Towards a Reconsideration of the Rules for Space Security[1]

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Since the space age began, two competing images have influenced policy debates about space security. One conception sees space as the "final frontier," a largely lawless environment where conflict is inevitable and superior firepower provides the only reliable protection for satellites and the terrestrial activities that depend on them. The alternative view uses imagery of "the heavens" to suggest that if, and only if, humans can transcend the fear and greed that generate earthly conflict, then there will be a natural harmony of interest that promotes the peaceful use of space for the benefit of all. Neither the "Realist" imagery of unbounded conflict nor the "Idealist" imagery of natural cooperation adequately reflects the amount of effort spent over the past half century on developing rules to manage space operations. When analysts and practitioners do write about the rules for space, they typically focus only on space law, especially those rights and obligations that have been codified by international treaties — another idealized conception of the rules governing space activity.

This paper broadly defines the rules for space as anything that induces regularity or restraint in behavior beyond what would be predicted on the basis of interests and power alone. This includes not only formal laws, but also principles, norms, informal understandings, common practices, agreed decision-making procedures, and institutional arrangements. In other words, this paper analyses space as an extension of an international system where governance occurs on a piecemeal basis in the absence of a world government with supranational law-making and enforcement powers.

The rules that regulated early space activities, while far from ideal in any sense of the word, were reasonably functional and stable because the formal laws, informal operating practices, and strategic context complemented and reinforced each other. Over time, fundamental processes associated with globalization have altered the strategic context and the operational practices for space activities, but international efforts to update the formal legal framework have not kept pace. Instead, the United States has embarked on a unilateral attempt to rewrite key rules related to space in ways that other countries find extremely threatening, while hoping to preserve international support for aspects of space law that the United States finds beneficial. This strategy underestimates negative international reaction both to the substance of US space security policy and to the process whereby the United States is making momentous policy changes while rebuffing international attempts to discuss, let alone negotiate, new rules for space security. More importantly, this strategy overestimates the United States' ability to accomplish its objectives in space without widespread acceptance of equitable rules to protect legitimate space activities.

The disjunction between the George W. Bush administration's strategic principles and preferred rules for space and those of the other space-faring countries has grown so great that the space governance system may collapse unless its core elements are strengthened, updated, and expanded. Modest accords about mutual concerns such as space debris and voluntary rules of the road could be useful at the margins. But these minor steps would not repair the gaping cracks at the center of the space security system unless they are linked to the foundational 1967 Outer Space Treaty (OST) and to serious consideration of questions that the existing legal framework does not adequately address. For example, the OST legitimates the free use of outer space for activities that are "in accordance with international law, including the Charter of the United Nations, in the interests of maintaining international peace and security." But aside from prohibiting weapons of mass destruction in space and military activities on celestial bodies, the Treaty does not delineate between

military uses of space that are genuinely peaceful and thus protected, and those that are intolerably threatening. Nor does it tell how to balance the interests of military, commercial, and civilian space users around the world. These questions cannot be answered by reference to an abstract, idealized conception of space as a realm beyond the reach of normal human affairs. Instead, sustainable space security will require more refined rules for military uses of space that reinforce, rather than undermine, an approach to terrestrial security based on reassurance and restraint.

I. Competition and Restraint Shape the Initial Rules for Space

US space security policy evolved as an integral part of the Cold War competition with the Soviet Union. The superpower struggle involved not only a military dimension, where the primary goal was to preserve stable deterrence, but also a political dimension, where the core objective was to create international arrangements that promoted American interests and appealed to the rest of the "free" world. Even in the military dimension, the superpowers soon came to recognize that some rules and restraint would enhance their security. Thus, despite their intense rivalry, space was never an arena for a no-holds-barred clash of brute force against brute force any more than it was a zone of pure peace and harmonious cooperation. Instead, what developed was a patchwork of international agreements, principles, national policies, and informal behavioral rules through which all the states with a stake in space tried to balance their common and conflicting interests.

The Origins of the Space Security Regime

In the early US space program, developing a supportive political and legal foundation for information-gathering satellites was considered more important than beating the Soviets off the launch pad.[2] In the wake of the Korean War, President Eisenhower wanted to cut US defense spending

without falling behind the Soviet Union in the arms race. He needed reliable information about military developments behind the Iron Curtain in order to negotiate arms control, to retain defense sufficiency in the absence of agreements, or to destroy Soviet targets if all else failed. Reconnaissance satellites could address these needs, but only if their use was legitimatised. Therefore, the Eisenhower administration not only talked about peaceful uses of space for the benefit of mankind while quietly pursuing military applications, but it also acted in ways that showed concern for both power and legitimacy. For example, it launched its first satellite as a scientific project for the 1958 International Geophysical Year; it selected a civilian launch option over a military program that was ready sooner; and it took great pains to position itself as the champion of openness, international cooperation, and the rule of law in space. Soon after Sputnik was launched, Eisenhower observed that the Russians had "done us a good turn, unintentionally, in establishing the concept of freedom of international space."[3]

The 1967 Outer Space Treaty enshrined the basic principles of free access, non-appropriation, equitable benefits, and peaceful use in the operative articles of the Treaty, not merely in the more aspirational preamble.[4] The United States was most interested in formalizing the principle that outer space, unlike air space, should be free for access and use without the permission of the underlying states. To secure broad agreement on the Treaty, however, the United States had to accept Brazil's proposal to precede the freedom-of-use principle with the commitment that the exploration and use of space shall be for the benefit of all countries, irrespective of their degree of economic or scientific development (Art. I.1). The freedom-of-use principle is strengthened by Article II's prohibition on national appropriation, the formalization of a declaration made by then-Senator Johnson shortly after Sputnik was launched: "We of the United States do not acknowledge that there are landlords of outer space who can presume to bargain with the nations of the Earth on the price of access to this domain."[5] The right to use space is qualified both by Article IX's insistence that one country's use of space

should neither interfere with other countries' current space activities nor degrade the space environment for future users, and by Article VII's assignment to launching States of international legal liability for damage done to other States Parties.

The portions of the OST devoted explicitly to military uses of outer space tried to balance the political benefits of peaceful space with complex military considerations. Article IV's prohibition on weapons of mass destruction in space creates a legally binding obligation built upon declaratory statements made in support of the 1963 UN General Assembly Resolution 1884 on "Stationing Weapons of Mass Destruction in Outer Space." It took a series of compromises in the early 1960s to move the superpowers from unproductive posturing over broad, one-sided proposals to a more limited, mutually beneficial cooperation. They had to de-link space from other disarmament issues and agree that even small nuclear weapons were, by definition, weapons of mass destruction (WMD). The United States had to stop reflexively insisting that verification must include inspections, while the Soviets had to stop drawing a distinction between "innocent" satellites and "espionage" and start tacitly legitimating reconnaissance satellites. The United States had to reassure the Soviet Union that it was no longer taking an all-or-nothing approach to space arms control that included a ban on ballistic missiles while the Soviets had to accept, at least temporarily, the US preference for a declaratory agreement over a treaty requiring ratification. Four years later, President Johnson was able to build on this narrow, informal agreement to gain unanimous Senate consent to ratification of a treaty that not only banned WMD in space, but also prohibited States from using the Moon and other celestial bodies for military purposes. The Treaty still said nothing about putting conventional weapons in orbit, sending ballistic missiles with nuclear warheads through space, or deploying most types of anti-satellite weapons. Article III established the general requirement that all space activities shall be conducted in accordance with international law, including the United Nations Charter, thus limiting the legitimate use of force in space to self-defense.

The vague formulation of Article III leaves much leeway for space-based military support operations to enhance deterrence, but it contradicts claims that anything not explicitly prohibited in Article IV is permitted.[6]

Other space-related arms control accords show comparable concern for both the military and the political dimensions of the US Cold War strategy. The formal limits on space-based military activities are narrowly drawn: the 1963 Limited Test Ban Treaty outlawed nuclear tests in space but allowed them underground; the 1972 Anti-Ballistic Missile Treaty prohibited space-based missile defense but permitted limited land-based systems; and various accords banned interference with "national technical means of verification" — a euphemism for photo intelligence satellites and other remote monitoring systems. The superpowers calculated that it was in their security interests to rule out certain forms of military competition in space, and they gained political benefits by showing that they could cooperate enough to limit those aspects of the arms race that the rest of the world found most threatening.

Informal Restraint on Anti-Satellite Weapons

Although anti-satellite weapons (ASAT) were technically feasible and legally permissible during this period, neither superpower made a sustained effort to develop and deploy ASATs or space-based weapons that could hit terrestrial targets. Instead, both appeared to exercise contingent restraint — i.e., to signal that they would keep their own ASAT efforts at a low level as long as the other side did likewise, but that they were prepared to accelerate their nascent ASAT programs if the other side did.[7] The United States began developing nuclear-armed ASATs in the 1950s as a hedge in case the Soviets placed nuclear weapons in orbit, a concern that was diminished by Soviet endorsement of 1963 UNGA resolution. Existing strategic missiles could be used as ASATs, but the electromagnetic pulse from their nuclear warheads would have damaged American satellites as well as Russian ones, making them impractical for most uses.[8] When the Soviets initiated

tests of a non-nuclear co-orbital satellite interceptor system in 1968, the United States assessed that this primitive system did not pose an immediate threat and that a competitive response could stimulate the Soviets to develop a more capable system. Therefore, the United States increased passive protection for its satellites and preserved its own rudimentary ASAT system, but actually reduced funding for next-generation ASAT work. The United States interpreted the Soviet decision to stop ASAT testing in 1971 as reciprocal restraint, a view that was reinforced by several minor agreements providing implicit protection for certain satellite activities.[9] It does not appear that the superpowers exchanged views about military space activities writ large, however, neither side proposed including an ASAT ban in the 1972 Anti-Ballistic Missile Treaty.[10]

The US preference for tacit cooperation reflected hard-headed security calculations:

1. Space weapons were technologically challenging, expensive, vulnerable, and offered the United States few, if any clear advantages over land-, sea-, or air-based systems for most military missions.
2. If the United States deployed space weapons, the Soviet Union would follow suit so the advantage for the US would be short lived, whereas if the United States exercised restraint the Soviets would either reciprocate or take an incremental step toward space weapons that the US could quickly counter.
3. The United States was more dependent on satellites for military-support functions than the USSR was, so it had more to lose if attacks on space assets were legitimized.
4. Many benign security-related uses of space, such as arms control verification and early warning, helped to stabilize deterrence, whereas the deployment of offensive space weapons would create destabilizing incentives for pre-emptive attack.

The combination of principles, narrow legal prohibitions, and broader tacit restraint that shaped space security policy from the mid-1950s through the mid-1970s was reasonably stable because it fit well with a bilateral strategic context that emphasized mutual deterrence and limited arms control. The largely informal approach had shortcomings, though. As was true in other areas of détente, Americans sometimes accused the Soviets of breaking unwritten rules of restraint, for example by sharing reconnaissance data with client states, although it is still not clear (a) that the Soviets agreed that such a norm existed; (b) that they actually provided the information; and (c) that the Americans were not engaging in similar behavior from time to time.[11] Misperceptions and false alarms also caused problems. When three American satellites were temporarily blinded in 1975, initial news coverage emphasized the possibility that the Soviets were testing lasers to blind US early-warning satellites. Puzzling features, such as the long duration of one episode, the simultaneous effects on several satellites in different orbits, and the fact that the radiation did not come from the one known Soviet laser test-site, were cited as evidence that the Soviet anti-satellite threat must be very advanced and extensive. With no ASAT treaty, the United States had no consultative and clarification mechanism to invoke, so it took several months for the incidents to be attributed to a fire along the trans-Siberian pipeline. A press statement by then Secretary of Defense Donald Rumsfeld failed to end lingering suspicions.[12]

The inadequacy of the informal approach to ASAT restraint became more obvious when the Soviets resumed testing in early 1976. The tests had little military significance — the Soviet's ASAT system became significantly less reliable after they started using the new guidance system that was the main reason for these tests.[13] Nevertheless, American security experts attributed tremendous political significance to the tests as evidence that the Soviets placed a higher value on incremental improvements to their ASAT system than they did on stable deterrence and détente. The Americans did not give serious consideration to an alternative explanation — that Soviet leaders were feeling increasingly threatened by the

growing US advantage in military-support satellites and wanted to signal that reciprocal ASAT restraint could not continue indefinitely without corresponding limits on military satellites.[14]

Space security policy reviews undertaken at the end of the Ford administration and the beginning of the Carter administration led to a two-track political and military strategy: the United States would ramp up research and development of next generation ASAT weapons, preferably to pressure the Soviets to accept legally binding ASAT limits, but also to deter attacks on US satellites and to hold Soviet satellites at risk if arms control failed.[15] This shift to coercive diplomacy reflected growing doubts about the assumptions underlying past attempts to keep space as a sanctuary for military-support satellites. Technological change was blurring the distinction between "benign" and "threatening" uses of space: for example, photoreconnaissance satellites were gaining real-time transmission capabilities and early-warning satellites were becoming precise enough for targeting, not just general observation of troop movements or ballistic missile launches. This blurring exacerbated concerns that the Soviets might exploit American restraint by suddenly deploying an advanced ASAT system or claiming sanctuary for military-support activities that strengthened their hand in regional crises, small-scale conflicts, and possibly even a superpower war. The change in political context and policy beliefs was even more dramatic. Space was no longer assumed to be an arena where the superpowers clearly recognized a shared interest in modest arms control, transparency, and tacit restraint to stabilize mutual deterrence. Instead, space security policy was increasingly shaped by the broader shift to a "countervailing" deterrence strategy that required American superiority in every aspect of the military balance so that the Soviets would not try to offset weakness in one area by moving the competition to another venue where they could compete on more favorable terms.

Carter's two-track ASAT policy helped finesse internal US disagreement about what, if any, mutual restraints on offensive space activities would actually enhance national security. Even with the new tests, the Soviet co-orbital ASAT system used outdated technology and had serious limitations on the timing, frequency, and number of interceptor launches; the speed and reliability of intercept; and the altitude that could be reached. The Defense Department was directed to develop immediately an operational direct-ascent ASAT system that would be "orders of magnitude more advanced." The Miniature Homing Vehicle (MHV) ASAT would ride on a short-range attack missile carried by an F-15 fighter, so it could deploy rapidly from many locations, destroy a target within minutes of launch instead of the several hours needed for a co-orbital interceptor, and attack a large number of Soviet satellites in a short period of time, leading one proponent to claim that it would be capable of "sweeping the skies clean in twenty-four hours." By pressing forward much faster with ASAT technology development than with negotiations, the Americans accelerated the rate of technological change, intensified Soviet concerns about US military space capabilities, and exacerbated domestic disagreements over the possibility that the United States might use its technological prowess to gain perpetual dominance in space.

When ASAT negotiations finally started in mid-1978, the US team had no specific instructions for nearly a year because the President wanted a comprehensive ban on dedicated ASAT weapons but the military preferred a no-use/non-interference agreement linked to broad, informal "rules of the road" analogous to rules for military operations on the high seas. Nearly a year later, the United States finally proposed a short-term no-use/non-interference agreement, possibly coupled with a testing moratorium and a long-term goal of banning all dedicated ASAT weapons. The American proposal placed no constraints on military support satellites. While significant progress was made toward a no-use agreement, the Soviets reserved the right to attack satellites whose "hostile or pernicious acts" threatened their security.[16] The United States

postponed the next round of ASAT negotiations that might have finalized this deal in order to concentrate on SALT II ratification, but did not have a parallel delay in the ASAT development track of their strategy. The Soviet invasion of Afghanistan in December 1979, followed by their resumption of ASAT testing in April 1980, ended Carter-era attempts at cooperative ASAT control and left only the competitive pursuit of space weapons.

The Cold War Quest for Space Dominance

An arms race in space seemed inevitable by the mid-1980s because the Reagan administration maintained that the only way to deal with the "Evil Empire" was to develop the capability to fight and win a nuclear war. Military satellites for early warning, communication, targeting, and damage assessment played an integral role in Defense Secretary Weinberger's Strategic Modernization Program. The threat from the Soviet co-orbital ASAT system was deemed to be much greater than it had been a decade earlier, although that technology had not significantly improved. The Defense Department also assessed that the Soviets had a ground-based laser ready for use in an ASAT role, and would be able to deploy a space-based ASAT laser in the early 1990s.[17] The Reagan administration cited the threat posed by Soviet military-support satellites, such as the RORSAT radar ocean reconnaissance system for tracking and targeting US carrier battle groups, as a reason why the United States needed an advanced ASAT capability regardless of Soviet ASAT development or restraint. The military also began to pursue a new type of war-fighting capability — the ability to apply force from space to terrestrial targets. Reagan's March 1983 Strategic Defense Initiative (SDI) speech and US efforts to reinterpret the ABM treaty as inapplicable to "exotic" technologies provided yet another impetus for the United States to intensify work on a wide range of offensive and defensive space weapons and space-based military support systems. Funding for the Department of Defense's space activities, which had remained consistently low from 1959-

1979, more than quadrupled from 1980 to 1988.[18] Unified space commands were established, first within the individual services, and then for the entire military in the form of the US Space Command (SPACECOM). In short, the Reagan administration radically reoriented US space security policy away from all vestiges of cooperative restraint in order to compete with the Soviets in all aspects of military space.

Contrary to expectations, a superpower space race never materialized. The initial constraints on the Reagan administration's program were technological and budgetary: cost projections for the MHV program rose from $500 million to $5.3 billion by 1986 for a system that could only reach 30% of the satellites in the Joint Chiefs of Staff's target list and that could only give high confidence of destroying a fraction of them.[19] Congress began to exert its power of the purse after the administration rebuffed two Soviet suggestions for new space arms control negotiations: a 1981 proposal to prohibit stationing any weapons in space and attacking or interfering with permitted space objects, and a 1983 proposal that would also prohibit testing new ASAT systems and eliminate existing ASAT systems, including the operational Soviet co-orbital interceptor. In response to a Soviet promise not to put ASATs in space if the US pledged reciprocal restraint, the administration rushed to conduct its first in-space test of the MHV system in a way that was clearly done for political rather than technological reasons, Congress blocked funding of ASAT tests against objects in space unless the Soviets did so again.[20] In 1988, the Reagan administration cancelled the MHV program while proclaiming even more boldly than before that the military's basic missions in space went beyond space support and force enhancement to include space control and force application.[21]

Even as superpower relations warmed, the Soviet Union disappeared, and Russia's space-related military programs deteriorated, the George H. W. Bush administration maintained that national security required the near-term deployment of missile defenses and anti-satellite weapons. The programs were refocused, however, on less ambitious

goals like protecting against a limited nuclear strike rather than a massive attack. They also favored more attainable kinetic-energy (KE) "hit-to-kill" options over more futuristic technologies. Neither Congressional efforts to permanently ban all ASAT tests nor administration attempts to significantly increase funding for a KE ASAT program succeeded, although Congress did place a one-year ban on testing the ground-based Mid-infrared Advanced Chemical Laser (MIRACL) against objects in space.

By the mid-1990s, the notion of a space war seemed anachronistic to most people. The Clinton administration neither actively promoted major new space arms control initiatives nor paid much attention to the old space warriors in Congress and SPACECOM who thought that the demise of the Soviet Union made US space dominance easier to attain but no less valuable to have.[22] Although space policy innovations promoted commercial development and multilateral civilian programs such as the International Space Station, the competitive military space policy rhetoric inherited from the Reagan and Bush I administrations was not revised to reflect growing international cooperation. Official policy documents still assigned DOD responsibility for thinking about space control and force application, while specifying the importance of treaty compliance and the need to consider diplomatic and legal measures, not just military ones.[23] The administration neither endorsed nor repudiated SPACECOM's long-range planning documents that presented numerous space control and force application options that it wanted to develop in case a policy change made space weapons a high priority again.[24] National policy debates and US-Russian security discussions focused on the pros and cons of missile defense as a response to threats posed by potential proliferators like North Korea, Iraq, and Iran.

The Clinton administration tried to have it both ways on offensive space weapons. It declared that the US had no near-term requirement for ASATs and blocked Congressional efforts to add funding to the FY 1998 Defense Appropriations

Bill for space-based missile defense research (disguised as asteroid defense), a military space plane, and the Army's KE ASAT program that had been terminated in 1993. At the same time, the administration reassured Congress that it was funding other, less provocative anti-satellite technologies and space-based missile defense research. DOD space budgets dropped sharply in the first few years of the Clinton administration, then climbed slowly back to Bush I levels as the Clinton administration tried to show Congressional critics that it was doing enough on missile defense. President Clinton did not take Russian Premier Yeltsin up on his 1997 offer to begin new talks about banning ASAT weapons. He acquiesced to domestic pressure for the first MIRACL test against an object in space, but downplayed the significance of the experiment by characterizing it as an attempt to assess the satellite's vulnerability to inadvertent or deliberate lasing, rather than as a test of the lasers themselves.[25] Meanwhile, the United States' reliance on space-based assets for military support and force enhancement in conventional conflicts continued to increase. Advances in computing capabilities made it possible by the late 1990s to get satellite imagery to tactical users in near-real time, while GPS-guided bombs were used extensively for the first time in Kosovo.

In short, the rules for space security that evolved during the second half of the Twentieth Century were very robust in some regards and very fragile in others. Both the broad principles and the specific prohibitions of the Outer Space Treaty seemed to have nearly universal support. Great efforts were made to justify any military space activity as "peaceful" and few people seriously expected to see military bases established on the Moon or weapons of mass destruction placed in orbit. The Anti-ballistic Missile Treaty survived SDI and all the other challenges of the Cold War years, so it was reasonable to expect continued agreement that missile defense activities in space or elsewhere should not progress to the point where they undermined either side's confidence in its deterrent. Likewise, neither superpower ever actually deployed a weapon in space that could hit targets on earth nor demonstrate more than a rudimentary ASAT capability.

Sometimes restraint reflected a deliberate policy decision, while at other times, it flowed from technical and budgetary limitations. Restraint was strongest when national security strategy emphasized stable mutual deterrence and arms control for reassurance and when technological capabilities and military practices made it easier to draw conceptual distinctions between military-support satellites that stabilized deterrence and offensive space weapons that could undermine it. Technology and policy changes of the late 1970s blurred the line between "benign" and "threatening" military support satellites. US policymakers still acknowledged that increasingly capable military-support satellites could not be protected without cooperative restraint, yet feared that "to the extent that ASAT development is suppressed and the vulnerability of spacecraft masked, the superpowers will be more and more tempted to deploy threatening spacecraft. And…pressures will in turn build to set aside the treaty and deploy ASATs."[26] The Reagan administration tried to escape this dilemma by asserting that competitive ASAT development offered more protection for US satellites than cooperative restraint would, but its plans were blocked, first by technical and budgetary problems, and then by Congressional refusal to fund advanced ASAT work when the purported threat no longer wished to compete. Neither the first Bush administration nor the Clinton administration developed a coherent post-Cold War space security policy to match the principles, legal rules, and informal operating practices with changed circumstances. That was left for the second Bush administration to do.

II. The Current Situation

The strategic context for space security has changed dramatically over the past fifty years. The Cold War ended and the Soviet Union dissolved nearly fifteen years ago, so military and political competition with Moscow no longer drives US space policy. As the United States has surged forward in its military space capabilities, the program that Russia inherited from the Soviet Union has stagnated in some

areas and deteriorated in others.[27] Other space powers, most notably Europe, China, Japan, India, and Israel, are developing impressive indigenous space capabilities, so the number of countries that could directly affect each other's space activities is growing even as the technology and spending gap between the United States and all potential space competitors has widened.[28] Since the 1980s, the information revolution and economic globalization have made the commercial space industry an increasingly important player with varying degrees of independence from national governments. By 2003, world satellite industry revenues had reached $91 billion, total consumption of satellite-based telecommunication and sensing services had topped $1 trillion, and an incalculable amount of additional global economic activity relied on satellites for high-speed financial transactions, real-time inventory tracking, and other efficiencies.[29] US military reliance on satellites for communications, precision targeting, navigation, remote sensing, and weather forecasting has also grown dramatically, and the US commercial space industry remains beholden to the military as its most lucrative and reliable customer.[30] While there is some dispute over the magnitude and pace of these changes, the basic trends are clear and the primary disagreements involve their implications for space security.

The Quest for Dominance Resumed

The George W. Bush administration has used growing US reliance on vulnerable commercial and military satellites to justify its quest for an expanded version of Reagan-era military space dominance, sized not in reaction to the probable near-term threat posed by a specific country's space activities, but in response to the US military space community's desire to dominate any conceivable future adversary. The report of a commission chaired by Donald Rumsfeld and released shortly before he became Secretary of Defense portrayed conflict in space as inevitable. To avoid a "Space Pearl Harbor," it warned, the United States must finally "develop the means to deter and defend against hostile acts in and from space."[31] The commission proposed organizational and management changes to speed technology development, to increase

resources, and to sustain Presidential leadership. It also recommended an active US effort to reshape the space legal and regulatory environment. The report provided an extremely permissive interpretation of the current rules for space by insisting that "there is no blanket prohibition in international law on placing or using weapons in space, applying force from space to earth or conducting military operations in and through space" without mentioning any of the restrictions and qualifications on the use of force in, from, or through space that do exist. It also warned against "agreements intended for one purpose that, when added to a larger web of treaties or regulations, may have the unintended consequences of restricting future activities in space."[32]

Instead of releasing a new National Space Policy during its first term, the Bush administration reinterpreted the ambiguous Clinton-era document as requiring the development and deployment of space weapons, rather than as it was originally understood — i.e., as instructions to protect US freedom of action in space through deterrence and diplomacy, with more offensive means of space control reserved as a long-term last resort at odds with current policy.[33] Lower-level military planning documents provide more explicit, if less authoritative, depictions of security through perpetual "space dominance." SPACECOM's 1998 *Long Range Plan* defines this as 1) control of space — the ability to ensure uninterrupted US access and freedom of action in space and to deny this to others if required; 2) global engagement — the combination of global surveillance from space, worldwide missile defense, and force application from space; 3) full force integration that uses space-based information and communication systems as a "force multiplier" for terrestrial operations; and 4) global partnerships that leverage civil, commercial, and international space systems to bolster and decrease the costs of military capabilities.[34] In other words, the SPACECOM goal is to be able to see anything in and from space, to attack it quickly if ordered to do so, to defend all US space assets, to control other countries' access to and use of space, and to secure foreign cooperation with these objectives.

Whereas the Clinton administration was unenthusiastic about some aspects of the SPACECOM plan and actively opposed to others, the current Bush administration shows no such reluctance. Instead, it has pressed Congress for major increases in funds for military space activities: total unclassified spending on selected programs related to space weapons nearly tripled from the FY 2002 Defense Appropriations Bill (which still reflected Clinton-era priorities) to the FY 2005 Defense Appropriations Bill, and classified spending on military space activities has probably increased at a similar or greater rate.[35] The Bush administration re-energized, at least temporarily, some old space weapons programs, including the KE ASAT, space-based lasers, the Multiple (formerly Miniature) Kill Vehicle interceptor, and a military space plane. It also initiated a number of new space control and force application programs.[36] The Air Force has begun publicly to document its plans to develop specific types of space weapons, including "hypervelocity rod bundles" (a.k.a. "rods from God") and to describe operational plans for pre-emptive or retaliatory attacks, not only on enemy military satellites, but also against third-party-owned commercial or civilian satellites being used by an adversary.[37]

The Bush administration has radically altered the strategic context from mutual deterrence mixed with reassurance to a much more assertive mix of coercive prevention and asymmetrical deterrence and started to unilaterally rewrite the rules for space security. Three key developments occurred in June 2002. First, President Bush gave a speech outlining a new US national security strategy that included the intention to initiate force, including nuclear weapons if necessary, to prevent so-called "rogue states" from acquiring weapons of mass destruction. The United States has elaborated this doctrinal shift in several more formal documents, coupled it with a major expansion of its arms and acquisition plans, and demonstrated the will to start a preventive war, as occurred in Iraq.[38] The US withdrawal from the ABM Treaty took effect shortly after the President's speech, followed by an intensified effort to develop a wide range of missile defense technologies

(most of which would also have offensive capabilities) and to deploy a rudimentary system. The removal of treaty restrictions on missile defenses was accompanied by reductions in the legal constraints on US and Russian offensive nuclear weapons, severely weakening two traditional pillars of the nuclear restraint regime.[39] Then, at the end of June 2002, Secretary Rumsfeld announced that SPACECOM would merge with STRATCOM, making a single command authority responsible both for US strategic nuclear forces and for four "emerging missions" that track neatly with the original SPACECOM vision: "global strike; information operations; missile defense; and command, control, communications, intelligence, surveillance, and reconnaissance (C4ISR).[40] In short, the United States is developing an integrated set of nuclear and precision-guided conventional options for long-range offensive strikes backed by comprehensive missile defense, and space is the glue that holds it together.

President Bush depicted his coercive prevention strategy as a fundamentally new approach to threats posed by "shadowy terrorist networks" and "unbalanced dictators with weapons of mass destruction" that cannot be deterred or contained, so the United States must be "ready to strike at a moment's notice in any dark corner of the world." The United States has made no serious effort to engage other countries in a discussion about how this strategic context affects the rules for space security. Instead, it acts as if it can get rid of inconvenient agreements such as the ABM Treaty, preserve those aspects of the Outer Space Treaty that it still favors, and still find international partners to share costs and provide specific technologies for its space programs. This underestimates how negative the international reaction is likely to be.

Understanding the International Reaction

When countries like Russia and China question the impact of US military space programs on "strategic stability," they are not just thinking about traditional arms control issues like

ASATs and missile defense. They are also concerned that space-based sensing and information management allow the United States to conduct large-scale traditional missions like the 2003 attack on Iraq more efficiently, while precision technology permits extremely intrusive small-scale missions to be performed from far way, with no warning, and perhaps no attribution. At a time without another superpower to balance or deter the United States, they fear that expanded military use of space may reduce US concerns about costs and casualties that have traditionally had a self-deterring effect on the use of force. [41]

The challenge for Russian security planners is to maintain deterrence stability while US capabilities are steadily improving and Russian capabilities are declining both quantitatively and qualitatively. The Bush and Putin administrations speak warmly of their new strategic partnership, yet suspicions linger along with massive nuclear arsenals on continual alert. In February 2004, Russia used its largest war game since the early Reagan years to demonstrate that Russia's deterrent remains strong and that Russia could match the United States in areas such as new nuclear weapons development and war-time satellite launch. Russia claims to have developed a hypersonic missile that could maneuver through a future US anti-missile system and to have tested a modernized version of its nuclear-tipped ABM system around Moscow. Several missile launch failures during the Russian war game, however, were embarrassing reminders that the Russian military has serious reliability problems and it is hard to know whether these modernization efforts are more than public relations exercises.[42] Moreover, pervasive gaps in Russia's early-warning satellite systems prevent Russian military leaders from having confidence that they would know if they were to come under attack at any time from any direction. The more that space-based systems reduce US concerns about the costs of using force, the more likely Russia is to seek asymmetrical, and potentially very destabilizing, ways to shore up its own deterrent.

China has a more immediate problem because it has a much smaller nuclear deterrent and a core security issue — Taiwan — that could cause a near-term conflict with the United States. China has historically been the most restrained of the nuclear powers, with an unwavering "No First Use" policy, an unequivocal pledge not to use nuclear weapons against non-nuclear countries, and a very small arsenal. Since China has only about 20 single-warhead ballistic missiles that could reach the United States, it is concerned about even a rudimentary US missile defense system, especially in the context of the coercive prevention strategy. It is equally concerned by US plans to use space for advanced reconnaissance and precision targeting while controlling other countries' use of space for military purposes. China is clearly considering alternative responses, including expanding its offensive capabilities to overwhelm US defenses and finding asymmetrical ways to "negate" US space assets. But it, like Russia, would prefer to focus on economic development, not military competition with the US.[43]

Chinese representatives to the Conference on Disarmament (CD) have repeatedly declared that US plans for expanded military space activities run "counter to the fundamental principle of peaceful use of outer space" and have speculated that the US goal in outer space is to "defy the obligations of international legal instruments and seek unilateral and absolute military and strategic superiority."[44] Such statements are clear evidence of international opposition to practices that go beyond the kinds of space-based military support activities that have been tolerated to date under the ambiguous language of the OST.[45]

Efforts to de-legitimize certain space activities as inconsistent with the Outer Space Treaty's peaceful-use provisions could be interpreted as a subtle way of suggesting that any legal protection the Treaty currently provides would be jeopardized if the United States continues to expand its military space activities without international agreement on the limits of peaceful use. These observations might be intended to induce

caution by reminding a wide range of interest groups, especially the commercial space industry, that their vulnerable assets could be easily disrupted, damaged, or destroyed if the United States refuses to work out more refined international agreement about which military uses of space are peaceful and which are not. The diplomatic statements also establish a record that could be used to legitimate attacks on military-support satellites if any space-faring country ever felt threatened enough to employ a high-leverage asymmetrical response to US military advantages.

Shortly after the demise of the ABM Treaty, China and Russia submitted a working paper outlining the basic elements of a new "Prevention of an Arms Race in Outer Space" (PAROS) agreement. It would complement the Outer Space Treaty by banning weapons in space (in orbit, on celestial bodies, or stationed in space in any other way) and threats or use of force against space objects.[46] This joint document appears designed to maximize international support for PAROS negotiations because it leaves out more controversial features of earlier Chinese proposals, including bans on most, if not all ABM systems and on space-based sensors that operate as part of a weapons system. However, Chinese diplomats still say that issues raised in their earlier PAROS working papers about missile defense, intrusive surveillance, and precision targeting remain part of the official Chinese position and must be addressed at some point.

The United States has rejected PAROS negotiations on the grounds that there is no need for new measures to prevent an arms race in space because there is no arms race in space. This retort had some validity during the Clinton administration, when the United States was canceling or scaling back space weapons research, had explicitly ruled out space-based interceptors for a limited national missile defense, and was willing to join a space security discussion group in the CD in order to get a negotiating mandate for a Fissile Materials Cut-off Treaty (FMCT).[47] Under current circumstances, however, the rejoinder is true only in the narrow sense that there is not, and probably will not be, a Cold

War-style "space arms race," i.e., an action-reaction dynamic between peer competitors. But it ignores the broader problem that other countries feel deeply threatened by US plans for military space dominance in the context of its overall attitude toward security policy and they could react asymmetrically against US space assets if less drastic measures fail to satisfy their concerns. They are not satisfied by US reassurances that its military space activities will be restrained by UN Charter provisions governing the use of force, by military rules of engagement, and by requirements for high-level approval of particularly consequential military space operations — especially because the United States interprets "anticipatory self-defense" much more broadly than most other countries and seems to view space-enabled precision weapons as more "humane" and usable.[48] Calling for PAROS negotiations is a way to start talking about this larger problem by focusing on the part that has the longest history of broad-based international opposition. International support for addressing PAROS is nearly unanimous; recent UN General Assembly resolutions have passed with the approval of about 170 countries and abstentions by only the United States, Israel, and sometimes one or two smaller countries.[49]

The United States deflected responsibility for blocking international discussions of space security for several years because of a procedural deadlock in which China refused to support negotiations on a Fissile Material Cutoff Treaty unless the United States agreed to PAROS negotiations. In August 2003, China made a major concession by accepting a PAROS committee with a discussion mandate rather than a negotiation mandate. The United States responded by deciding to review its FMCT position, which suddenly seemed like less of a priority. In July 2004, the United States announced that it was no longer interested in an FMCT with verification provisions, claiming that verification would be expensive and intrusive without guaranteeing compliance.[50] Since few other FMCT supporters agree that verification must be perfect to be worthwhile, the US shift effectively perpetuates the CD standstill.

In short, US plans for expanded military activities in space, especially when combined with the strategic doctrine of coercive prevention, are perceived internationally as presenting a serious problem, but the United States will not acknowledge any legitimate reason for concern. It has unilaterally withdrawn from the ABM treaty and is refusing to discuss, let alone negotiate, new rules for military space activities in the CD, in the UN Committee on the Peaceful Uses of Space (COPUOS), or in any other multilateral forum.[51] US efforts to unilaterally rewrite the rules for space in support of a national security strategy of coercive prevention could provoke a major international policy confrontation in which the United States would be isolated unless it restores a diplomatic dimension to its space security policy and considers more collaborative steps to protect its own space assets without threatening other countries.

Why the International Reaction Matters

SPACECOM supporters often question why the United States should enter into uncomfortable diplomatic discussions, let alone negotiate any new rules for military space activities, when it has an across-the-board advantage in this arena. The United States has used the muted reaction to the ABM Treaty's demise to claim that even traditional arms control supporters no longer see US space dominance as destabilizing and to question the motives of countries that want the issue on the international agenda. When Bush administration officials dismiss concerns about international reactions to US space policies, they typically either say that foreign countries make defense decisions for domestic or regional reasons without reference to the United States, or they say that US military superiority will be sufficient to dissuade most countries and to deter or defeat anyone foolish enough to challenge the world's sole superpower.

One problem with this response is that US efforts are unlikely to produce such a decisive level of unilateral space dominance that the US would no longer need to worry about asymmetrical attacks. Achieving the SPACECOM vision

would be prohibitively expensive; launch costs alone are still $10,000 or more per pound despite decades of effort to reduce them.[52] Air Force Space Command compared its projected resource growth with the estimated cost of acquiring all the capabilities for which is it responsible in the timeframe desired by the warfighter. It concluded that the requirements were "unexecutable" because the cost would be almost double the available resources in the next decade.[53] Key systems are likely to be even more expensive than these estimates, as evidenced by the cost overruns and delays that have already occurred in the development of the Space-based Infrared System, the Future Imaging Architecture, and the Evolved Expendable Launch Vehicle.[54] Moreover, given the difficulties in the commercial space industry and decisions by the two largest US firms — Lockheed Martin and Boeing — to concentrate primarily on government business rather than foreign commercial sales, it is unrealistic to expect private industry to invest its own capital in research and development, or to achieve economies of scale needed to reduce the per-unit cost of satellites and launch services. Finally, with US budget pressures caused by the war in Iraq and increasing concern about projected federal budget deficits, future spending on military space activities is more likely to be scaled back than to be ratcheted farther upward.

Even if the United States were willing and able to spend whatever it takes to achieve space dominance, the laws of physics limit what is realistic to do in space. Several assessments of space weapon proposals have determined that few are worth pursuing due to technical difficulties, high costs, susceptibility to counter-measures, and availability of cheaper, more effective ways to perform the same military mission.[55] One narrow task for which space weapons might seem uniquely qualified in theory would be boost-phase defense against certain types of ICBMs launched from the interior of large countries like China and Russia. Once one examines the practical details, however, the application that purportedly provides one of the strongest cases for space weapons actually illustrates a very different point: United States withdrawal from the ABM treaty removed a legal

constraint without altering immutable laws that make offense generally easier and less expensive than defense in space.

A study by the American Physical Society determined that space-based interceptors (SBIs) "would have the same time constraints and engagement uncertainties as terrestrial-based interceptors," and thus their kill vehicles would need as much mass as those for other basing modes. A thousand or more space-based interceptors would be needed for a system with the lowest possible mass and a realistic decision time, which would require a five- to ten-fold increase over current US space-launch rates.[56] Even if the United States decided to pay all the costs associated with building, operating, and launching such a system, it would take a number of years to deploy. If any space-faring country ever decided that this system might actually affect their deterrent, it would be "trivial to destroy the SBIs one by one as the constellation is being built" or to deploy space mines near the space-based interceptors.[57] A space-based missile defense system would be subject to single-point failure because once one or more SBIs had been destroyed, the attacker could launch missiles through the hole in the defense constellation. If the defender tried to protect itself with another SBI, it would create a new or enlarged hole in the system.[58] Some analysts have suggested that preventive attacks against SBIs are unlikely because "existing international law would require the state responsible … to repay the United States the cost of the SBI and its launch."[59] But if the United States continues to repudiate central components of space law and to stretch the definition of "peaceful uses" far beyond its traditional meaning, then it would be unrealistic to expect legal protection.

In short, despite the many changes recommended by the Rumsfeld Commission and the strenuous development efforts being undertaken by SPACECOM proponents, the United States is no more likely to gain decisive space dominance in the coming decades than it was in the past. The gap between US space capabilities and those of other countries is growing, but so is the ability of other countries to use asymmetrical strategies against US space systems if necessary. It appears

that all space services can be denied or disrupted at a fraction of the cost and technical expertise required to perform them. The United States risks having the worst of both worlds if it provokes or inspires other countries to develop new military space capabilities that the United States would find threatening and it erodes the legal and diplomatic tools for managing space security without being able to provide reliable military protection for its own satellites, let alone those that the rest of the world uses to operate an increasingly complex world economy and to manage the environmental consequences of globalization.

III. A More Constructive Approach to Space Security

Rather than assuming that conflict in space is inevitable and then taking unilateral actions that turn that dire assumption into a self-fulfilling prophecy, the United States could lead international efforts to update the rules for space so that they fit the changing circumstances of global security. As the dominant power in space and in world politics, the United States could be confident that an expanded and elaborated set of formal and informal rules would reflect its preferences and could be widely accepted as long as the rules also enhanced the security and prosperity of others. Of course, the United States could only return to its traditional position as champion of an approach to space security based on peaceful cooperation, freedom of access, equitable benefits, and transparency if its political leaders accepted something that a majority of the public already knows: competing for national advantage by deploying anti-satellites weapons, space-based missile defense interceptors, and other expanded military uses of space is no more likely to bring lasting security now than during the Cold War.[60] Key trends associated with globalization and the information revolution strengthen, rather than undermine, the logic of restraint that shaped US space security preferences in the 1950s and 1960s. They also pose new challenges that are best addressed through a comprehensive effort to formalize, operationalize, and

institutionalize new rules for space within the broader strategic context of global security.

Globalization Strengthens the Logic of Mutual Restraint

For proponents of the SPACECOM vision, technological change and diffusion strengthen the case for space weapons by increasing American dependence on military and commercial satellites and by expanding potential threats to them. Their selective analysis ignores other countervailing effects of technological change and diffusion that strengthen traditional arguments for space weapons restraint:

- Technological advances are also occurring in non-space-based weapons systems, so it remains true that space weapons offer the United States few, if any, advantages for most military missions. For example, a combination of cruise missiles and intercontinental ballistic missiles retrofitted with conventional warheads could provide access, reach, accuracy, and short response time comparable to space-based "global engagement" weapons at a fraction of the cost and no more international opprobrium than should be expected with a "bolt from the blue" space weapons attack. [61]

- Technological diffusion means that if the United States deploys space weapons, a number of other countries have the ability to emulate or offset them, so the advantage to the United States would be short-lived. Now and for the foreseeable future, no country or combination of countries could match the United States in terms of total military space spending or technological sophistication of military space systems. This means that the United States can afford to exercise restraint knowing that other countries have even less incentive or ability to suddenly surge ahead of the US than the Soviets did during the Cold War. If, however, the United States continues to forge ahead

toward highly threatening space weapons, plenty of countries have enough knowledge, resources, and capabilities to expand their military space operations in ways that would increase the net uncertainty, expense, and insecurity of US space activities. In a global economy, secrecy and export controls cannot protect the American technological advantage in space; instead, they sabotage the US satellite industry and motivate other countries to develop indigenous capabilities and cooperative arrangements that exclude the United States.[62]

- The United States depends on space more than any other country does, so it has the most to lose if attacks on space assets are legitimized. For much of the Cold War, the United States' highest priority for military space was to legitimate and protect its information-gathering satellites in order to compensate for the secretive nature of the Soviet Union. Today, the United States' military and economic superiority is due in large part to its sophisticated use of space-based information and communication systems, so it should be trying to strengthen legal protections and norms against attacking space assets, not undermining restraints and exaggerating the ease with which a hostile state or terrorist group could cause a "space Pearl Harbor" as a high-leverage asymmetrical attack.

- Even though the line between "benign" military-support satellites and "threatening" military space capabilities is less clear now than it was in the 1950s and 1960s, it is still valuable to differentiate between uses of space that enhance mutual security and those that are destabilizing. In scenarios where adversaries were both armed with anti-satellite weapons, there would be strong incentives to strike first. But space-based weapons can be destabilizing

> even if only one country possesses them. For example, one of the main arguments for space-based weapons is to shorten the response time between target identification and attack. A pre-emptive security strategy that places a premium on speed, however, quickly runs up against the limits of intelligence and human judgment. In Iraq and Afghanistan, the United States launched a number of fast, precise, lethal attacks against purported leadership targets, only to learn later that some attack decisions were spectacularly wrong. The United States pays a high price in lost legitimacy for such mistakes, especially when it goes to war with few allies and little foreign support. The "collateral damage" in these cases was relatively minor compared with the general carnage of war, but a single mistake could cause mass casualties if, for example, a precision attack on a biological weapons storage facility pinpointed the explosion a few meters away from where weapons were actually stored — close enough for the shock wave to rupture the containers and disperse the agents, but not close enough for the heat (and radiation, if nuclear warheads were used) to sterilize the pathogens.[63]

Changes associated with globalization also mean that stable mutual restraint is unlikely to occur through tacit bargaining and informal policy coordination alone. During the Cold War, the United States used a combination of legal obligations and reciprocal restraint to gain political and military benefits from cooperation while keeping certain options open vis-à-vis the Soviet Union and avoiding bruising bureaucratic battles at home. As we have seen, this worked reasonably well when the strategic context seemed to reflect a shared commitment to deterrence and détente, but was highly unstable when the strategic context was oriented more toward war-fighting. Misperceptions and action-reaction cycles drove the superpowers in an increasingly competitive direction even when the US preference was for cooperation because key formal rules were ambiguous and norms were imputed but never directly discussed. Moreover, there was no reliable way to differentiate between dedicated efforts to achieve ASAT capabilities and hedging strategies or bargaining chips, and

there were no institutional channels for consultation, clarification, and dispute resolution regarding superpower space security.

The prospects for miscommunication, misperception, and inadvertent conflict are multiplied in a world with many space powers unless the rules for cooperation are more clearly defined, states and non-state actors (e.g. commercial entities that may be only loosely associated with states) provide information to document their compliance with the rules, and international arrangements exist both to assist less developed countries with their compliance obligations and to address concerns about willful non-compliance. Of course, multilateral negotiations can be more challenging than bilateral ones, but skillful, motivated diplomats can take advantage of complexity to forge creative bargains and focus intense pressure on recalcitrant states. It is unrealistic to expect that multinational space cooperation will spontaneously increase and be sustained over time with no formal discussion, let alone negotiation, of new rules and reciprocal obligations to enhance mutual space security. It is equally unrealistic to hope that codes of conduct, rules of the road, parallel unilateral declarations, and other less formal arrangements can provide the same scope and stability of cooperation as full-scale legal agreements, without the corresponding difficulties of negotiation and ratification.[64]

The Inadequacy of Incrementalism

Any consideration of new rules for space security immediately encounters a basic problem: the current leadership of the United States is intensely skeptical about international constraints on US freedom of action, yet it is hard to imagine international initiatives that could significantly strengthen space security despite the opposition of the United States.[65] Some analysts, therefore, try to position themselves as offering a "realistic" middle ground between space warriors and space sanctuary "purists." They argue that the United States should unilaterally shape how and when space is

weaponized by using more passive and defensive measures for satellite protection while neither being the first to deploy dedicated ASATs, space-to-Earth weapons, or space-based missile defense, nor ruling out these options except, perhaps, through carefully tailored constraints such as a ban on missile or ASAT tests that generate debris above 300 miles.[66] Such a treaty would appeal to many, but not all, US military space users who want to minimize the proliferation of debris that could damage their satellites, but it is hard to imagine why countries without the non-destructive anti-satellite capabilities being developed by the United States would accept this as an isolated measure.

Another suggestion is to precede PAROS negotiations by seeking international agreement on verification and transparency measures that would enhance space security "whether or not new treaty prohibitions are implemented." Michael Krepon suggests that "if Russia and China are as concerned about an arms race in space as their public statements suggest, they will accept the application and adaptation of intrusive measures negotiated for other purposes to a space assurance regime" even though this would "require that Moscow accept even more openness regarding military practices established over the past two decades, and that Beijing adopt a sea change in attitude toward transparency."[67] Regardless of whether or not Russia and China are sincerely interested in mutual constraints on space weapons, they are unlikely to accept specific demands for intrusive verification, let alone undertake a "sea change" in attitudes toward transparency, before the United States even agrees to a negotiating mandate for a PAROS committee. It would be most unfortunate if we repeated the Cold War pattern of interpreting the rejection of a "first step measure" that asked the other side to make all the major concessions as evidence that they were more interested in competition than cooperation.

A third incremental strategy is to focus on relatively non-controversial functional areas where everyone's interests could be served by closer cooperation, and to hope that

progress in these areas will spill over into cooperation on more difficult problems over time. For example, Theresa Hitchens has proposed concentrating for now on three major baskets of issues: Space Environment (debris, spectrum interference, and crowding of satellites in Geostationary Orbit); Transparency and Confidence Building (e.g. space surveillance and data sharing); and Rules of the Road (new norms for responsible space behavior).[68] Other proposals hoped to build on nascent US-Russian cooperation in programs such as the Joint Data Exchange Center (JDEC).[69] While such proposals could be very useful as part of a general effort to address international concerns about space security in a strategic context of restraint, reassurance, and transparency, they are at odds with the United States' quest for space dominance coupled with a more pre-emptive and coercive national security strategy. In this context, JDEC, the Russian-American Observation Satellite program, and other bilateral space initiatives are essentially dead because the security bureaucracies on both sides are not convinced that cooperation would actually be mutually beneficial, equitable, and enduring. It may be possible to isolate some cooperative space endeavors outside the security realm from this larger context, but then they will be just that — isolated ventures with no broader effect on security relationships.

Elements of a Comprehensive Space Security System

If the quest for unilateral space dominance is likely to lead to an expensive and dangerous policy confrontation while proposals for informal, incremental, or isolated forms of international space cooperation are inadequate to address the core problem, then it seems prudent to start considering the basic elements of a more comprehensive approach to a mutual space security even though the political preconditions are not currently in place. The basic objectives would be to better protect legitimate space activities while providing more reliable reassurances about how those activities will operate and how their benefits will be shared. Achieving lasting security at an acceptable cost does not depend on negotiating a

super-treaty that provides formal legal specifications for all space activities. Instead, it involves piecing together a mutually reinforcing set of principles, norms, laws, and informal operating practices that match the strategic circumstances and that are widely perceived as legitimate by all space powers.

Rebuilding the political foundations for a more constructive space policy requires reevaluating the strategic circumstances associated with globalization. Space policy is but one of many security problems that illustrate the fallacies of assuming that the ascendance of the United States as the sole information-age superpower offers perpetual military dominance that can be used to achieve a wide range of American objectives regardless of other countries' interests or concerns. Just as we saw that trends associated with globalization strengthen rather than undermine the logic of mutual restraint in space, the development and diffusion of other technologies that are integral to the global economy and that create new vulnerabilities provide powerful incentives for all countries, regardless of their historical animosities, to engage in forms of security collaboration that would have been unthinkable during the Cold War.[70] A shared interest in preventing global terrorism, particularly acts of mass destruction, is motivating new forms of information sharing and policy coordination not only among the United States and its traditional allies, but also with Russia and other countries that are simultaneously cited as justifications for US military transformation. The United States also needs international support to use its military superiority in ways that are considered legitimate enough to avoid stimulating a counter-reaction. That support will be increasingly difficult to achieve unless other countries get more reliable reassurances that this concentration of power will provide protection for everyone — not just the favored few — and that it will not be used against anyone who displeases the United States but is not considered by the rest of the world to be a threat to international peace and security. It remains to be seen how long it will take for the United States to remember that if it wants more reliable cooperation, it must return to its traditional leadership role in building rules and

institutions that shape everyone's behavior for the benefit of all. Even before this general reorientation of US security policy occurs, the dangerous futility of trying to protect US space assets through competitive national programs should be clear enough to create the political conditions for a serious discussion of collaborative steps to enhance space security.

The Outer Space Treaty should remain as the foundational legal document because its fundamental principles — freedom of access, non-appropriation, equitable benefits, transparency, and peaceful use — make even more sense now that numerous countries can affect each other's use of space positively or negatively, deliberately or inadvertently, and when even countries without their own programs see space-based information and communication systems as increasingly important for security and economic growth. It would be counter-productive to try replacing the Outer Space Treaty and the various other international space agreements with a single Comprehensive Space Treaty, or to attempt renegotiating specific provisions of the Outer Space Treaty (which would be extraordinarily difficult and would require re-ratification by all member states). Instead, the focus should be on international discussions leading to agreement on one or more supplemental accords, with the understanding that more effective and equitable rules, higher rates of participation, more widespread compliance, and more vigorous international responses to non-compliance are likely to require formal negotiations, legally binding agreements, and implementing organizations that have both resources and political clout. Since the Conference on Disarmament remains the international community's sole standing body for negotiating multilateral arms control agreements, the United States should cease using procedural maneuvers to preclude even a preliminary discussion about cooperative measures to enhance space security — especially if it wants to continue keeping military matters off the COPUOS agenda.

One new rule that follows logically from the OST principles and that could, with US support, gain widespread assent,

would be a categorical prohibition on the destruction of peaceful space assets or direct interference with their legitimate purposes. This would begin with a ban on testing and deployment of weapons based in space or targeted at space assets. It should prohibit further development of space-based anti-missile systems because their very limited defensive benefits are dwarfed by the new level of vulnerability they would create for satellites in geostationary orbit.

Although destructive anti-satellite attacks are more obviously objectionable than reversible ones, legitimating any type of attack on peaceful space assets would undermine rather than reinforce the central norm. If the United States tried to exempt non-lethal anti-satellite weapons while banning destructive ones, it would decrease the probability of international agreement on easier means of attacking satellites, such as nuclear explosions, debris-generating kinetic energy ASATs, and destruction of ground stations, in order to preserve an option that the United States could not exercise without risking major economic disruption, diplomatic outrage, and military consequences when other countries developed and used non-lethal weapons against the United States and its allies.

A wide range of military-support, commercial, and civilian space activities could damage or destroy space assets even if that was not their primary purpose or their intent. It would, therefore, be necessary to devise behavioral rules to facilitate the continued growth of international space operations while minimizing inadvertent problems, unwarranted suspicions, and deliberate misuse. There are numerous proposals to be evaluated here, including measures to prevent orbital overcrowding and debris generation, to increase missile launch transparency, and to avoid maneuvers that might be mistaken as aggressive or used to hide hostile intent until it was too late for defensive maneuvers. The likelihood of agreement on any of these measures would be significantly greater in the context of US support for a space security system based on mutual cooperation and restraint rather than

national dominance. The prospects for successful implementation and high levels of confidence in compliance over time would also be vastly improved if the United States returned to its traditional role as champion of transparency in space activities and helped to create a climate in which states could exchange sensitive information about their space programs without fear that it would be misused.

Some analysts have suggested that the latent capability to use a wide range of space technologies as anti-satellite weapons provides a useful hedge against the possibility that another country might take advantage of American restraint. It is debatable whether advertising and planning to use residual capabilities in an ASAT mode represents a prudent insurance policy or a blueprint for instability. Given that such latent capabilities are an endemic feature of the space age whose use could set revolutionary precedents, though, it would be foolish to ignore their implications until a crisis occurs or to delegate the decision to a small group of national security officials who do not represent the range of interests at stake. The challenge is to develop a clear set of behavioral rules about the circumstances in which it would or would not be legitimate to use latent capabilities against space assets which have lost their protected status. Should the basic principle be "no first use" then "anything goes;" some type of just war criteria to be applied by national decision makers; or some international process to authorize interference with or destruction of hostile space assets in the interests of international peace and security?

Any international rules about the destruction of peaceful space assets or direct interference with their legitimate purposes will require greater clarity and more widespread agreement about which military space activities are truly peaceful and what constitutes legitimate use. Article III of the Outer Space Treaty provides a useful starting point, but few countries accept the United States' claim that anticipatory acts of coercive prevention such as the Iraq War are consistent with the definition of self-defense in the UN Charter or

international law more generally. If the United States wants to retain international legal protections for its military-support satellites during a conflict, then the US role in that conflict would need to fit under the common definition of self-defense or be explicitly authorized by the UN Security Council.

The more difficult question involves the need for rules about destabilizing military-support activities during peacetime. In the Cold War bilateral context, "destabilizing" activities increased real or perceived incentives for the other side to acquire more arms, to strike first in a crisis, or to launch a preemptive attack to escape from mutual deterrence. Michael Krepon and others have tried to identify dangerous space activities that could destabilize space security, but there should also be an attempt to assess how continual advances in US capabilities to collect and control information from space affect the stability of global security writ large. If the United States continues to pursue increasingly capable reconnaissance systems such as space-based radar, relies more on space for coercive diplomacy short of war, and retains coercive prevention as its national security strategy, other countries may feel intolerably threatened and seek similar or asymmetrical responses unless the United States accepts some limits on its non-weapons uses of military space.

International support for a strengthened set of space security rules will also need more specification about the allocation of benefits from space activities. One pressing question at the moment involves the provision of orbital data necessary for a growing number of countries to operate safely in space. The world has relied almost exclusively on the United States for this data and analytical support, but the Air Force is now restricting some information. This move away from transparency would provide little cover for US satellites that can already be tracked through other means, yet would create problems for other countries and make them less likely to provide space-related data to the United States. Another ongoing initiative involves the global exchange of satellite remote sensing and other earth observation data through the February 2005 agreement to establish a Global Earth

Observation System of Systems (GEOSS). The Bush administration has favored a largely voluntary arrangement to facilitate the exchange of data that states are already collecting, but this minimal form of cooperation could be expanded and institutionalized so that all member states and international organizations could have reliable, low-cost access to satellite sensing information needed for sustainable agriculture, environmental protection, humanitarian relief, and many other activities that contribute to global security.[71] Issues of equity also arise in deliberations over the International Telecommunication Union's allocation of increasingly scarce orbital slots and in concerns about how the deregulation and privatization of telecommunications services will affect access in less lucrative markets.[72] If the technology for space mining and other resource extraction ever becomes practical, then there will need to be equitable rules for managing these activities too.

Reaching domestic and international agreement on rules that balance the various interests at stake in space security will be challenging, and working out the practical details of implementation will be equally demanding. That is all the more reason to start taking these questions seriously now, so that progress toward constructive arrangements for managing space activities has a hope of moving at least as rapidly as space technology develops and spreads around the world.

Notes

[1] This paper was prepared as part of CISSM's Advanced Methods of Cooperative Security Program at the Maryland School of Public Policy with generous support from the John D. and Catherine T. MacArthur Foundation.

[2] Walter A. McDougall, The Heavens and the Earth, 2nd ed. (Baltimore: Johns Hopkins University Press, 1997) pp. 108-134.

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[3] Quoted in John Lewis Gaddis, "Evolution of a Reconnaissance Satellite Regime," in Alexander George, et al. eds., U.S.-Soviet Security Cooperation (New York and Oxford: Oxford University Press, 1988), p. 355.
[4] See Ram Jakhu, "Legal Issues Relating to Global Public Interest in Outer Space," Center for International and Security Studies at Maryland working paper, forthcoming, esp. pp. 6-17.
[5] Treaty on Outer Space, Hearings before the Committee on Foreign Relations, United States Senate, Ninetieth Congress, First Session, March 7, 13, and April 12, 1967, US Government Printing Office, Washington, D.C., pp. 105-6.
[6] See Raymond Garthoff, "Banning the Bomb in Outer Space," International Security 5:3 (Winter 1980/81), pp. 25-40.
[77] See Steven Weber, Cooperation and Discord in U.S.-Soviet Arms Control (Princeton: Princeton University Press, 1991), pp. 204-272.
[8] US and Soviet high altitude nuclear tests before the LTBT generated artificial radiation belts that damaged or destroyed satellites and persisted for an extended period of time, in addition to causing a variety of problems with electronic devices on earth. For example, the 1962 "Starfish Prime" test burned out streetlights in Hawaii, destroyed seven satellites in seven months, and left an artificial radiation belt that lasted until the early 1970s. See Barry D. Watts, The Military Uses of Space: A Diagnostic Assessment (Washington, D.C.: Center for Strategic and Budgetary Analysis, February 2001), p. 19.
[9] The 1971 Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War committed the superpowers to consult immediately in the event of interference with communication or early warning satellites, while the 1971 Hot Line Modernization Agreement specified the use of Soviet Molniya and American Intelsat satellites for crisis communication and committed both sides to ensure their continuous and reliable operation.

[10] Raymond Garthoff views this omission as a serious missed opportunity because the Soviets felt threatened by the existing American ASAT system that was more capable than their own, while the Americans were planning to unilaterally dismantle that system and preferred not to develop a more capable system unless the Soviets did so. In Détente and Confrontation (Washington, D.C.: Brookings, 1985), pp. 189-90.
[11] Weber, Cooperation and Discord, p. 238.
[12] Philip J. Klass, "Anti-satellite Laser Use Suspected," Aviation Week & Space Technology (December 8, 1975), p. 12 and "DOD Continues Satellite Blinding Investigation," Aviation Week & Space Technology (January 5, 1976), p. 18. See also Steven Weber and Sidney Drell, "Attempts to Regulate Military Activities in Space," in Alexander George, et al., eds., U.S.-Soviet Security Cooperation (New York and Oxford: Oxford University Press, 1988), p. 397.
[13] Paul Stares, Space and National Security (Washington, D.C.: The Brookings Institution, 1987), p. 88.
[14] Weber, Cooperation and Discord, p. 263.
[15] Donald Hafner, "Averting a Brobdingnagian Skeet Shoot," International Security 5:3 (Winter 1980/81), pp. 56 and 60.
[16] Quoted in Paul Stares, The Militarization of Space: U.S. Policy, 1945-1984 (Ithaca, NY: Cornell University Press, 1985), pp. 198-9.
[17] Department of Defense, Soviet Military Power 2nd ed. (Washington, D.C.: US Government Printing Office, 1983) pp. 67-8.
[18] See Tamar Mehuron, "2004 Space Almanac," Air Force Magazine (August 2004), p. 32, available at: www.afa.org/magazine/aug2004/0804space_alm.pdf. The constant dollar figures show a jump in DOD space budget from about $3.8 billion in FY1980 to about $18 billion in FY 1988. The 1988 edition of Soviet Military Power (p. 44) assess Soviet spending on military space programs to be about $80 billion over the past decade, but that would be in 1988 dollars and probably not comparable. The comparative space launch charts look dramatic because the gap between Soviet and US

launches increases steadily after the mid-1960s, but it is not a good measure of relative military space capability Because the short lifetimes of many Soviet satellites required frequent replacement launches to retain a capability in being.

[19] John Pike and Eric Stambler, "Anti-Satellite Weapons and Arms Control, in Richard Dean Burns, Encyclopedia of Arms Control, vol. II (New York: Charles Scribner's Sons, 1993), p. 994; Stares, Space and National Security, pp 103 and 108.

[20] In 1983, Congress withheld some funds for ASAT testing until the administration certified that the tests were necessary and that it was negotiating in good faith the Soviet Union. The next year, it made significant cuts in MHV funding. The reciprocal moratorium offer was made by General Secretary Andropov to a group of visiting US Senators on August 19, 1985, the day before the Soviet Union presented their new draft treaty to the UNGA. On August 21, the Administration informed Congress that it would soon conduct its first test of the MHV against an object in space, but technical problems meant that the only way it could conduct the test before the upcoming Geneva Summit was to change the objective from hitting a balloon with special instruments to assess numerous parameters of system function to hitting a defunct US satellite that could show nothing more than whether or not a hit had occurred. See Weber and Drell, "Attempts to Regulate Military Activities in Space," pp. 416-17.

[21] The 1988 National Space Policy was the first to explicitly identify the Department of Defense's four basic missions in space as space support, force enhancement, space control, and force application. See Steven Lambakis, On the Edge of the Earth (Lexington, KY: University Press of Kentucky, 2001), pp. 229-30.

[22] There were attempts to strengthen the Missile Technology Control Regime and to negotiate bilateral early warning and pre-launch notification agreements with Russia but no effort to bring these initiatives into the broader context of CD discussions on PAROS.

[23] The White House, National Science and Technology Council, "Fact Sheet: National Space Policy," (September 19,

1996), p. 5, available at: http://www.ostp.gov/NSTC/html/fs/fs-5.html.
[24] USSPACECOM, Vision for 2020 (February 1997) and USSPACECOM, Long Range Plan (April 1998) will be discussed in more detail in the next section.
[25] The White House Office of the Press Secretary, "Press Briefing on the Line-Item Veto," (October 14, 1997), available at: http://clinton6.nara.gov/1997/10/1997-10-14.raines-bell-hamre-press-briefing-on-the-line-item-veto.html. DOD News Briefing with Kenneth Bacon (including MIRACL experiment), Thursday October 23, 1997, available at http://www.dod.mil/cgi-bin/dlprint.cgi?http://www.dod.mil/transcripts/1997/t10231997_t1023asd.html. See also Patricia McFate, "Arms Control in Outer Space," in Jeffrey A. Larsen, ed., Arms Control: Cooperative Security in a Changing Environment (Boulder, CO: Lynne Reinner, 2002), p. 296.
[26] Ashton Carter, "Satellites and Anti-Satellites: the Limits of the Possible," International Security 10:4 (Spring 1986), p. 68.
[27] Pavel Podvig, "Russia and Military Uses of Space," Stanford University Center for International Security and Cooperation, available at: http://russianforces.org/podvig/eng/publications/space/20040700aaas.shtml.
[28] Laurence Nardon, "The World's Space Systems," Disarmament Forum 1 (2003), pp. 33-40. These countries and a handful of others can manufacture and launch their own satellites; they and many other countries also have missile with sufficient range to hit satellites in low-earth orbit. For comparison purposes, in 2001, the military and civilian space budget of the United States was approximately $27 billion, while the European budget was $6 billion primarily for commercial applications, the Japanese space budget was $2.5 billion, Russian and Chinese space budgets were around $1 billion, and all others were $500 million or less. The disparity in government spending on space-based military activity is even starker, with the United States spending nearly thirty times the European total. See Xavier Pasco, "Ready for Take-

off? European Defence and Space Technology," in Carl Bildt, et al., Europe in Space (London: Centre for European Reform, October 2004), p. 19. Available at: http://www.cer.org/uk/pdf/p527_space_pol_eu.pdf.

[29] Satellite Industry Organization, "The State of the Satellite Industry Report," June 2, 2004, available at: http://www.sia.org/industry_overview/03industrystates.pdf.

[30] For example, the per-troop use of communications bandwidth was fifty times greater in the 2001-2 military operation in Afghanistan than it was in the Gulf War a decade earlier. See Michael O'Hanlon, Neither Star Wars Nor Sanctuary: Constraining the Military Use of Space (Washington, D.C.: Brookings, 2004), p. 4.

[31] "Report of the Commission to Assess United States National Security Space Management and Organization," Executive Summary, (January 11, 2001), pp. 8-10 (Hereafter cited as Rumsfeld Commission Report). Available at: http://www.defenselink.mil/pubs/spaceintro.pdf.

[32] Rumsfeld Commission Report, pp. 17-18.

[33] Theresa Hitchens, "National Space Policy: Evolution by Stealth?" Arms Control Today 34:9 (November 2004), pp. 19-20. The Air Force Space Command's "Strategic Master Plan FY06 and Beyond," (October 1, 2003) states that the development and deployment of counterspace weapons is already required by US policy, but that approval by the President or Secretary of Defense will be needed before these weapons are used. The document is less forward-leaning on space-based weapons to attack terrestrial targets, saying that the SPACECOM vision calls for them, but that national leadership still must decide whether or not to pursue them (p. 35). Available at http://www.cdi.org/news/space-security/afspc-strategic-master-plan-06-beyond-pdf.

[34] US Space Command, "Long Range Plan Implementing USSPACECOM Vision for 2020," (April 1998), available at: http://www.fas.org/spp/military/docops/usspac/lrp/toc.htm.

[35] Mehuron, "2004 Space Almanac," p. 32

[36] Jeffrey Lewis, "Selected Space Programs in the 2005 Appropriations Process," Prepared for the 9th Annual

ISODARCO Meeting, Nanjing, China (October 2004), at: http://www.cissm.umd.edu/AMCS/publications.htm. See also Jeffrey Lewis, "Lift-off for Space Weapons: Implications of the Department of Defense's 2004 Budget Request for Space Weaponization," CISSM working paper, (July 21, 2003), available at: http://www.cissm.umd.edu/documents/spaceweapons.pdf.

[37] "The U.S. Air Force Transformation Flight Plan, (November 2003) at: http://www.af.mil/library/posture/AF_trans_flight_plan-2003.pdf. US Air Force, "Counterspace Operations," Air Force Doctrine Document 2-2.1 (August 2, 2004), at: http://www.dtic.mil.doctrine/jel/service_pubs/afdd2_2_1.pdf. See also Theresa Hitchens, "USAF Counterspace Operation Doctrine: Questions Answered, Questions Raised," (October 4, 2004). Available at: http://www.cdi.org/friendlyversion/printversion.cfm?documentID=2504.

[38] Remarks by the President at 2002 Graduation Exercise of the United States Military Academy, West Point, New York (June 1, 2002). Available at: http://www.whitehouse.gov/news/releases/2002/06/20020601-3.html; "The National Security Strategy of the United States of America" (September 2002). Available at: http://www.whitehouse.gov/nsc/nss.html; and "National Strategy to Combat Weapons of Mass Destruction" (December 2002). Available at: http://www.whitehouse.gov/news/releases/2002/12/WMDStrategy.pdf.

[39] The withdrawal from the ABM Treaty occurred right after the US and Russia signed the Moscow Treaty, an extremely permissive accord where the sole legal obligation — to reduce down to 1,700-2,200 "operationally deployed strategic warheads" doesn't take effect until the day when the treaty expires at the end of 2012. Russia responded to the US withdrawal from the ABM Treaty by declaring that it would not ratify START II. Thus, START I is the only accord that

currently limits US and Russian strategic offensive or defensive arms, and it is set to expire in 2009.

[40] In the remainder of the paper, despite the merger of SPACECOM into STRATCOM, I will continue to use the label "SPACECOM" to refer to supporters of this vision within STRATCOM and elsewhere in the space security community.

[41] An extended discussion is in John Steinbruner and Nancy Gallagher, "Prospects for Security Transformation," CISSM working paper, (July 2004), at: http://www.cissm.umd.edu/documents/securitytransform.pdf.

[42] Nikolai Sokov, "Military Exercises in Russia: Naval Deterrence Failures Compensated by Strategic Rocket Successes," CNS Research Story, February 24, 2004. Available at: http://www.cns.miis.edu/pubs/week/040224.htm.

[43] Jeffrey Lewis, The Minimum Means of Reprisal, Ph.D. Dissertation, University of Maryland, 2004, available at: https://drum.umd.edu/dspace/retrieve/2077/umi-umd-1886.pdf.

[44] For examples, see the statement by Ambassador Li Changhe at the March 12, 1998 CD Plenary Meeting at www.nti.org/db/china/engdocs/lich0398.htm; Fu Zhigang, "A Chinese View of Star Wars," The Spokesman No. 72 (no date, circa 2000), pp. 17-18; and the statement by Ambassador Hu Xiadodi, at the June 7, 2001 CD Plenary Meeting at: http://un.fmprc.gov.cn/eng/12869.html.

[45] Air Force lawyers maintain that "various unopposed military uses of space may as a practical matter enlarge the unofficial definition of 'peaceful purposes' to the point that specific arms control agreements may be the only effective limitation on development and deployment of various weapons in space." This claim that the continuous escalation in the use of space for military purposes by the US is going uncontested, and therefore is permissible under the Outer Space Treaty, reflects the controversial premise that anything not explicitly prohibited by a treaty is permitted, ignores extensive diplomatic opposition to expanded US military space activities, and assumes that a formal protest under OST

Article IX or some forceful reaction would be the only types of international opposition that matter. See Elizabeth Waldrop, "Weaponization of Outer Space: U.S. National Policy," High Frontier (Winter 2005), pp. 36-37

[46] "Possible Elements of a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects," CD/1679 (June 23, 2002). Available at: http://ods-dds-ny.un.org/doc/UNDOC/GEN/G02/624/84/PDF/G0262484.pdf?OpenElement.

[47] "Statement by Ambassador Robert T. Grey, Jr., "United States Representative to the Conference on Disarmament," Washington File (September 14, 2000). Available at: http:usinfo.org/usia/usinfo.state.gov/topical/pol/arms/stories/00091501.htm.

[48] For arguments that the United States may be legally or morally bound to use space assets to meet the Law of Armed Conflict's criteria of necessity, distinction, proportionality, humanity, and chivalry, see Waldrop, op cit., pp. 40-41. A more general argument about the morality of many military space activities is Col. John Hyten and Dr. Robert Ury, "Moral and Ethical Decisions Regarding Space Warfare," Air & Space Power Journal (Summer, 2004), at: http://www.airpower.maxwell.af.mil/airchronicles/apj/apj04/summer04/hyten.html.

[49] In 2004, the annual U.N. General Assembly resolution urging steps to consolidate and reinforce the legal regime for outer space, including the establishment of an ad hoc Committee on PAROS in the CD, was supported by 167 countries, with no opposition, and abstentions only by the United States, Israel.

[50] Dafna Linzer, "U.S. Shifts Stance on Nuclear Treaty," Washington Post (July 31, 2004), p. A1.

[51] Many members would like COPUOS to adopt the weaponization of space as an agenda item. After COPUOS held a policy conference on military uses of space in the early Reagan years, however, there has been an unwritten

agreement, largely at the insistence of the United States, that COPUOS will no longer discuss military matters.

[52] See Futron, "Space Transportation Costs: Trends in Price per Pound to Orbit," (September 6, 2002), at: Http://www.futron.com/pdf/futronlaunchcostwp.pdf.

[53] Air Force Space Command, "Strategic Master Plan FY06 and Beyond," (October 1, 2003), p. 13.

[54] Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, "Report of the Defense Science Board/Air Force Scientific Advisory Board Joint Task Force on Acquisition of National Security Space Programs," (May 2003) at: http://www.fas.org/spp/military/dsb.pdf.

[55] Bruce M. DeBlois, Richard L. Garwin, et al., "Space Weapons: Crossing the U.S. Rubicon," International Security 29:2 (Fall 2004), pp. 50-84; Bob Preston, et al., Space Weapons, Earth Wars (Santa Monica, CA: RAND, 2002), and David Wright, Laura Grego, and Lisbeth Gronlund, The Implications of Physics for Space Security, Occasional Paper of the Committee on International Security Studies, American Academy of Arts and Sciences, forthcoming.

[56] "Report of the American Physical Society Study Group on Boost-Phase Intercept Systems for National Missile Defense: Scientific and Technical Issues," (July 2003), p. xxix at: http://www.aps.org/public_affairs/popa/reports/nmd03.cfm

[57] DeBlois, Garwin, et al., op cit, pp. 82-3.

[58] The same problem also means that the United States could not use space-based weapons to deny other countries access to space; at most, it could marginally increase the costs of access and generate tremendous hostility in the process. See Wright, Grego, and Gronlund, The Implications of Physics for Space Security.

[59] DeBlois, Garwin, et al., p. 83.

[60] The American public shares the Bush administration's concerns about proliferation, but strongly favors multilateral cooperation over unilateral military action for addressing security problems. When presented with arguments for and against negotiating a ban on space weapons, 65% of respondents favored a new PAROS accord and only 35%

opposed it. Only 21% of respondents wanted the United States to "build a missile defense system right away, while 68% wanted to do "more research until such a system is proven to be effective" and 8% thought that the United States "should not build a missile defense at all." See Steven Kull, "Americans on WMD Proliferation," (a CISSM/PIPA/Knowledge Networks Poll) April 15, 2004, available at: http://www.pipa.org/OnlineReports/WMD/WMDreport_04_15_04.pdf.

[61] Garwin, DeBlois, et al., pp. 67-77.

[62] James A. Lewis, Executive Director, Preserving America's Strength in Satellite Technology: A Report of the CSIS Satellite Commission (Washington, D.C.: Center for Strategic and International Studies, April 2002).

[63] Robert W. Nelson, "Nuclear Bunker Busters, Mini-Nukes, and the U.S. Nuclear Stockpile," Physics Today (November 2003), available at: www.physicstoday.org/vol-56/iss-11/p32.html.

[64] Terms like "codes of conduct" and "rules of the road" can refer to everything from weak coordinating mechanisms that apply only during peacetime to elaborate proposals modeled on arms control treaties that would be no easier to negotiate or to secure Congressional support for implementation just by virtue of being called something other than a treaty. From an international law standpoint, any agreement that was meant to be legally binding has the same legal status regardless of whether or not it is called a treaty. In terms of the US domestic approval process, the more significant an agreement is, the stronger the reasons are for following the treaty approval process (two-thirds Senate support for ratification) rather than using the Congressional executive agreement process (majority approval by both houses of Congress) or trying to claim that no legislative approval is needed. Either house of Congress can withhold funding or use other legislative strategies to block implementation if they do not like the substance of the accord or the process by which the Executive Branch minimized the need for Congressional approval.

[65] Some analysts have proposed using an "Ottawa Process," — i.e., working out an agreement among like-minded states to build pressure on other states for constructive negotiation and cooperation. While this strategy had some benefits in the landmines case, the Bush administration is much less susceptible to international pressure than the Clinton administration was and few space security challenges do not involve the United States in some capacity. See Rebecca Johnson, "Multilateral Approaches to Preventing the Weaponisation of Space," Disarmament Diplomacy 56 (April 2001), available at: http://www.acronym.org.uk/dd/dd56/56rej.htm.
[66] O'Hanlon, Neither Star Wars Nor Sanctuary, esp. pp. 138-9.
[67] Michael Krepon with Christopher Clary, Space Assurance or Space Domination (Washington, D.C.: The Henry L. Stimson Center, 2002), pp. 108, 110, and 114.
[68] Theresa Hitchens, Future Security in Space (Washington, D.C.: Center for Defense Information, September 2004).
[69] John Steinbruner, "The Significance of Joint Missile Surveillance," Occasional Paper of the Committee on International Security Studies, American Academy of Arts and Sciences, (July 2001), available at: http://www.cissm.umd.edu/documents/jointmissile.pdf.
[70] For a more general analysis of the changing circumstances of global security, see John Steinbruner and Nancy Gallagher, "Constructive Transformation: An Alternative Vision of Global Security," Dædelus 133:3 (Summer 2004), pp. 83-103.
[71] Joanne Irene Gabrynowicz, "Global Remote Sensing: Issues and Opportunities," CISSM working paper, forthcoming.
[72] Ram Jakhu, "Safeguarding the Concept of Public Service and the Global Public Interest in Telecommunications," Singapore Journal of International and Comparative Law 5:1 (2001), pp. 71 et seq.