Aerospace Experts Challenge ASAT Decision

Reagan claims that an antisatellite treaty is infeasible, but many satellite designers and intelligence analysts disagree

A major congressional fight is brewing over President Reagan's recent decision to postpone, perhaps indefinitely, any efforts to limit the development of antisatellite weaponry. Some influential Republicans have joined a large group of Democrats in an attempt to force a reversal of the decision, a development that may lead to a major defense policy setback for the Administration.

The vehicle for this campaign is a resolution to be considered on the Senate floor within a week or two, which demands a temporary halt in the ongoing U.S. effort to develop and deploy an ASAT, or antisatellite weapon. It also demands prompt talks with the Soviets on "a mutual and verifiable" ASAT arms control treaty. Introduced by Senator Larry Pressler (R–S.D.) with 20 cosponsors, the resolution won unanimous support from the Senate Committee on Foreign Relations last fall. But the Administration is lobbying aggressively, and its proponents forecast a close vote.

A similar attempt to force the President's hand is planned in the House of Representatives, where a newly formed umbrella organization known as the Coalition for the Peaceful Uses of Space will try to eliminate funding for ASAT testing and procurement during upcoming deliberations on the 1985 defense budget. Membership in the group, which is led by Representative George Brown (D–Calif.), includes representatives of the Union of Concerned Scientists, the Federation of American Scientists, Physicians for Social Responsibility, the Council for A Livable World, and the Arms Control Association. A resolution in the House, similar to Pressler's but sponsored by Representatives Norman Dicks (D–Wash.), Albert Gore (D–Tenn.), and Les Aspin (D–Wis.), has 52 cosponsors.

The rationale behind Reagan's decision is laid out in a 16-page report, *U.S. Policy on ASAT Arms Control*, released by the White House on 31 March. Much of the report is devoted to the elaboration of an argument that arms control advocates already concede: a total ASAT ban is infeasible because Soviet compliance could not be adequately verified. The problem stems from the relatively small size of the existing Soviet ASAT, as well as general U.S. ignorance of the number produced to date—factors that would obstruct any verification of their destruction. Given this obvious encumbrance, a treaty entirely barring ASAT possession has attracted only slight interest.

More to the point is a brief section in the Administration report devoted to problems associated with potential agreements that fall short of a total ban. Last year, for example, the Union of Concerned Scientists drafted a treaty that would ban ASAT testing, deployment, and use, but not possession (*Science*, 28 October 1983, p. 394). Its guiding principle was the common notion that no weapon is truly threatening until it has been thoroughly, realistically, and successfully tested, and that any significant tests of ASAT systems could be observed by the other side.

Kenneth Adelman

A comprehensive test ban "is simply not possible."

In its report, the Administration throws cold water on the proposal by asserting that circumvention of a ban on ASAT testing and deployment would be nearly impossible to detect, because so many legitimate space activities incorporate ASAT technology. As Kenneth Adelman, director of the Arms Control and Disarmament Agency (ACDA), explained in recent congressional testimony, "the fact that many systems not designed to be ASAT weapons nonetheless have inherent ASAT capabilities . . . [implies] that a truly comprehensive ban on tests of all means of countering satellites is simply not possible."

Public debate on this claim, which lies at the heart of the President's decision, is hindered by the Pentagon's understandable reluctance to specify, on an unclassified basis, the limits of U.S. intelligence capabilities in outer space. "Our chance of monitoring some potential ASAT tests is 10 percent or less," says Richard Perle, an assistant secretary of defense, "but of course I can't say which ones." He suggests that participants in the debate take his word for it that, with regard to an ASAT treaty, "lack of verifiability is a show-stopper." Many members of Congress are persuaded. For example, Senator John Warner (R–Va.), a former Secretary of the Navy who chairs a key subcommittee on strategic weapons, says that "a careful reading of [the Administration's report] can result in only one conclusion: The prospects regrettably are limited and the pitfalls are plenty."

This assessment is challenged, however, by a host of weapons designers and intelligence analysts with extensive experience in the aerospace industry, who say that the risk of undetected Soviet cheating pales in relation to the overall benefits of an ASAT treaty. William Colby, who directed the Central Intelligence Agency (CIA) during the Ford Administration, for example, claims that "we do a pretty good job of verifying today what the Soviets are doing, and a treaty generally makes the process easier. Verification is not an absolute. We are better off if an activity is essentially stopped, even with a possibility for marginal cheating, than we are if the technology is left unconstrained."

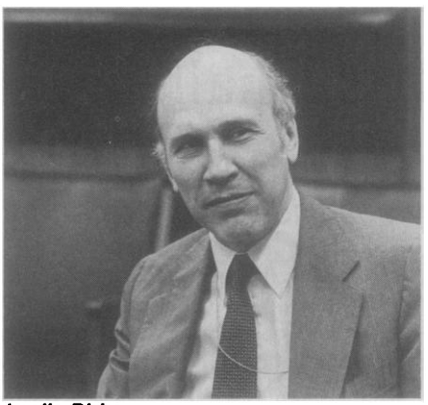
Leslie Dirks, a Raytheon Corporation vice president who retired in 1982 after 6 years as the CIA's deputy director for research and technology, agrees. "I'm quite confident that testing things surreptitiously in space is a hard thing to do, and the United States has a very robust detection capability in this area," he says. "It would be pretty difficult to

guarantee absolutely that no testing was going on. But I hope one would take a liberal view of the verification problems, and be prepared to take a few risks, because there are clearly strong U.S. national interests in [signing] a treaty that would deter continued testing of the existing Soviet ASAT or prevent the development of a better Soviet system."

One of the few ASAT technologies advertised by the Administration as a potential outlet for cheating is the laser, which could be deployed either on the ground or in a high-flying aircraft. Construction of a laser capable of striking a swiftly moving satellite poses a formidable technical challenge, particularly if the laser is also moving, as on an aircraft. Nevertheless, the fear is that such a weapon could be used either to burn out the electronic circuitry or to ruin the optical sensors of satellites overhead, following an extensive program of secret testing. According to the Pentagon's latest published estimate, the Soviets could test a ground-based laser by the late 1980's, and begin to operate it by the early- to mid-1990's.

Michael May, the associate director of Lawrence Livermore National Laboratory, agrees that under certain conditions, tests of ground- or air-based lasers would indeed be difficult to detect. He points out, however, that the useful range of such lasers is limited, with the result that many high-powered lasers would have to be constructed in order to mount a significant attack on U.S. satellites. "The installation of a high-powered laser system would be detectable," he says, adding that detectable lasers can also be watched. Low-powered lasers, which could be substantially smaller and thus less easily detected, would be effective against U.S. satellites only if American designers are "remarkably careless" and fail to include various straightforward laser countermeasures, he adds (see box). Citing a need for secrecy, May is vague about what these countermeasures might be. But other experts say that it is easy for a satellite to detect laser illumination, and that it is possible to block the entrance of high-intensity light into optical systems by installing fused shutters.

The Administration also argues that the Soviets could secretly test the technology needed for so-called space mines, or satellites capable of maneuvering near their targets and exploding on command. "Any nation routinely conducting space rendezvous and docking operations, as the USSR does, could, under the guise of that activity, develop spacecraft equipped to maneuver into the path of, or detonate next to, another nation's spacecraft," its report states. Some officials in the Air Force Chief of Staff's office, in particular, are known to be concerned that an attack by secret Soviet space mines could be effectively used in the opening stages of a nuclear attack.



Leslie Dirks

Believes secret space tests are difficult.

This assessment is challenged by several experts, however, including James Reynolds, a manager of aerospace activities for the Northrop Corporation who formerly managed the Navstar and Satellite Communications System programs for the space division of the U.S. Air Force. "The people who postulate this threat don't know a spacecraft from a frying pan. It is highly improbable," he says. "You are talking about a complicated space system, with multiple rockets, sensors, payloads, and ground control. The mines must be situated next to everything of importance we have in space. And they must be on-line 24 hours a day, ready to detect evasive maneuvers and come after us, even though it takes twice as much fuel to follow as it does to evade. How much do you think the Soviets are willing to spend on this? How many mines will it take to guarantee 98 or 99 percent success? Virtually an infinite number! Now are they dumb enough to spend all their resources on that, or are they more likely to build more missiles or put more tanks in Eastern Europe? There's a smarter way to fight a war."

Dirks agrees that a surreptitious space mine attack is improbable. "Any substantial space mine system would be discovered by U.S. ground-based capability," he says, and goes on to make a broader point that with any potential surreptitious ASAT threat, the issue is not whether the Soviets can test components but whether they can test the entire system. "I spent about 20 years engaging the Soviets on this issue, and I know that the Soviet military would be very unwilling to depend on a system that had not been fully tested." Walter Slocombe, who served from 1979 to 1981 as deputy secretary for policy planning in the Defense Department, also makes this point: "In a crisis involving low-level U.S.–Soviet hostilities, only high-confidence, high-precision ASAT systems would suffice. Jury-rigged systems are clearly inadequate."

Beyond the issue of verification, however, the Administration cites several other drawbacks to a treaty banning ASAT testing and deployment. One is that the development of a U.S. ASAT is supposedly needed to deter any Soviet ASAT use. "If, for example, during a crisis or conflict, the Soviet Union were to destroy a U.S. satellite, the United States would lack the ability to respond in kind to avoid escalating the conflict. Thus, in present circumstances, a U.S. [ASAT] clearly responds to the need to deter such Soviet attacks," the Administration's report states. Reynolds questions the military wisdom of this strategy, however. "I don't know that a 1-to-1 satellite exchange is that productive to us," he says. "Our satellites are better than theirs, and they can replace theirs more easily."

But Administration officials offer a second justification for the U.S. ASAT, which conflicts with the need to deter any space warfare. It is also needed, they say, to initiate attacks on Soviet satellites that can fix the location of aircraft carriers at sea, either by radar or electronic eavesdropping. "In view of the fundamental importance of U.S. and Allied access to the seas in wartime, including [the need] for naval reinforcement by sea, the protection of U.S. and Allied navies against such targeting is critical," their report states. Proponents of a treaty also challenge this assertion, however. They point to congressional testimony last year by Vice Admiral Gordon Nagler, director of command and control for the Navy, in which he sharply disputed claims that aircraft carriers could be targeted by Soviet ocean reconnaissance satellites. "I think I covered that before [in classified testimony], how we can avoid that," he said.

This point is also made by Robert Buccheim, a former chief scientist for the Air Force who served as the chief of the U.S. delegation to ASAT treaty negotiations held from 1979 to 1980. He says flatly that a radar satellite "can be countered electronically," and that other means of surveillance are available to the Soviets anyway. "It continues to be true that long-haul radio-transmissions from combatants at sea can be detected and

Pentagon Neglects Satellite Defenses

Several years ago, Colonel James Reynolds, the manager of the Air Force's Navstar satellite program, hit upon an idea that he thought would defeat "any practical ASAT through the next 15 or 20 years." A relatively simple maneuvering system, devised by a Navstar contractor, would enable each of the system's satellites to scoot safely out of harm's way on warning of an ASAT attack, he believed. To his great frustration, however, higher-ups in the Air Force were unwilling to pay for it, with the result that none of the 28 Navstar satellites now under contract will have this capability.

Reynolds and other satellite engineers characterize this decision as a common one in the U.S. military space program. They say that the Pentagon has at its disposal the means or the know-how to defend virtually all of its satellites against a Soviet attack. Yet with few exceptions it is unwilling to invest the money needed to do so. Instead, its managers pour money into development of their own satellite-killing technology, and seek to avoid an arms treaty which in combination with satellite defenses might guarantee the survival of intelligence assets essential to national security.

"It's a generic problem," Reynolds says of the reluctance of high-ranking Pentagon officials to invest heavily in satellite defenses. Albert Wheelon, a former CIA analyst who is now a senior vice president with the Hughes Aircraft Corporation, agrees. "It's been a recurring theme for 20 years: we really ought to do something to fix these things up so they aren't quite so wide open to assault. It always seems like there are more important things to do with the money, however, and we really haven't done anything very effective, so they really are kind of sitting ducks," he says.

Among both satellite designers and intelligence analysts, there seems to be little concern about defending against the existing Soviet antisatellite (ASAT) weapon, a huge explosive device that usually takes several hours to approach low-altitude targets. "The latest information I've had is that it doesn't work," says Leslie Dirks, a physicist who retired from a senior post at the CIA in August 1982. "Anybody who has followed it closely would have to agree." Reynolds, who now works on special aerospace programs for the Northrop Corporation, is even more derisive. "It's so weak and cumbersome that I think we literally have to let them get us in order for it to work," he says.

There are substantial fears, however, that the Soviets eventually might refine their existing ASAT and extend its range, or develop ASAT's of a different character, such as lasers. Reynolds worries in particular about the possibility of a well-designed, high-altitude, direct satellite interceptor, armed with a nuclear warhead. "If a nuclear warhead were used atop the SS-9, that would be a sporty threat for some of our systems," he says. "I would say that if you attribute strong motives to the Soviets they could quickly make this a strong threat." It was to counter exactly this threat that the Navstar maneuvering system was proposed, he adds. "The problem is that satellite system survivability always has to compete against the traditional Air Force budget priority: winged weapons systems. There is simply only so much money to go around."

Although Pentagon officials boast of spending $900 million on satellite survivability programs in fiscal year 1984, critics point out that much is for research and development that could have been started long ago, or for survivability add-on's to existing satellite programs that should have been incorporated at the start. Only recently, for example, did the Pentagon realize that its new meteorological satellites, which operate at low altitudes and provide information considered critical to ballistic missile targeting, should be hardened against ground-based lasers. As a result, the equipment will have to be added (production began in 1981). On the average, such efforts boost overall satellite system costs by as much as 15 percent, according to official estimates.

The potential for vast improvement in this area is demonstrated by the Pentagon's plans for Milstar, a satellite designed to transmit nuclear war–fighting information in the next decade. According to testimony last April before the House Appropriations Committee, Milstar will be hardened against ground-based laser radiation, and will have the capability for additional hardening against space-based lasers. Its command and communications links will be encrypted, and jamming will be prevented by beam hopping antennas, frequency hopping, and burst transmissions. It is supposed to be hardened against a nuclear blast in space and, if the necessary funding is not eliminated, it will be the first U.S. satellite to have substantial maneuvering capability. Like the Navstar system, which is designed to provide navigation information, the Milstar system will also include spare satellites and spare ground terminals.

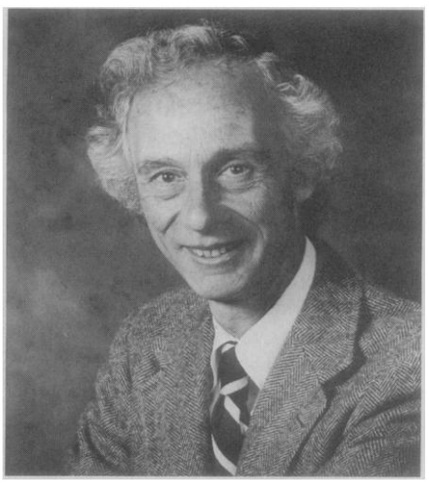
Milstar is the exception, not the rule, however. Other programs of substantial importance have been neglected. For example, the Defense Department's communications workhorse for the next 10 to 15 years, a satellite known as DSCS III, has been designed without impact detectors or laser and radar receivers. "If it should suddenly stop working, we'd have a tough time determining why," confesses an executive at General Electric, its principal manufacturer. The low priority attached to virtually all survivability measures became evident again several weeks ago. Faced with an assignment to cut $5.4 billion from the 1985 Air Force budget request, Pentagon officials chose to put off an $18-million expenditure for small, high-volume computers, considered essential to mobile satellite ground terminals. "The remarkable thing is that we really don't have to spend a great deal of money to make some dramatic changes in this area," Reynolds emphasizes.

Michael May, an associate director of the Lawrence Livermore National Laboratory, believes that a substantial new emphasis on satellite survivability would have direct implications for space arms control. "Making space systems survivable would make ASAT's susceptible to negotiation, because it would substantially increase the cost, time, and risk involved in an attack, thereby diminishing the prospect and significance of any cheating." He adds that "the United States is well down the path toward survivable satellite systems, but we still need to develop the same strong, steady support for this that we have for making offensive strategic systems survivable."

"—R.J.S.

used for location-fixing purposes by high-frequency direction-finding stations in Soviet territory," he says. Similarly, Richard Garwin, a physicist at IBM with long experience in weapons design, says that Soviet eavesdropping can be defeated by high-frequency, short wavelength, broad-spectrum radio signals, generated by focused antennas and relayed from one U.S. satellite to another. "The U.S. ASAT is not needed to defeat this threat," he says.

Given the apparent defects in the Administration's stated justification for the U.S. ASAT, there is considerable speculation that its proponents like it because its development offers a convenient cover for antiballistic missile (ABM) research that would otherwise be prohibited by the ABM treaty. This theory was given a boost several weeks ago by presidential science adviser George Keyworth, who said that "in order to leave our successors any options" for ABM systems, the United States should not tie its hands with ASAT limitations.



Michael May

"A high-powered laser system would be detectable."

But others question the Pentagon's need for an ASAT program. For example, Sayre Stevens, a former CIA analyst and current Defense Science Board member who also serves as vice president for strategic intelligence at the Systems Planning Corporation, says "I don't know exactly why it is that we're so anxious to build an ASAT system. I can't see that we're all that helpless. I also don't think we need it as much as we need some other things, such as a better space surveillance system so we really know what's going on." Albert Wheelon, a former CIA analyst who is now a senior vice president at the Hughes Aircraft Corporation, agrees. "I think it's a good idea and to everyone's net advantage to keep mines and torpedoes and lasers and other weapons out of space," he says.

Administration officials publicly insist the door on ASAT arms control is still ajar, and that several options for a limited agreement remain under consideration. One idea is a ban on tests of ASAT's aimed at high-altitude satellites, which are needed for early warning and communications in the event of an all-out war. Sidney Graybeal, a former SALT II negotiator and CIA analyst who is now vice president of the Center for Strategic Policy at Systems Planning Corporation, says that he particularly likes this idea. "The United States has such an overwhelming interest in space assets that a limit on advanced ASAT's—weapons capable of interdicting satellites in geosynchronous orbit—through a ban on testing would be in the net U.S. interest," he says. A second option is to prohibit the trailing of one satellite by another in peacetime, and a third idea is simply to prohibit any peacetime interference with a satellite's operation.

Although the report characterizes the potential for violation of even these limited agreements as troublesome, ACDA director Adelman remains publicly optimistic that one idea or another will prove worth pursuing. "I myself feel there may be possibilities for real proposals for arms control," he said at a recent hearing before the House Committee on Foreign Affairs, adding that a final decision will perhaps be made within the next 6 months.

Few in Congress believe that this continuing review will amount to much. One of the cochairmen of the interagency task force is Richard Perle, who says flatly that "I haven't seen a suggestion yet that meets the two tests of verifiability and [protection of U.S.] national security." The other cochairman is Henry Cooper, an assistant director of strategic programs at ACDA who until recently helped direct the ASAT program for the Air Force. He also admits to "reservations as to the bans being studied," although he claims to be somewhat more enthusiastic than Perle.

William Durch, a research fellow at the Harvard Center for Science and International affairs who recently directed an extensive study of space arms control options for Reagan's ACDA appointees, says he feels that after "looking at all the variables, it is still in the net U.S. security interest to pursue some sort of limit on antisatellite capabilities." He hopes the Administration will eventually come to the same conclusion.—**R. JEFFREY SMITH**

NAS to Explore Expansion of Programs with Soviets

National Academy of Sciences president Frank Press announced on 1 May that he will lead an Academy delegation to Moscow in June "to explore new modes of interaction between American and Soviet scientific communities."

The Academy's governing council in 1980 responded to Soviet actions on Afghanistan and Poland and the banishing of physicist Andrei Sakharov to Gorki by voting to suspend scientific symposia held under the agreement between the U.S. and Soviet academies of sciences. The interacademy agreement, dating from 1959, lapsed in 1982, and cooperative activities between the two academies have been reduced to a small number of informally arranged exchanges of individual scientists.

Press announced his forthcoming trip during his annual report to Academy members, but he offered no details of proposals that might be made to the Soviets. He said that the initiative was the product of 2 years of discussion within the Academy about relations with the Soviets and that "If there is any message that we have received with great clarity from our membership, it is that in these troubled times it is better that scientists keep talking, raising issues of concern, as well as exploring areas of fruitful cooperation."

In a meeting with reporters, Press deflected repeated questions on whether the new effort marked an end to academy protests on human rights issues. "If you ask if we're going because of a change in the human rights situation, that is not the case," said Press. On the other hand, he said if there is no communication on issues in science and on global problems, progress on these issues or on human rights matters is unlikely.

As for the "new ideas" for contacts to which he alluded, Press said only that there were some "hot fields in science" in which an interplay would help both sides. He also said he hoped it would be possible to "recapture some of the flavor of former years when some of the best scientists were involved."

Press said that the State Depart-