure you it is happening very, very quickly.

Regarding Dr. Garwin's point, we are working more seriously on each of those countermeasures than he understands. He has had access to many of the classified areas of the program. I have specifically authorized him to go into some of those areas.

I just leave you with one last challenge. For some of your systems that you think are so effective, I would ask for you to bring that proposal -- an operationally effective proposal to me: a practical proposal that we can implement. That is what we are working on. Not the theoretical countermeasures, but the real countermeasures that can be effected.

REPRESENTATIVE MARKEY: For his concluding statement, Dr. Carl Sagan.

SAGAN: Last week, there was a Harris Poll of the American people concerning the negotiations on reducing the budget deficit, which may or may not be concluded this week. Eighty-two percent of the American people said that they did not want social programs cut; 58 percent believed that significant defense cuts are essential for deficit reductions.

These are very large majorities, considering the barrage of exhortation from the White House and their supporters, for a continuing military buildup. Two trillion dollars has been spent on the military since Mr. Reagan has been in office, and it is remarkable to see what the American people think of it.

It is true that the smaller the scale at which SDI is imagined, the cheaper it will be; and, therefore, the more politically accessible it will be. General Abrahamson and Mr. Perle are saying that full-up population defense is only one of the possibilities of SDI. Fine.

It is just not very likely, not very cost-effective; and, indeed, it is very dangerous. If the objective is to find a way of enhancing deterrence, if it is to find a way to shoot down an errant missile, let us find out how to do that without being burdened by the President's vision of an overall population defense.

Star Wars is a highly porous system which cannot protect the civilian population of the United States, even without Soviet countermeasures. And there are a wide range of countermeasures available to them: the system can be overwhelmed by adding more warheads; underflown by delivering nuclear weapons in ways other than high-arc ballistic missile trajectories. It can be outfoxed. It is an inefficient way to enhance deterrence.

It is ruinously expensive. It is likely to increase, not decrease, the likelihood of nuclear war.

Except for all that, it is a terrific idea.

[Applause.]

DR. SAGAN: I would like to see this Administration devote some small fraction of the media time and bureaucratic attention that has occupied it on Star Wars to explaining why it is important to reduce the strategic arsenals in a massive, bilateral, intrusively inspected missile reduction; and to be responsive to the grotesque build up of nuclear weapons from 1945 up to the present time -- something which future generations, if there are any, will regard with the same abhorrence that we regard the now defunct institutions of human sacrifice, or chattel slavery.

In terms of simple planetary hygiene, it is essential that we reduce those arsenals at least -- at first -- to a tiny fraction of their present numbers, and to free the human species from this specter of massive destruction.

[Applause.]

REPRESENTATIVE MARKEY: In conclusion, the responding statement of Richard Perle.

MR. PERLE: I hope that when Carl Sagan visits here in December, he will have the opportunity to make that impassioned appeal to Mr. Gorbachev.

[Applause.]

MR. PERLE: From the earliest days of the Administration we have had on the table proposals to reduce, radically, the strategic arsenals of both sides.

I find it a little curious the way this debate is taking shape. General



Abrahamson and I on the one side – respectively, a long time public official and a professional soldier – and, on the other side, we have two scientists. I was brought up to believe that science has a method, and that method is that you identify a hypothesis, you do research and experimentation, carefully collect data, and ultimately render some judgment about the validity of that hypothesis.

The hypothesis before us today is whether SDI will prove to be in the national interest. We non-scientists on this side of the table have said: "Let's collect the evidence, let's do the research, let's record the results carefully, and then, following the scientific method, let's make a decision about whether we have accomplished a program that is affordable and that is in our national interest."

That is not a question we can answer today. I find astonishing the certitude on the other side of the table, first, that SDI won't work and second, that there are a dozen different ways to overcome it if it does work.

They also seem to be quite certain about what the Soviets can do. Yet, if the Soviets take seriously their judgment about the effectiveness of the program – Carl Sagan just said we can underswim it, underfly it, and outfox it – they needn't respond at all, except by underswimming and underflying and outfoxing.

They don't have to build additional weapons.

[Applause.]

MR. PERLE: Let me conclude by trying, for a moment, to put this in some historical context. This debate is not unlike a debate that took place in the 1940s, after World War II, when Harry Truman was President of the United States.

Some of you will recall the debate in those days over whether the United States ought to develop the hydrogen bomb. It wasn't carried out in public. It was carried out, in fact, in great secrecy.

The scientific community pretty much divided 90 percent against proceeding, and 10 percent for going ahead. The 90 percent were led, you will recall, by Robert Oppenheimer, and a small band – 10 percent or so – led by Edward Teller, said we should proceed to develop the H-bomb.

The argument of the 90 percent was that if we proceeded to develop hydrogen weapons, the Soviets would do the same, and there would be instability and great danger. The argument of the minority was that it was imprudent not to proceed.

We now know that while that debate was taking place, while Oppenheimer and Teller were making their respective arguments, a young Soviet physicist by the name of Andre Sakharov had already been assigned by Joseph Stalin the task of developing the Soviet hydrogen bomb.

Had Harry Truman waited to see the facts as they emerged from the research, had Harry Truman decided with Robert Oppenheimer and not with Edward Teller, the Soviet Union would have emerged in the late 1940s or early 1950s with a monopoly of thermonuclear weapons.

I leave it to you to conclude how the face of the globe, how the values that Carl Sagan and Dick Garwin and General Abrahamson and I all share, might have been altered.

I hope we don't make the mistake that Harry Truman refused to make, and believe that we can stop history and the other side, just by wishing things were different.

[Applause.]

REPRESENTATIVE MARKEY: I would like to thank all of the panelists for joining us here today. I believe that we have had an excellent debate and exchange of ideas. I want to thank our speakers, and I want to thank all of you who are here for your participation in this important debate.

The Cannon Caucus Room has never been as filled as it is today, and I think it is a reflection of the importance of the issue that we are debating that it was able to draw this kind of attention in Washington; and, in fact, people from across the country who came in here today for this debate.

I would like to thank the staff of SPACEWATCH, who put together this forum here today.

[Applause.]

REPRESENTATIVE MARKEY: They consist of Eric Fersht, Cynthia Kelly, Patrick Tracey, Katherine Magraw, Arthur Klein and Dan Charles. I think they did an absolutely splendid job in organizing a debate of this magnitude.

I would also like to use this opportunity to allow for some closing observations on the future of the Star Wars proposal. I believe the year ahead of us is going to be a year of reckoning for the Strategic Defense Initiative

program.

Between now and December of 1988, the President, the Congress and the American people have some important decisions to make about Star Wars, and about national security. These decisions ultimately should be based on a determination of whether or not Star Wars is in the national interest.

The President has to decide whether he is willing to accept some limits on Star Wars, in return for deep cuts in Soviet strategic nuclear arms. Congress has to decide what level of funding it wishes to provide for Star Wars, and whether to limit Star Wars testing in order to ensure continued adherence to the traditional interpretation of the ABM treaty.

The American people have to decide who will be our next President and whether they want an Administration committed to Star Wars testing and deployment; or one committed to preservation of the ABM treaty, and willing to discuss limits on the exotic technologies of Star Wars.

How these decisions will come out is anybody's guess. But I think, in today's discussion, we have had a chance to look at some of the questions that must be considered before our country commits itself to proceeding with Star Wars testing and development.

Questions like: Will Star Wars work? Can it be outfoxed, overwhelmed, or outflown? Will it make our cities and populations safer? Or will it only defend our missile silos and military command centers?

How much will it cost? Can it meet the Nitze criteria of cost-effectiveness at the margin? Will it usher in a new strategic relationship based on defenses? Or will it destroy prospects for arms control, and touch off a strategic offensive and defensive arms race?

Underlying these questions is a more fundamental one: Should we put our faith in technological solutions, or should we seek political solutions—negotiated solutions? Congress has decided this year to limit the Star Wars funding to no more than \$3.9 billion, and to prohibit any testing outside the traditional interpretation of the ABM treaty.

That gives enough time for our next President to make the decision on whether or not to go ahead on Star Wars. One of the great things about our system of government is that the people decide who they want to have serve as their leaders, and what direction they want the country to move towards.

The final decision on who our next President will be is in the hands of the people who are in this room, the people who are watching this broadcast, and millions of others across this country. They will be choosing a new Administration to begin serving in January of 1989.

You, and the people like you, will determine who will sit in the Oval Office, and who will sit across the negotiating table from General Secretary Gorbachev. In making that decision, I would hope that very serious consideration would be given to the issues that we have discussed today: whether Star Wars is in the national interest.

If you want to continue to be apprised of SPACEWATCH's program, of debates throughout the coming year on this and other issues, please contact our staff immediately after this proceeding, and we will be more than willing to put you on our mailing list.

If you have any ideas of how we can frame debates for public discussion, please come forward with those ideas as well. We need the input of all sides if we are, in fact, going to be able to frame this debate in a way in which the election of 1988 will reflect the informed citizenry that we really have to have.

Once again, I want to thank our panelists: Dr. Garwin and Dr. Sagan, General Abrahamson and Mr. Perle. I think they all did an excellent job, and we thank all of you for your participation.

[Applause.]

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**SPACEWATCH** is a nonprofit research and investigative organization concerned with civilian and military space policy. It is dedicated to the peaceful use of space.  
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### Space Station Faces Deep Budget Cuts

Earlier this year the Office of Management and Budget and the White House agreed to increase space station funding in NASA's Fiscal 1989 budget to \$1.8 billion. But the centerpiece of the future US civil space program will be lucky to get \$300 million when a House-Senate conference meets this week, Hill sources say.

Last October, NASA Administrator James Fletcher suggested in a letter to Senator Jake Garn (R-UT) that he will not proceed with the program at slashed funding levels. With a six-month delay expected to boost costs by as much as \$1 billion, many lawmakers are also questioning whether the space station should be built at all, despite recent contract awards of \$5 billion. □

### Scientists Ask Congress to Cut SDI Funds

In a letter presented to Senator Bill Bradley (D-NJ), more than 1,200 scientists -- including five Nobel laureates, 40 members of the National Academy of Sciences or the National Academy of Engineering, and many former and present directors of the six national laboratories -- urged Congress to cut SDI spending and expressed "serious concern" about the program moving too fast and without "the technical and policy scrutiny appropriate to an undertaking of this magnitude."

Moreover, the group said, a total population defense is "not feasible in the foreseeable future" and the partial defense now being planned is likely to undercut arms control negotiations and spark an escalation of the arms race into space. □

### Joint US-Soviet Mission to Mars?

Representative Robert Roe (D-NJ), chairman of the House Science, Space and Technology Committee, and Raold Sagdeyev, who heads the Soviet Space Research Institute, informally agreed December 3 to pursue plans for a joint US-Soviet manned mission to Mars.

Last year the US rejected a formal Soviet proposal for cooperation in an unmanned sample return mission to Mars. The Pentagon is known to oppose the idea for the reason that such an agreement could lead to problems associated with technology transfer and linkages to Star Wars, which the Soviets consider destabilizing. Supporters, however, say that cooperation could make the superpowers friends, not foes, in space. □

### Treaty Interpretation 101

Hours after watching Reagan and Gorbachev sign an INF Treaty that he helped negotiate, Ambassador Maynard Glitman gave the press a brief tutorial on treaty interpretation.

A negotiating record, he said, is misleading because "you're going to see a lot of posturing that both sides did in order to make certain points, and I think it would be very easy to misread the actual flow of what's happening. One really ought to read the treaty. That's the end result."

Glitman might have more pointedly addressed his remarks to the Reagan Administration, which continues to insist on a reinterpretation of the ABM Treaty based on selective excerpts from the negotiating record. □

*Spacewatch invited each of the participants in last month's policy debate to submit additional comments on the Strategic Defense Initiative. We begin with Dr. Carl Sagan. Other submissions will appear in future issues of Spacewatch Fortnightly.*

Proponents of Star Wars want to have it both ways. When attempting to respond to technical criticism, they describe SDI as a research program devoted to determining the feasibility of space-based ballistic missile defense. Who could be against research? But when attempting to sell the program to non-technical audiences, they sometimes behave as if the research has been completed and a favorable verdict rendered -- as when they advocate something called "early deployment," designed to make SDI irreversible, whatever its flaws.

Despite their posture of openness to any outcome, Mr. Perle and General Abrahamson say nothing about the poll of members of the National Academy of Sciences in which over 90 percent think population defense infeasible. We do not hear about the expert panel convened by the American Physical Society, with full access to classified data, that concluded that the exotic

weaponry proposed for Star Wars is not remotely ready and may never be.

Have Messrs. Perle and Abrahamson conveyed these adverse findings to the President? Have they laid out for him the distinction between defending civilian populations and defending missile silos? Have they informed him that bomb-driven X-ray lasers and orbiting fission reactors are incompatible with the "non-nuclear" SDI whose praises the President sings?

If protection against accidental launch is now the true focus of Star Wars, why is a billion dollar computer facility being designed in a forlorn attempt to see how to "manage" a massive attack? Why aren't much simpler and cheaper defensive systems that might be ready in the comparatively near future being developed? If "enhancing deterrence" is the focus, where is the analysis that demonstrates that Star Wars is the most cost-effective of the many possible ways of defending retaliatory forces?

Trying to be all things to all men is a political commonplace; but with trillions of dollars and the national security at stake, it is time for something more than conveniently blurred distinctions and facile ambiguities. -- Dr. Carl Sagan

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## Star Wars as Offense

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**T**he Reagan Administration has always maintained that Star Wars is for purely defensive use against incoming missiles. President Reagan may believe this himself, but many of the technologies under investigation within the Strategic Defense Initiative may prove more useful as offensive weapons against Soviet satellites and aircraft, according to a recent study prepared for Congress.

The study, by Cosmo DiMaggio of the Library of Congress' Congressional Research Service (CRS), concludes that "most or all of the weapon concepts that do prove feasible could in principle be used either offensively or defensively. Military objectives would be the driving factors in determining their purpose."

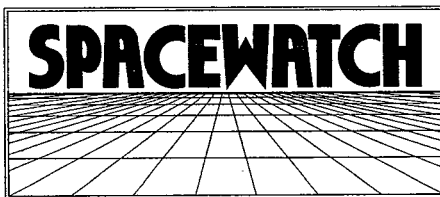
DiMaggio notes that while it remains impossible for space-based lasers to completely propagate the atmosphere to hit ground-based targets, they could be used offensively to disable high-altitude aircraft and satellites. Ground-based lasers, on the other hand, might be able to penetrate the atmosphere to knock out ballistic missiles. "Propagating a beam down through the atmosphere is more difficult than shooting up," writes DiMaggio. "Consequently, while SDI research might prove that it is possible to penetrate the atmosphere far enough to perform the ballistic missile defense mission at high some altitude, the probability of being able to wreak havoc on ground targets [such as missile silos] appears remote. Nonetheless, high altitude aircraft could be vulnerable to such weapons."

However, DiMaggio says that the jury is still out on a study conducted two years ago by researchers at RDA Logicon showing that lasers could be used to start firestorms on the ground. "Certain wavelengths of laser beams can be transmitted through the atmosphere at low energy levels. However, there is currently no experimental evidence that lasers can propagate intense, lethal energy through the atmosphere," though they might be able to disable missiles in the atmosphere as they rise from their silos.

As for simple kinetic energy weapons slated for early deployment -- those that destroy their targets by smashing into them -- DiMaggio says that atmospheric drag (the friction created by the movement of the weapon through air) would limit their effectiveness to targets below an altitude of 60 miles.

But even without dedicated offensive applications for SDI weapons, the program can never be viewed as strictly defensive in its won right. Coupled with increased accuracy of US offensive weapons, anti-ballistic weapons might be perceived as a US attempt to gain a first-strike capability. As the President told a team of Soviet journalists in 1985, "If someone was developing such a defensive system and was going to couple it with their own nuclear weapons -- yes, that could put them in a position where they might be more likely to declare a first strike."

Thus from the viewpoint of the Soviet Union, which has to assess the US nuclear forces in terms of capability, not intent, Star Wars assumes an entirely different character than the one popularly portrayed in this country. When suspicions run high on both sides, SDI might very invite the very nuclear disaster it is designed to prevent. □



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