

Summary

In late 1982 and early 1983, the Subcommittee on Arms Control, Oceans, International Operations, and Environment of the Senate Committee on Foreign Relations held hearings on space weapons and arms control. To explore these issues further in a discussion format not easily achieved in hearings, Sen. Larry Pressler, Chairman of the Subcommittee, asked OTA to conduct a workshop focusing on anti-satellite (ASAT) weapons as one aspect of space arms control. The workshop, held in Washington, D. C., on January 30 and 31, 1984, provided an opportunity for technical, diplomatic, military, and policy-analysis experts to interact, think out loud, and build upon each other's ideas.

The workshop was organized into six sessions, although issues involving anti-satellite weapons and arms control are not easily compartmentalized into distinct subject areas. Each session was introduced by a 10- or 15-minute informal oral presentation which set the stage for further discussion. This workshop proceedings volume is organized along the same divisions as the sessions, with some rearrangement.

The first session, an overview, reviewed technical aspects of anti-satellite systems and presented a candidate set of topics for discussion in later sessions. The second session covered pros and cons of ASAT arms control. Soviet attitudes and efforts regarding ASATs were the focus of the third session; U.S. attitudes and developments in ASATs and ASAT

arms control were reviewed in the fourth. The effect of ASATs on the continued viability of the 1972 Anti-Ballistic Missile (ABM) Treaty, and vice versa, were covered in the fifth session. The last session centered on verification issues.

At Senator Pressler's request, OTA is publishing the workshop proceedings. OTA's agreement with the panelists was that the workshop report would discuss the viewpoints, ideas, and findings arrived at during the conference, but that particular statements or opinions would not be attributed to specific individuals. Therefore, the transcript has been paraphrased and rearranged to form this report. The proceedings have been circulated among the panelists, who were given the opportunity to suggest corrections and clarifications. They have not been reviewed by the Technology Assessment Board.

The workshop panelists were asked to raise and clarify issues, not to resolve them. No attempt was made to reach conclusions or develop consenses during the workshop sessions. However, OTA has noted and listed below several points where the panelists appeared to be in general agreement. These points are followed by a brief discussion of some of the fundamental bases for disagreement among the panelists. Following that is a list of some issues, raised during the course of the workshop, which were felt to merit further research and analysis.

POINTS OF GENERAL AGREEMENT

No arms control agreement can eliminate all anti-satellite capability. However, panelists differed in interpreting the significance of this residual ASAT capability which would be infeasible or impractical to ban. Some systems not designed to be ASATs (ICBMs, manned spacecraft, etc.) nevertheless have some ASAT

potential, making some de facto residual ASAT capability inevitable. ASAT arms control supporters stressed that it would be minor compared to the capability of extensive ASAT or "space mine" efforts which could be undertaken in the absence of an arms control agreement, while some of the ASAT arms con-

trol opponents believed that the residual capability might nevertheless pose a significant threat to U.S. satellites.

ASAT arms control cannot eliminate the need to protect or supplement vital satellites with a variety of survivability measures. However, it can serve to lessen the measures required to protect space systems. Under any arms control accord, programs to ensure survivability of critical satellites or programs which supplement or replace their function will remain vital. The temptation to assume that survivability measures could be relaxed following an agreement must be resisted. "We could be that stupid," said one panelist, "but we don't really have to be."

The "verifiability" of an ASAT accord can only be assessed for a specified set of restrictions and measures, and any discussion of the verifiability of a particular provision ought to include consideration of the significance of potential violations of that provision. The panelists did not evaluate in detail, partly because of security classification restrictions, the verifiability of compliance with the various kinds of arms control agreements that were discussed. It was clear that the standards of verification required for effective ASAT arms control are highly controversial. Panelists agreed, however, that bans on testing would require less extensive verification measures than bans on possession, and that compliance with some ASAT arms control provisions could be verified with high confidence.

Future U.S. and U.S.S.R. activities in space hold great potential for generating uncertainty and misunderstanding regarding the countries' respective intentions. Workshop participants agreed that the Soviet Union will continue its vigorous exploitation of space, and that some Soviet activities will be perceived in the United States as provocative. Similarly, some American actions will appear provocative to the Soviets. Both countries will observe activities which they will not completely understand and which will cause considerable concern. Misunderstandings concerning the intent of various space actions could be particularly dangerous during crises or low-level conflicts.

Ambiguities might be lessened or resolved with some type of "rules of the road" or "behavior in space" agreement. Some panelists thought that an agreement concerning behavior in space, or towards space objects, might serve to reduce tensions and uncertainties. Such an agreement need not be associated with other measures limiting anti-satellite weapons systems; indeed, there might be value even if (thought some panelists) or especially if (thought others) there were no accompanying ASAT restrictions. Such an agreement might be modeled after the "rules of the road" on the high seas, which are embodied in several international agreements that recognize freedom to operate, lessen the risk of accidental collision, and minimize unnecessary provocation at sea. Possibly the most valuable feature of a "rules of the road in space" agreement would be the establishment of a forum like the U.S.-U.S.S.R. Standing Consultative Commission, which would help maintain an ongoing dialog between the United States and the Soviet Union and would permit discussion of activities whose significance was not clear. A "rules of the road" agreement should not be allowed to impede more serious provisions concerning space weapons if such provisions are found to be desirable. The precise form of a "space behavior" agreement was not explored in depth at the workshop, and the political and diplomatic procedures and tradeoffs required to negotiate and implement such an agreement were not addressed.

If ASAT threats are reduced by an agreement, there may be fewer reservations about placing important systems in space, creating in turn greater incentive for developing ASAT weapons. If an accord has the effect of relaxing survivability measures at the same time that reliance on space systems is increasing, then the growth of targets both valuable and vulnerable might provide strong motivation to attempt covert ASAT development. This possible paradox reinforced panelists' observations that an ASAT accord is no substitute for effective measures to reduce space system vulnerability.

Preservation of the functions now performed in space does not require the survival of all space

assets. Military support activities carried out in space are very important, but they can be duplicated or distributed among many space systems. Furthermore, many alternatives to space-based systems exist or can be developed.

The idea that the United States needs an ASAT weapon in order to deter enemy ASAT attack was not strongly supported. Many participants felt that the ability to retaliate against terrestrial assets served to deter ASAT attack at least as well as the ability to respond in kind against enemy satellites. Furthermore, one of the rationales other than deterrence which has been given for the U.S. ASAT program—to carry out attacks on particularly hostile Soviet satellites—conflicts with the ASAT's deterrent role. Nobody at the workshop felt that an ASAT attack scenario was well enough understood to predict the outcome of "tit-for-tat" ASAT retaliatory attacks in general. The likelihood and nature of subsequent escalation would be highly dependent on which satellites were attacked and under what circumstances.

The U.S. air-launched ASAT weapon now undergoing testing is clearly technically superior to the present generation of Soviet ground-launched ASATs. The ability to home in from a wide range of directions, and the flexibility of being launched from highly mobile aircraft, will make the U.S. ASAT a considerably more capable weapon if deployed. The United States will be able to launch consecutive ASATs much more rapidly than the Soviets, who are restricted in how rapidly their ASAT can be fired by their limited number of launch sites and by the time required to recycle them. There are also significant asymmetries in the target sets which are at risk to the two systems. Many important space functions are carried out by the United States using satellites in geosynchronous orbit, well out of range of the Soviet ASAT. Many Soviet satellites with similar functions use highly elliptical "Molniya" orbits, which could be vulnerable to U.S. attack at their lower altitudes. However, the United States would face severe logistical and operational difficulties in attempting to exploit this vulnerability. In addition, since So-

viet satellites are shorter lived than U.S. satellites and are consequently replaced more frequently, the Soviets may be better prepared to reconstitute space systems than the United States would be.

In spite of asymmetries in capability, neither the existing Soviet ASAT nor the U.S. ASAT undergoing tests poses a severe military threat to the other side. The present level of ASAT technology is significantly limited. Both U.S. and U.S.S.R. weapons are restricted to targets in low Earth orbit and cannot reach geosynchronous orbit. Both systems may have to wait several hours for a target satellite to come within range of the appropriate F-15 base (for the U.S. system) or ground launch site (for the Soviets), although the mobility of the F-15 makes this restriction considerably less severe for the U.S. ASAT. If either the U.S. or the U.S.S.R. system were mated to boosters able to reach geosynchronous orbit, the ascent would take many hours. In light of these limitations, many treaty proponents would tolerate (although not necessarily prefer) a treaty which would "grandfather" existing systems. Perceptions differed as to the relative political implications of the existing U.S.S.R. system versus the U.S. ASAT which is undergoing testing, but nobody felt that the overall military balance was affected significantly by either—especially when compared with potential future ASAT developments.

A ban on testing ASAT weapons would greatly increase the difficulty of developing a high-confidence, high-quality, dedicated ASAT system. Panelists thought it would be very difficult to develop and field a highly capable new system with no detectable tests. Some tests might go undetected—for example, there are many perfectly legitimate activities involving rendezvous in space which could be made to be partial tests of ASAT interception capability—but many tests would be required to instill confidence in an ASAT system, and some of these would probably be detected. Banning the tests would force the violator either to forgo tests or to test covertly; covert testing, assuming that it could in fact be carried out undetected, would certainly be more difficult

and less extensive than the overt testing that would be possible in the absence of a ban. In the absence of tests, all agreed that no one could be highly confident that a new system would be effective in difficult scenarios (against many targets in a short time interval and/or effective at geosynchronous altitude). If a system were to be developed without testing, the inability to make refinements based on tests and the lack of confidence developed through tests would degrade the system's military significance.

ASAT and ballistic missile defense (BMD) systems and technologies are closely related. As effective ASAT weapons are developed and introduced, boost-phase ballistic missile defense systems will become increasingly problematic since all such systems utilize space-based early warning systems and possibly other subsystems which would be vulnerable to ASAT

attack. Many, although not all, prospective midcourse BMD systems would also have vulnerable space-based assets, and even terminal BMD systems would likely utilize space-based early-warning sensors. At the same time, even a poor quality or prototype midcourse or boost-phase BMD system may have very significant ASAT capability since satellites are much easier to destroy than missile warheads. Therefore, development of boost-phase and mid-course BMD systems will severely constrain ASAT arms control possibilities. Conversely, since ASAT and BMD technologies are related, treaties limiting ASAT development or testing will limit development and deployment of boost-phase and midcourse BMD systems. Of course, the 1972 ABM Treaty and 1974 protocol thereto already severely constrain testing, development, and deployment of BMD systems.

POINTS OF DISAGREEMENT

Disagreement over the desirability of an ASAT treaty hinges on basic philosophical differences over the role of arms control. Although acknowledged at the workshop, these differences were not discussed or debated significantly during the sessions. They are outlined below in an attempt to summarize some of the considerations most relevant to different sides of the ASAT arms control debate.

One attitude, supporting ASAT arms control, is that we value the safety of our own satellites more than we value the ability to destroy Soviet satellites. We want to protect those of our own military support functions which we presently carry out via satellites, and protecting them is much easier if our satellites are not threatened by a highly developed, highly capable Soviet ASAT. Preventing the Soviets from deploying an effective ASAT would be much more helpful than developing our own.

While a ban on all Soviet ASATs would be ideal, the principal U.S. interest is to prevent

the Soviets from developing a highly capable system: one which works reliably, threatens satellites in geosynchronous orbit, operates with no warning, and/or attacks many targets at once. Several approaches, including banning ASAT testing, banning the development of new ASAT systems, or barring all dedicated ASAT systems, could inhibit such a Soviet development. Banning only tests or new developments would be more easily verified than barring all dedicated ASATs; however, a total ban might nevertheless be a more effective approach to preventing development of a highly capable Soviet system. Although no agreement can eliminate all ASAT capability, supporters of ASAT arms control felt that an agreement could be devised which would make Soviet development of such a highly capable ASAT system very difficult, and that such an agreement could be adequately verified. The criterion for supporting an agreement would be improvement in the security of our space systems as compared to not having an agreement.

A contrasting approach considers military competition between the United States and U.S.S.R. to be inevitable, with arms control in many cases not being an effective or appropriate alternative to that competition. Accordingly, the relevant measure of national security would be relative advantage or disadvantage of the United States with respect to the U.S.S.R. Those holding this view consider it essential to deny the enemy the use of space during a conflict when such use provides a military advantage. In the case of ASAT arms control, even if U.S. satellites were to be safer with an ASAT limitation or test ban than without one (which would almost certainly be the case), a treaty might not be appropriate if it would benefit the Soviet Union more than it would the United States. Such asymmetrical advantage might arise under an ASAT accord for two reasons: First, a treaty would divert the military competition away from an arena (ASAT competition) where the United States would otherwise have been able to exploit its superior ability to develop highly sophisticated technologies. Second, the Soviets might cheat. Because of the asymmetric nature of Soviet and American societies, it is argued, the Soviet Union is much more likely than the United States to cheat on an agreement. For the same reason, Soviet attempts to cheat are more likely to be successful. Whether or not the kinds of violations which might go undetected would in themselves pose major threats to U.S. security, any covert violation would work to our military disadvantage and would have undesirable political and psychological consequences as well.

There is disagreement regarding how much significance can be attributed to residual or cov-

ert ASAT capability. The panelists agreed that a considerable testing program is required in order to have high confidence in an ASAT system. However, there are differences of opinion regarding how significant an incompletely or covertly tested system might be. A covert system might not engender high confidence, it might not be as reliable as a dedicated, overtly tested system, and it might be discovered, but it might nevertheless still be developed. There is disagreement not only about how remote this possibility is, but also about how this possibility affects the relative advantages of a treaty versus the risks.

ASAT arms control is also complicated by more general considerations regarding the military use of space. On the one hand, emplacing weapons in space or using weapons against targets in space can be seen as breaking a de facto political taboo which would be difficult to restore. Furthermore, introducing weapons into space might make the world a more dangerous place; this is now almost universally believed to be the case concerning introduction of multiple independently targetable reentry vehicles (MIRVs). On the other hand, any space arms control might be viewed as a political and psychological barrier inhibiting the much wider exploration and exploitation of space as a theater of military operation. A primary example of the wider possibilities of space is ballistic missile defense—while many would not be willing to limit ASAT weapons at the price of impeding investigations into the possibilities of BMD, others see those restrictions on BMD which would be included in an ASAT accord as reinforcing the ABM treaty in support of its original and continuing goals.

TOPICS FOR FURTHER RESEARCH

Among the more general subject areas suggested to the workshop for further research were possibilities for “rules of the road” agreements in space. As noted above, many participants believed that some measures to reduce uncer-

tainty and ambiguity in space might be desirable. Although possible models were proposed, potential agreements were not discussed in detail. What sort of mechanisms (be they unilateral actions, treaties, or informal working ar-

rangements) could be established to permit mutual U.S. and U.S.S.R. use of space with a minimum of suspicion?

Are there ways of characterizing ASATs such that we can define and ban the most threatening or destabilizing types? Certain activities in space are clearly more threatening than others, just as certain activities are more visible than others. Is there a way that a "rules of the road" agreement could focus on the more dangerous rather than the more visible? What are the implications for verification and for stability?

No treaty of any kind can be perfectly verified. Several questions arise in handling ASAT treaty provisions which must therefore be verifiable only partially, or with less than 100 percent confidence. One problem involves how general or specific treaty provisions must be made. Treaty language intended to prevent some particularly threatening activity (e.g., testing ASAT interceptors at geosynchronous orbit) might be phrased in general terms (e.g., for-

bidding all ASAT tests) which would include less threatening activities that might be less verifiable (e.g., testing ASATs in low earth orbit where they might be masked as non-ASAT-related operations). What are the implications of having varying levels of confidence in verifying compliance with treaty provisions? Are activities which are not explicitly proscribed under a treaty necessarily condoned?

Another verification issue requiring further work involves cooperative verification procedures. Although existing rules regarding freedom of navigation and innocent passage on the high seas permit forces of one country to approach those of another, approaching a foreign satellite closely enough to examine it in space might nevertheless not be taken kindly in the absence of prior approval. If nuclear weapons are to be kept out of space with high confidence, then cooperative inspection procedures (either in space or on the ground) will likely be required. Can such procedures be arranged?