THE STRATEGIC DEFENSE INITIATIVE AS A CAUSE OF CRISIS INSTABILITY*

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THE ATTRACTIVE VISION OF DEFENSE AGAINST NUCLEAR WEAPONS

In his famous "Star Wars" speech of March 23, 1983, President Ronald Reagan held out a vision of making nuclear weapons "impotent and obsolete" by developing a defense against them. He said, "I have become more and more deeply convinced that the human spirit must be capable of rising above dealing with other nations and human beings by threatening their existence. . . . Wouldn't it be better to save lives than avenge them?"[1] This is a very attractive and powerful vision, and it has helped maintain a measure of public support for the Strategic Defense Initiative (SDI, or "Star Wars") despite widespread doubt about its feasibility among technical experts.

Defense is a better strategy for war avoidance than the threat of retaliation for a number of reasons:

1. Purely defensive measures do not pose a threat to the security of other nations. They need therefore not lead to a spiraling arms race fueled by mutual fear.
2. Pure defense prevents the escalation of war if it ever starts, whether intentionally or accidentally. Retaliation may provoke further mutual attacks and counterattacks and lead to escalation of a war. Defense can help prevent aggression, but cannot be used to carry out aggression. It is therefore an effective way to end a war.
3. If a country possesses offensive capabilities (even if they are intended to be used only for defensive purposes) an opponent may feel under pressure to destroy that offensive potential, out of fear that it might be used against him, if war appears imminent. On the other hand, if a country has only defensive capabilities, it does not invite a preemptive attack. Nor does an opponent have to fear a preemptive attack, because a country possessing only defensive arms is unable to destroy the military forces of an adversary.

For these and other reasons, purely defensive military preparations tend to be stabilizing. A distinction can be made between arms race stability, crisis stability and political stability.[2] A purely defensive strategy is stabilizing on all

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1. Address of President Reagan to Nation on Defense and National Security, 1 PUB. PAPERS 437 (Mar. 23, 1983).
2. Nye, *Farewell to Arms Control?*, 65 FOREIGN AFF. 1 (1986).

three counts: It helps avoid an arms race, because an adversary has no need to protect himself against purely defensive arms; it offers no advantage to the side that strikes first and therefore promotes crisis stability; and, a defensive strategy makes it difficult to change the status quo by military means and thus promotes political stability.[3]

In terms of conventional arms this means that antitank weapons are preferable to tanks, antiaircraft weapons preferable to bombers, coast guard vessels preferable to landing boats, etc., in order to help prevent the outbreak or the escalation of war. If an effective and nonthreatening form of defense against nuclear weapons were feasible, it would be a significant contribution to world peace.

TRADITIONAL ARGUMENTS AGAINST SDI

Criticism of SDI has so far focused mainly on three aspects:

1. It looks technically infeasible.
2. It violates the 1972 Anti-Ballistic Missile (ABM) Treaty.
3. Even if feasible, SDI would be far too expensive.

To prove that something is technically infeasible is difficult. For each proposed solution that can be shown to violate physical principles, a host of other approaches can be proposed. What would need to be shown infeasible is constantly changing. Proponents of SDI can also quote a long list of false predictions about the infeasibility of certain technologies, from airplanes to flights to the moon.

There is, however, an important difference. No one deliberately attempted to sabotage these achievements. As McGeorge Bundy pointed out, a contingent of moon men with axes would have made a successful moon landing much more questionable.[4]

It is true that current SDI proposals offer no protection against the latest missile technology, cruise missiles that closely hug the ground and never leave the atmosphere, unlike ballistic missiles. But proponents of SDI argue that this problem will be addressed in time. Even if evidence suggests that a defense against nuclear weapons is not feasible, one may legitimately ask what is wrong with trying to find out for certain. The claim of infeasibility may also have the effect that it challenges scientists working on SDI to prove their critics wrong.

Concerning the second frequently made objection that SDI would violate the ABM Treaty, the Reagan Administration asserted that testing SDI components in space would not violate the ABM Treaty. That approach stood on very weak ground, since Gerard Smith, the chief American negotiator of the ABM Treaty publicly maintained that the Treaty prohibits such tests. The Reagan Administration approach also caused problems with the Senate which ratified the Treaty. Senator Sam Nunn (D-Ga.) has pointed out that if the executive branch unilat-

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3. By "political stability" I do not mean a situation where the status quo is rigidly preserved by the fear that any attempted change could lead to the outbreak of war. I prefer to refer to a situation where gradual peaceful change is possible, so as to remove the pressure for violent change.
4. Bundy, Kennan, McNamara & Smith, *The President's Choice: Star Wars or Arms Control*, 63 FOREIGN AFF. 264 (1984-85).

erally interprets a treaty differently than the way it was interpreted by the Senate when it ratified the treaty then a fundamental constitutional crisis would occur.

There is a much easier way to deal with the "obstacle" of the ABM Treaty. Treaties are supposed to be in the mutual interest of both signatories. At the time the ABM Treaty was signed, it stemmed a new round in the arms race that could have been very costly for both the United States and the Soviet Union. If in the meantime the ABM Treaty has outlived it usefulness, and if new technological developments have indeed made missile defense cost-effective, the time may have come to renegotiate the Treaty, if that is in both sides' interest. Or either party could withdraw from it unilaterally with six months notice, as provided for in the Treaty. Opponents of SDI emphasize, however, that if the United States begins to abrogate treaties, it loses its credibility as a reliable negotiating partner, and this may doom the arms control process.

A third objection to SDI has been that it would be far too expensive. Cost estimates have ranged up to more than one trillion dollars for initial deployment, and up to two hundred billion dollars per year thereafter for maintenance and modernization.[5] This could bankrupt the American economy. But believers in SDI contend that preventing nuclear war is such an overriding goal that no effort should be spared and no sacrifice is too big to make in pursuing it.

These three objections, while important, overlook the central point. The key argument against SDI is that it would increase the danger of nuclear war. It is not only a question of possibly wasting billions of dollars on a fantasy that may never work. Deploying SDI, at least as currently envisaged, would positively harm U.S. and global security. The remainder of this paper discusses SDI's potential for creating instability.

OFFENSIVE USES OF SDI

Former U.S. Defense Secretary Caspar Weinberger has written that SDI offers "a bold new vision for peace. . . . Such systems would save lives, not threaten them. The plan involves a visionary, moral quest."[6] In the same article, however, Weinberger writes, "a Soviet breakthrough in advanced defense technologies. . . would seriously tilt the balance against us and put us at great risk." How could a moral quest for peace put the United States at great risk?

What Weinberger appears to have in mind is that if the Soviet Union had an effective defense against nuclear weapons, while still possessing such weapons, it could launch a nuclear attack against the United States, or at least use nuclear blackmail by threatening such an attack, without fear of retaliation. The same, of course, applies in reverse. Weinberger may consider it as self-evident that the United States would never use nuclear blackmail against the Soviet Union, but that does not necessarily convince the Soviet leadership.

While a defense against nuclear weapons by itself does not threaten an adversary, a combination of nuclear weapons with defense against retaliation is a far more threatening system than the nuclear weapons themselves. No sane leader would order a nuclear attack knowing that his country would be vulnerable

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5. Proxmire, *When You Are Talking About "Star Wars" You're Talking Trillions,* Christian Sci. Monitor, May 19, 1986 at 16, col. 1.
6. Int'l Herald Tribune, July 11,1985, at 4, col. 2.

to retaliation. But if a leader thought his country could protect itself against retaliation, he might be tempted to resort to nuclear blackmail.

Henry Kissinger once noted that the critics of SDI contradicted themselves. On the one hand they argued that SDI would never work. On the other hand they said that it was very dangerous and had to be stopped. Both claims obviously could not be true.

But SDI need not actually work for it to pose a threat to an adversary. The belief that a space-based missile defense system would work, can be, in itself, dangerous. Imagine, for example, that some future Soviet leader one day announces, "our scientists have developed a new weapons system with which we can survive and win a nuclear war." We may all be convinced that this is impossible and that it would violate the laws of physics. But it is not enough for us to know that. If we knew that a Soviet leader actually believed in a defense against nuclear weapons, we would have to fear that he could act on that basis. It would be necessary to convince that leader, not only ourselves, that such a defense could not work. The only way to do that might be to build more nuclear weapons to make it obvious that such a defense could not work. The Soviet reaction to an American deployment of SDI might well be just that.

Edward Teller has asserted that the Soviet Union takes SDI far more seriously than American critics, because it is so afraid of it. This does not prove that the Soviet leaders think that SDI could ever provide an effective defense against nuclear weapons. But as long as they fear that an American president might ever believe in such a defense, they have sufficient reason to be concerned. President Reagan's talk about an "astrodome" defense that would offer an impenetrable "peace shield" against Soviet missiles did not alleviate that concern.

When the Soviet Union improved its air defense system, the United States did not dismantle its nuclear long-range bombers as "impotent and obsolete," but built thousands of cruise missiles and embarked on the development of two new types of bombers, the B-1 and the Stealth, to continue to be able to penetrate Soviet defenses. This response does not imply that the United States plans a nuclear attack on the Soviet Union. The United States acted in order to maintain its capacity to retaliate against a potential Soviet attack. The Soviet reaction to a U.S. deployment of SDI would probably be similar. Soviet opposition to SDI and its announcement that it would take countermeasures in case of a U.S. deployment are not a sign of aggressive Soviet intentions, as is sometimes asserted in the United States, but of a legitimate desire to be able to deter a potential U.S. attack.

Space weapons could also have direct offensive uses to destroy ground targets. According to Theodore A. Postol, former advisor on nuclear weapons to the U.S. Chief of Naval Operations, and an expert on the implications of fire storms, an optical laser with enough power to attack hardened intercontinental ballistic missle (ICBM) boosters could also be used to start mass urban fires that would be potentially larger and more intense than those fires created by the incendiary raids on Hamburg and Dresden in World War II.[7] Other weapons

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7. Scheer, *Physicists Questioning Laser Defense,* Int'l Herald Tribune, Jan. 13, 1986, at 1, col. 1.

experts have noted that after spending hundreds of billions of dollars on space weapons, the United States would be back where it started from: deterrence by retaliation. American cities would be hostage to lasers instead of nuclear weapons.[8]

The United States does not base its security solely on announced Soviet intentions, even if those intentions are accepted as sincere, because intentions can change with a new government. The United States bases its defense preparations on Soviet capabilities. It is logical to expect the same type of strategic planning from the Soviet Union.

Space-based laser weapons would in some sense pose an even greater threat than today's nuclear arsenals, not because of greater destructive power (there is more than enough overkill already) but, because of greater speed and precision. Laser beams could hit a target with the speed of light, without any warning time whatsoever. They could hit single individuals. They would not cause radioactive fallout that could blow back to the attacker and are less likely to cause nuclear winter. Therefore, such weapons would appear more usable.[9]

INCENTIVE TO STRIKE FIRST

Deploying weapons in space would lead to crisis instability by giving an advantage to the side that struck first. If the United States deploys space stations to intercept Soviet nuclear weapons, it is likely that the Soviet Union would deploy a similar system within a few years, as it has usually caught up in the past with new American weapons developments. The space stations of both sides would then be extremely vulnerable themselves.

For cost reasons, each such station would have to be able to destroy several targets, perhaps several hundred. Only a small fraction of the space stations in orbit would be in the right position to help stop a missile attack at any given time. Both the United States and the Soviet Union possess about ten thousand strategic nuclear warheads. In addition, there would be many more decoys. If each space station could destroy only one target, there would have to be hundreds of thousands of such space stations circling the earth. That would be far more expensive than to overwhelm such a defense with more deliverable warheads. For this reason it is inescapable that each space station would have to be able to destroy many targets.

There is nothing that prevents laser or particle beams or kinetic energy projectiles, designed to destroy incoming enemy warheads, from being aimed also at enemy space stations. Since one such station can destroy more than one space station of the opponent, whichever side were to strike first during a grave international crisis, when war appears possible or imminent, would be able to destroy all of the space stations of the opponent, using only a fraction of its own. Whoever were to hesitate would risk losing all of their own space stations. Such an advantage to striking first is the principal cause of crisis instability.

Such instability is present whenever weapons systems have an "exchange ratio" greater than one, meaning that one weapon can destroy, on average, more than one similar weapon of the opponent. In that case, whoever strikes first can

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8. *Id.*
9. Galtung, *The Real Star Wars Threat*, 244 NATION 248 (1987).

destroy more weapons of the opponent than are being used in the attack. If the exchange ratio is less than one, the attacker uses up more weapons than he can destroy, and the side that strikes first is at a disadvantage. This situation promotes crisis stability.

Deploying space stations which can destroy several hundred targets each is comparable to deploying totally exposed, vulnerable MIRVed missiles with several hundred highly accurate warheads each. That would be more destabilizing than anything that ever existed.

Stability considerations are not purely theoretical. Crisis instability has led to the outbreak of wars in the past. For example, President Gamal Abdel Nasser believed in the 1960's that if Egypt could match Israeli air strength, his country would be militarily stronger and therefore safer. But the result was that each side had vulnerable bomber fleets on open desert air fields. Since one bomber can drop many bombs and destroy a whole fleet of bombers on the ground, each side knew that the side that struck first could destroy the other side's air force on the ground, before it could take off. This was a highly unstable situation. When tensions rose in 1967 and war appeared imminent, Israel felt under pressure to destroy most of the Egyptian air force in a surprise attack, out of fear that otherwise it could suffer the same fate. This helped precipitate the Six-Day War.[10] If we create a similarly unstable situation in space, the consequences could be far worse.

Congressman Jim Courter (R-N.J.) has supported a proposal that the United States put into orbit forty space stations, each containing 150 kill vehicles, weighing forty pounds each, that could destroy targets through force or impact, travelling at ten kilometers per second. It is obvious that such a space station could destroy up to 150 of an opponent's space stations. Such a high exchange ratio would provide a very strong incentive to strike first during a crisis.

Proponents of SDI argue that battle stations could be made invulnerable against attack. It is difficult to see how a space station could continue to function unimpaired after the impact of a forty-pound projectile at a speed of ten kilometers per second. But if shielding could provide the necessary protection, the space stations would become much heavier and more expensive to put into orbit. It would then be relatively cheaper to overwhelm such a defense with a larger number of offensive weapons. The two criteria for deployment of SDI put forth by Paul Nitze, "survivability" and "cost-effectiveness at the margin," meaning that it would be less expensive to defend against missiles than to build more missiles, have opposite requirements.

For example, a space station might be protected through "active" defenses that would intercept the kill vehicle before it reaches the space station. The same defenses, however, could also be applied to nuclear warheads, thus making the space-based defense ineffective.

Could space stations be "popped up" to make them invulnerable before they are used? Courter advocates the deployment of one thousand X-ray lasers, each able to destroy fifty targets, with up to twenty such laser weapons in the nose cones of land-based MX missiles or Trident sea-launched ballisitic missiles.

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10. *See* G. QUESTER, OFFENSE AND DEFENSE IN THE INTERNATIONAL SYSTEM (1977).

But an attacker could do the same first, and destroy those missiles or X-ray lasers as they emerge, before they could be used.

Land-based antiballistic missile systems are potentially less vulnerable than space-based systems, if they are sufficiently large in number. But designs involving free electron lasers envisage the construction of only a small number of very large ground-based laser stations that would be supplemented by relay mirrors in orbit. These few installations on the ground would represent very lucrative targets in case of war, inviting preemption. There have been speculations that Israel might be able to cover its entire country with an anti-tactical missile system consisting of a single ground-based free electron laser station with ground-based relay mirrors.[11] Such a station would represent a highly vulnerable, extremely attractive target that might be damaged even through a conventional bombing raid, in the same way as Iraq's Osirak nuclear research reactor represented a provocative target in the eyes of Israel.

ACCIDENTAL WAR

Deployment of SDI would also increase the danger of accidental war. The time to react to a computer warning of an impending nuclear attack during the boost phase of a missile, before multiple warheads and decoys have split apart, is slightly over one minute. There would be no time for human intervention. The decision to initiate acts of war would have to be turned over to a computer system.

There have been numerous false warnings of a possible Soviet nuclear attack on the United States. From January 1, 1979, to June 30, 1980, there were 3804 computer-generated warnings of a Soviet nuclear attack on the United States. After that, the Pentagon stopped publishing those statistics, so as not to frighten the public.

All of these warnings were, of course, found to be false in time on human inspection, before any irreversible action was taken, although on four occasions missile launch units were put on alert and bombers sent on a retaliatory mission, but later recalled. To allow a computer to initiate war based on such a warning would be folly.

Would such a war ever be confined to space, without harming the people below? There is no guarantee of that. If an opponent would suddenly destroy all of our space stations, especially during a time of crisis, this would be taken as a strong provocation and would hardly be accepted without some form of retaliation. That could set in motion a process that could escalate into a nuclear exchange.

The United States and the Soviet Union have not been able to agree to halt the nuclear arms race during forty years of negotiations. It appears doubtful that the two countries could agree to a nuclear cease-fire within hours or even minutes, given that cool rational thinking tends to be one of the first casualties of war.

Another danger of accidental war, besides a false warning, is the vulnerability of space weapons to accidental collisions, which might be misinterpreted as deliberate attacks. General Secretary Mikhail Gorbachev has speculated that a

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11. *Washington Round Up,* AVIATION WEEK & SPACE TECH., Oct. 20, 1986, at 27.

separated fragment of a test missile might collide with a space weapons system. If an occurance like this should take place, "decisions, irreversible in their consequences, would be taken by computers, without participation of human mind and political will. . . . Such a development could result in a universal catastrophe—even if the initial impulse were an error, miscalculation or technical malfunction of sophisticated computer systems."[12]

It has been estimated that the battle management system to control SDI would require up to one hundred million lines of computer code written by hundreds of thousands of individual programmers.[13] It is doubtful whether such a system could be expected to be free of errors, especially given that it could never be tested in reality. Highly complex systems occasionally can go wrong catastrophically. The tragedies of Bhopal, the Challenger and Chernobyl have warned us.

Lieutenant General James A. Abrahamson, the former director of the Strategic Defense Iniative Organization, was in charge of the space shuttle program while he worked at the National Aeronauatics and Space Administration. He was warned about possible problems with the O-seal ring on the booster rocket nearly two years before this problem caused the explosion of the space shuttle Challenger. He appointed a study commission, but did not follow up on it before he left his post and failed to inform his successor.[14] This cavalier attitude toward risk (on behalf of others) has already cost the lives of seven astronauts. The Reagan Administration showed the same scornful attitude in the face of warnings from many scientists about the dangers of SDI. This time it could cost many more lives. And unlike those astronauts, we are not volunteers.

ENHANCING DETERRENCE

Former Defense Secretary Weinberger has also argued that even a partial, leaky defense against nuclear weapons could cause uncertainty that could deter an aggressor contemplating a disarming first strike. As long as the nuclear powers rely on deterrence, it does make sense for both sides to make their retaliatory forces as invulnerable as possible. Some local, ground-based short-range missiles to protect a silo could play a useful role. But a far better way to achieve such crisis stability is to avoid putting nuclear weapons on missiles with multiple warheads. Putting ten warheads on a single missile, as with the MX or the Soviet SS-18 missile, makes these warheads ten times more vulnerable.

It would also be preferable not to develop missiles with extreme accuracy, such as the Trident D-5. If an adversary fears that we could pinpoint and destroy his nuclear weapons in a preemptive attack, he is under greater pressure to launch them on warning, before they might be destroyed. This increases the danger of accidental war and reduces both sides' security. If an adversary is confident that at least a portion of his forces would survive a first strike, he can afford to wait and make sure whether an attack actually occurred before retaliating.

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12. Shenfield, *The Militarization of Space Through Soviet Eyes,* in THE MILITARIZATION OF SPACE 439 (S. Kirby G. Robson eds. 1987)(quoting a Gorbachev speech in Geneva on Nov. 27, 1985).
13. Waldrop, *Resolving the Star Wars Software Dilemma,* 232 SCI. 710 (1986).
14. Sanger, *Top NASA Aides Knew of Shuttle Flaw in '84,* N.Y. Times, Dec. 21, 1986, at 1, col. 1.

SHARING SDI TECHNOLOGY?

President Reagan promised that he wanted to share SDI technology with the Soviet Union, after the system is developed. But his successors might have different ideas. Furthermore, the United States would not want to base its security on a Soviet promise, and we cannot expect the Soviet leadership to act differently.

Secretary Weinberger was once asked whether the United States would really be willing to share its most sophisticated technology with the Soviet Union. He replied that the United States never said it would share the technology. Instead America would share the benefits of SDI technology with the Soviet Union. In other words, the United States would protect the Soviet Union from U.S. missiles, for those who believe it.

An entirely different approach would be for the United States and the Soviet Union to jointly explore the dangers of strategic instability and the possible development of technologies that improve their mutual security, such as surveillance satellites. The satellites' pictures could be made available to every country, to reduce the danger and fear of surprise attacks.

PROTECTION AGAINST NUCLEAR TERRORISM OR AN ACCIDENTAL LAUNCH

One of the key agruments in favor of SDI is that it could at least offer protection against a nuclear attack from a terrorist group or a small country with a rogue government. But it is unlikely that a poor nation or a terrorist group could afford an intercontinental ballistic missile. It would be much easier to smuggle a nuclear weapon by sailboat or small plane, as drugs are routinely smuggled into the United States.

Nuclear terrorism is a very serious prospect for the future. Some years ago, the Puerto Rican Liberation Front left a bomb in a luggage locker at a New York train station. Nobody was hurt in the explosion. If this had been a nuclear bomb, the damage would have been inconceivable. Closer surveillance of suspects and tighter border controls may help prevent terrorism to some extent. But the most effective way to guard against terrorists is to remove their breeding ground: unresolved conflicts—conflicts in which people see no other way to change a situation that they consider unacceptable than through violence.

SDI has also been defended as an insurance policy against an accidental missile launch, or an unauthorized launch by a mad submarine commander who has the loyalty of his subordinates. The permissive action link technology, which prevents missiles from being launched without authorization from the National Command Authority, offers some protection against unauthorized launch. But during a crisis, there is great pressure to release the secret code before lines of communication may be interrupted. Once a missile has been launched, there is presently no way to prevent it from destroying its target.

When the booster rockets of the space shuttle Challenger began to veer in random directions on its fatal last flight, they were exploded in midair by a radio signal from the ground, before they hit populated areas. Such a mechanism should also be installed on nuclear missiles, so that they can be destroyed in flight, if it turns out that they were launched by mistake or without authorization.

Such a device is not now included, for fear that the opponent could get ahold of the signal to destroy the missiles in flight. But that disabling signal

could be kept secret, and could be changed daily or at irregular intervals if deemed necessary. The likelihood that an adversary would have access to those signals, especially if they are different for each missile, would be extremely low.

Two risks need to be balanced: (1) that a missile aimed at an enemy target would fail to reach it and (2) that an accidentally launched missile would destroy its target. The second problem could lead to unintended nuclear war and is far more serious. The first problem might slightly reduce deterrence, but hardly so. Neither side could rely on it definitely possessing the current disabling codes for every single missile of the opponent.

TECHNOLOGICAL SPINOFFS

Some commentators have enthused about the potential applications in transporation, communications and medicine that could result from Star Wars research. But if the same resources were invested directly into research for civilian applications, the results would be far greater. To take a detour through military technology is as if someone were to argue, "If I wash my car, it is good for the vegetable garden, because some of the waste water flows off towards the vegetables." Why not pour all the water directly onto the vegetables?

STRAINING THE SOVIET ECONOMY

Others advocate SDI because it could force the Soviet Union into an expensive arms race which it would lose. But that strategy could bankrupt not only the Soviet, but the U.S. economy as well. It is not clear for how much longer the U.S. economy can continue accumulating domestic and foreign debts at the rate it has over the last seven years. Within the last four years, the United States has turned from the world's biggest creditor to the biggest debtor nation. Its foreign debt now exceeds that of Mexico, Brazil and Argentina, the three runners up, combined. President Reagan accumulated more national debt than all the Presidents before him, from George Washington to Jimmy Carter, combined.

If the debt burden exceeds a certain limit, creditors will begin to doubt the government's ability, or willingness, to pay back its debts. This could cause a rush on the treasury, where all lenders want to get their money back as long as something is left. If the government refused to pay, this could cause an investors strike. If it paid, it might have to impose austerity measures that cause popular unrest.

If Star Wars increases the risk of war and puts such a burden on the economy, why is there so much pressure to proceed with it? Obviously, for a few it would be highly profitable. It would channel billions of dollars to the defense industry for many years.

SECURITY THROUGH COOPERATION

The path to greater security does not lie in a failure-prone technical system, but in better international cooperation.

A film produced by a defense contractor in 1969 during the big ABM debate argued that it was not yet technically feasible to build an ABM system against Soviet missiles, but that was not so important, since the Soviet leadership was relatively reasonable and reliable. The great danger was the Chinese, who were

so "fanatic and unpredictable." All that was needed was a "thin" ABM system against Chinese nuclear missiles.

Today, few in the United States are afraid of a Chinese nuclear attack, but not because of a thin ABM system. It is because the United States and China have developed better relations. With twenty thousand Chinese students in the United States and a quarter million Americans visiting China each year, neither side expects a nuclear attack from the other.

The United States and the Soviet Union would be much safer if instead of carrying the arms race into space, they would conclude a treaty banning weapons in space and would cooperate in the peaceful exploration of the solar system.

An example of successful joint scientific exploration was the International Geophysical Year of 1957, when American and Soviet scientists cooperated with scientists from a dozen other nations to explore Antarctica. In the meantime, enormous progress has been made in computers and data processing, communications technology and observation satellites. It would now be feasible to undertake a comprehensive survey of the entire earth's climate, fauna, flora and geological composition. This could bring a better understanding of the resources available for economic development, help anticipate shortages of scarce resources and avert them through better management. It could also improve our understanding of the earth's climate to avoid catastrophic changes such as the greenhouse effect.

The United States and the Soviet Union, and other countries that wish to join them, could establish a permanent observation post on the moon, explore Mars, and mine a small asteroid for the construction of space stations for peaceful use. Such giant projects could absorb the human potential in science and engineering that is now misdirected into devising ever more sophisticated weapons. At best, these efforts are wasted, if the weapons are never used. And if the weapons are used, the result is much worse.

Cooperation on "superordinate goals," which are in the interest of both sides and require a joint effort for their solution, have been found to be among the most effective means to overcome mutual hostility and to foster a climate of mutual understanding.[15] There exist many such superordinate goals, above all, the prevention of nuclear war, but also the elimination of hunger, the prevention and cure of diseases, better education, increases in mutual contacts and the exchange of ideas, and many more.

We can use technological innovations to improve people's lives, or to wire our planet into a ticking doomsday machine. The choice is ours.

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15. See M. SHERIF, O. HARVEY, B. WHITE, W. HOOD & C. SHERIF, INTERGROUP CONFLICT AND COOPERATION: THE ROBBERS CAVE EXPERIMENT (1961). *See also* M. SHERIF, A. MUZAFER & C. SHERIF, SOCIAL PSYCHOLOGY (1969).