Documentation

Dr. Teller reports to Congress on SDI

The following statement was presented on May 9 by Dr. Edward Teller to the Subcommittee on Defense of the U.S. Senate Committee on Appropriations.

The statement has been excerpted, and subheads added by the editors.

Shortly after the discovery of fission, 47 years ago, it became clear to me that development of weapons of mass destruction based on nuclear energy had become inevitable. From that time on, it became increasingly clear to me that in a new and more dangerous age, scientists had to play their role in making it clear to free people what their dangers are and in what way these dangers may be avoided or diminished. My dedication to this effort took final shape when I heard President Roosevelt's response to Hitler's invasion of the lowlands [Netherlands, Belgium, and Luxembourg] in 1940. He challenged scientists to work on weapons without which freedom would perish. At that time, Roosevelt had been informed of the possibility of atomic explosions.

Forty-three years later, President Reagan made a similar appeal which was based, according to my knowledge, on years of careful consideration. He challenged scientists to find methods of defense against weapons of mass destruction. . . .

After the successful Soviet test of a nuclear explosion, some of us argued that our work during the war had been incomplete, and that with a moderate amount of additional work, a thermonuclear weapon could and should be developed. Many scientists argued at that time that if we did not develop the hydrogen bomb, neither would anyone else. It is now clear from the publications of Sakharov that he, the inventor of the Soviet hydrogen bomb, had been drafted to work on that super weapon a year and a half before the thermonuclear debate started in the United States. . . .

Today, we are engaged for a third time in a similar competition with the Soviet Union, but there are two differences. One is that in the two earlier competitions, weapons of aggression were developed. On this occasion, we are looking on President Reagan's initiative for methods of defense against aggressive instruments of mass destruction. The second difference is that, while on two earlier occasions we started from a technological advantage, in the field of defensive weapons the Soviets have worked diligently for two decades while our own efforts have been meager and hesitant. Indeed, in contrast to our wartime effort, few academic scientists participate in our work. . . .

The purpose of SDI

It is a mistake to believe that we are pursuing a plan for an impenetrable shield protecting the United States. Our purpose is to deter war by making the success of aggression less likely; thereby, we can contribute to deterring aggression. While we are in research, it is important to maintain the effectiveness of our offensive deterrent. As the research is successful, we can emphasize a defensive deterrence and a more stable basis for peace. Such policy is surely in consonance with the feelings of the American people, and modern developments show that it is technically the sound direction to pursue.

Defense will become practical only if it is effective. Feasibility is not the only criterion. It is also necessary that defense should be less expensive in effort and money than countermeasures. It should also be less expensive than a compensating increase in instruments of aggression. Research on defense performed thus far encourages us that these aims can be attained. Soviet protests are further evidence that they do not consider defense as an unimportant or infeasible activity.

Early concrete successes could be of great importance, even if the successes are partial. Thus, tactical defense against short-range missiles would be important for our allies, could decrease the threat of submarines to the United States, and would serve as a first step toward a more total defense of the United States.

Predeployment in space appears to be difficult because, according to the current situation, it seems at present more expensive to launch a satellite than to shoot it down. The question, however, needs to be included in the present research phase because the Soviets may well pursue this possibility, because launching of satellites could become less expensive, and finally because destruction of satellites could be made more difficult by any of several methods.

The defensive program on which we are embarking is a broad one, and it is unreasonable to determine at this time any particular plan of deployment. My experience with research, and specifically with research on defense, is that new initiatives lead much farther than was originally
This was true in atomic explosives, in electronics, in computer development, and in the magnificent space enterprise.

Soviet defense

The Soviet Union started on the strategic defense of Moscow at least two decades ago. By
their system. Probably two layers of defense are presently available, and such defense can be carried out with the help of appropriate nuclear explosives which will do no damage on the ground and are adapted to destroying incoming missiles. This "terminal defense" is made more easy because

light and cheap decoys are slowed down and burned up as they reenter the atmosphere.

The Soviets have ample opportunity to train their people in terminal defense. They also may have prepared components for a dozen or more sites that they plan to defend. Such defense could be put in place in the Soviet Union in less than a year.

The one particularly expensive and time-consuming element in this type of strategic defense is the big radar system. Such radars have been limited in the ABM Treaty of 1972; the Soviet Union has disregarded these limitations. The well-known example is the radar at Krasnoyarsk. When this instrument is completed, the Soviets will be in the position to use terminal defense in an effective way for the whole of the Soviet Union, with the exception of the easternmost tip of Siberia.

Rockets are most vulnerable in their boost phase while they are accelerated. The fragility of this stage has been tragically demonstrated in the recent Challenger accident. The Soviet Union has been working on various instruments of defense that could attack rockets in their boost phase or in mid-course. In my opinion, the most important of these are various kinds of lasers. According to estimates published by the Pentagon, the Soviet Union has spent on the appropriate high-intensity lasers at least a billion dollars annually for several years. Our planned laser budget has not reached this level as yet. The Soviets have also deployed an effective prototype at the test site Sary Shagan, located in Siberia on the shore of Lake Balkash. This establishment appears to be far ahead of any American experimental laser facilities.

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The x-ray laser is a novel variety of laser whose energy penetrates into the skin of the attacked missile, but which can act only in space or in the uppermost fringes of the atmosphere. As a defensive instrument, it probably will have to be popped up when an enemy launch is noticed. Our own efforts in that field have been stimulated by Soviet publications which stopped abruptly in the late 1970s.

Lasers may be the most effective directed energy weapons which are not weapons of mass destruction, but can be used to destroy aggressive weapons at definite locations at great distances. Other weapons of this kind are electron beam weapons and neutral particle beam weapons. These also can be used to discriminate between decoys and rockets. The Soviet Union has led the way in both these developments.

Still another important development which could be useful both in the terminal phase and in space are rockets guided to their high altitude targets from ground launch points. The Soviet Union has developed several generations of these. Some of them have been used in the 1972 war in the Middle East. The much more modern SA-12 is probably highly useful in missile defense as well as conventional air defense.

A possible scenario

I do not believe that the Soviet Union plans to attack us . . . but it is useful to consider a possible scenario. Assuming that the Soviets plan to launch a nuclear strike, they may establish instruments to prevent our retaliation and deploy them in Cuba and on ships or submarines in the Atlantic and Pacific. The Soviets would expect our retaliation, and with simple instruments from satellites or ground-based radar, they could observe the launching of our retaliatory missiles. Upon such an American launch, Russian instruments could be popped-up. These could be mirrors to reflect and direct high intensity laser light or they could be x-ray lasers driven by nuclear explosives. The latter are novel developments and at the present time, we cannot judge whether they will be relatively unimportant or exceedingly useful.

When both our retaliatory rockets and the Soviets' instruments have reached a 50 or 100 mile altitude, the Russian instruments will be in a line of sight with our retaliatory missiles. Our missiles will be still accelerating and, therefore, highly vulnerable. Most of them could be destroyed in the boost phase.

The Soviets have a triple chance to render our retaliation harmless: preventive strike on our missiles, destruction of our missiles in the boost phase as described above, and terminal defense as discussed in the previous section. Under these conditions, the Soviets may be tempted to attack. The primary purpose of SDI is to discourage attack. Its secondary purpose is to limit the effects of attack if it should occur nevertheless. . . .

The needed budget

The President has asked for a little less than 2% of our military budget to spend on SDI research in fiscal 1987. This is certainly not as much money as the Soviets will spend on the same general purpose in the same period. Considering the fact that in true defensive measures we are late comers, this requested amount is desperately needed.

Our efforts on SDI are of recent origin and one cannot expect that in spending money in this direction no mistakes will be committed. It is, of course, necessary that Congress review both spending and progress. It seems to me very difficult to earmark funds for special expenditures. Directing

research by those who do not participate in it in a direct manner has always proved to be difficult and in the long run, unrewarding. At the same time, constructive criticism and advice are of high value.

The SDI efforts proceed under exceptionally difficult circumstances. The present leader of the project, Lt.-Gen. James Abrahamson, is eminently suited for this task both in his technical knowledge and in his organizational efforts. His performance is without parallel in my four-and-one-half decades of experience in such matters.

Obsolescence of aggression

Our government has taken the initiative to collaborate on defense with our friends and allies. The President has stated that the end results should be shared even with the Soviet Union.

The purpose of rendering weapons of mass destruction "impotent and obsolete" can be accomplished by international cooperation which is directed in general against aggression, and at the moment, more specifically against the launching of aggressive rockets, particularly when great numbers of rockets are launched at the same time. We are beginning to succeed in finding methods of defense against such instruments.

Our flexibility in seeking cooperation from other nations in any form in which we can obtain it is both unprecedented and encouraging. . . .

At this time, the Soviet Union enjoys a monopoly in defensive weapons and also in most of the research leading to such weapons. They do not intend to lose this monopoly; hence, their opposition to SDI and their lack of interest in sharing information.

As we make progress toward realistic and effective methods of defense and as we gain participation of more and more nations in this effort, the interest of the Soviet leaders will increase.
table. They proved in the past to be flexible and also open to accept reasonable peaceful compromises where such can be had without danger to themselves.

Due to the open discussion generated by the democratic process at home and abroad, it is becoming perfectly clear that the purpose of SDI is not to isolate America, not to obtain superiority over the Soviet Union, but to preserve peace for ourselves and for everybody else. This was the announced purpose of our President on the 23rd of March 1983. It should be a nonpartisan issue.

During the Second World War, I participated in practically all phases of the Manhattan Project, which was an effort to avert the most terrible consequences to which this war might have led. The challenge today is to avert a third world war. I believe this deserves the full support of Congress. The large majority of the American people have already demonstrated their support.

Need goal-oriented space program

by Robert Gallagher

The quickest way to get America back into space, is to orient the program around the three national space goals set by the President and by his Commission on Space: deployment of a strategic defense sometime in the 1990s, and the establishment of a permanent manned space station by 1994, and of a manned base on the Moon early in the 21st century. A review of even these modest commitments of the Reagan administration is mind-boggling when compared to existing launch capabilities.

Defense and space programs, and satellite launches for U.S. corporations and our allies, will require a national space launch capacity equivalent to a fleet of at least eight Space Shuttles by 1992, according to a tabulation of NASA, Defense Department, and other estimates carried out by the Fusion Energy Foundation. By 1992, NASA must be deploying the space station if it is to meet President Reagan's date of early 1994 for initial operation; according to official estimates, this will require 8-10 dedicated Shuttle missions per year. (The shuttle payload capacity is rated at 65,000 pounds.) Also in 1992, the SDI program should move into the development stage, according to a conservative timetable proposed by Strategic Defense Initiative director Lt.-Gen. James Abrahamson—an effort that he estimates will require the equivalent of five full Shuttle payloads (called "Shuttle-equivalent payloads") launched per year. These NASA and SDI needs themselves require the launch capacity of at least three Shuttle orbiters flying five missions per year each. However, national security requires that SDI be accelerated toward deployment around 1992, an effort that SDIO estimates will require 25 to 40 Shuttle-equivalent payloads launched per year.

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Launch backlog grows

Even before the Challenger explosion, a backlog of national and allied defense, commercial, and other missions, beyond the capability of the Shuttle, NASA, and Air Force expendable rockets and Europe's Ariane, was growing with alarming speed. The Shuttle fleet was expected to carry out at best 14 missions in 1986, whereas demands on U.S. launch systems are for the equivalent of about 18-19 missions (see **Table 1**).