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Center for Space and Defense Studies

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The Center's mission is to provide the intellectual foundation for the integration of space policy in the overall national security policy of the United States, define the curriculum for space policy studies in higher education, and produce successive generations of Air Force officers with a vocation for space.

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INTRODUCTION TO THE FIRST ISSUE

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This journal has come into existence to provide a forum for discussion of an intellectual and policy foundation for U.S. activities in space. It is open to all legitimate points of view and to contributions from policy makers, operators, academics, and the private sector. Although the Center for Space and Defense Policy is located at the Air Force Academy, no preference will be given in these pages to the Air Force's position on space policy. We are not advocates but academics, and conceive our contribution as providing Air Force and government leaders with situational awareness about thinking in other sectors of the space community, as well as in other spacefaring nations.

There have been three great visions of America's role in space and each can be associated with the President who emphasized that vision: Eisenhower's conception of peaceful uses of space that focused on the collection of intelligence data, Kennedy's call to manned space exploration, and Reagan's reconceptualization of the strategic role of space known as the Strategic Defense Initiative. All were products, to some degree, of the competition of the Cold War. All served as organizing principles that rallied public support on the one hand, and rationalized government space programs on the other. And all were honed during long periods of intellectual incubation in free and open discussions like those this journal is intended to propagate.

But it has been twenty-three years since Reagan espoused his vision and since then the Cold War ended, new spacefaring actors have emerged, and both the geopolitical importance of space and the number of actors increasingly reliant upon it have expanded many fold. Technology now makes possible activities that were difficult to imagine in 1983, although perhaps not yet the impenetrable anti-ballistic missile shield that President Reagan foresaw. Despite these changes – or, perhaps, because of them – no vision of space future has arisen to give coherence to our space activities, and to rally the sort of public support needed for the multi-year funding such activities require.

There are, of course, *some* areas of general agreement. All agree that circumterrestrial space is becoming more crowded, and that this trend will likely accelerate. All agree that in some areas – and particularly in communications, positioning, navigation and timing, and intelligence gathering – space provides considerable comparative advantages. All agree that space is a potential arena for military competition, and that such competition – if it occurs – will be extraordinarily expensive. And most would agree that the days of practically unlimited resources for space are over, that private investment will now be more selective, and that future government space programs will be competing for pieces of a budgetary pie which is unlikely to grow and might very well shrink.

But there are also areas of broad disagreement, or perhaps lack of clarity. For example, although there remains broad public support for the notion of manned space flight, the sort of enthusiasm which once made possible the extraordinary financial and technological effort to land a man on the Moon is no longer as much in evidence. Nor has the President's *Vision for Space*

Exploration been comprehensively integrated into a wider vision of the U.S. role in space, and without such context, it may well prove more difficult to build and sustain public support.

By the same token, while there is an emphasis in U.S. national space policy on maintaining freedom of action in space, there is no consensus on what that aspiration implies, or what – in terms either of hardware or policy – will be necessary to achieve it. Some see a forceful assertion of U.S. military power in space as necessary, some think it unavoidable, while others view it as counterproductive. Finally, while most agree – with greater or lesser enthusiasm – that some regime of regulation will be necessary in space beyond the rudimentary ones that now exist, there is disagreement on whether the United States should retain a special status within this regime, especially in the military sector. Some argue that our insistence on maintaining freedom of action in the military realm dooms the possibility of imposing order on the competition of spacefaring nations; others contend that no such order is possible without the enforcement of law that only the United States – with freedom to act as it deems necessary – can guarantee.

there is an emphasis in U.S. national space policy on freedom of action but no consensus on what that implies

It is not the business of journals but of national leaders to rally the nation for the challenge of space, to set priorities and to settle bureaucratic disagreements. Indeed, if America succeeds in establishing an intellectual vision for the next stage of its activities in space, it will doubtless be a product of a President's vision and persistence, as our last three concerted efforts in space have been. The foundation for taking the next steps in space will be improved by vetting these steps through the process of open and honest intellectual debate. Fostering that debate is the mission the Center for Space and Defense Studies, through its textbook, this journal, and its other activities, has set for itself.

AN INCHOATE PROCESS FOR THE INTERNATIONAL REGULATION OF MILITARY ACTIVITIES IN SPACE

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As the breadth and depth of military activities in space expand, demands are growing to regulate these activities at the international level. In some cases, these demands stem from the recognition that broader national security operations in space are moving away from a legacy of being dominated by secret intelligence activities and in the direction of more open military activities.[1] In other cases, they are driven by the efforts of arms control advocates to roll back the "weaponization of space."[2] Regardless of the underlying motivations, the demands for international regulation are going to grow, and the debate will turn increasingly to the matter of how to proceed.

Recognizing that a limited number of international agreements to regulate both civilian and military activities in space already exist, there are a number of options available to U.S. and foreign policy makers.[3] A brief survey of these options was made available to the public by the Institute of Air and Space Law at McGill University in Montreal, Canada, in 2005.[4] This survey serves as a good guide to the available options and as a starting point for assessing the strength and weaknesses of each one, particularly at the international level.[5]

[1]The Eisenhower Administration initiated U.S. national security operations in space with a preference for intelligence activities with the signing of NSC 5520 on 20 May 1955. For a history of these early policies, see Walter A. McDougall, *The Heavens and the Earth: A Political History of the Space Age* (Baltimore: Johns Hopkins University Press, 1997). For the text of NSC 5520 and related documents, see John M. Logsdon, ed., *Exploring the Unknown*, vol. 1, *Organizing for Exploration* (Washington, D.C.: NASA SP-4407); John M. Logsdon, ed., *Exploring the Unknown*, vol. 2, *External Relationships* (Washington, D.C.: NASA SP-4407, 1996); and Stephanie Feyock, compiler, *National Security Space Project, Presidential Decisions Documents* (Washington, D.C.: George C. Marshall Institute, 2006), pp. 1–20.

[2]Michael Krepon (with Christopher Clary), *Space Assurance or Space Dominance? The Case Against Weaponizing Space* (Washington, D.C.: Henry L. Stimson Center, 2003).

[3]Among the existing international agreements are the (1) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, of 1967; (2) Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space of 1968; (3) Convention on International Liability for Damage Caused by Space Objects of 1972; (4) Convention on Registration of Objects Launched into Outer Space of 1975; (5) Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979; and (6) Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water of 1963. As a result, there is also a rich body of international law related to activities in space. A source of this body of law, although by no means the only one, is the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). The records of the Legal Subcommittee are available at: UNOOSA Legal Subcommittee.

[4]"Policy and Legislative Options for Parliamentarians Regarding Possible Deployment of Further Military Capabilities in Outer Space," (Montreal: McGill University, Institute of Air and Space, Faculty of Law, June 2005).

[5]The McGill University study includes options for purely domestic laws and regulations. This article will focus on the options available for the international regulation of military activities in space and touch on U.S.

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The weakness of the McGill University study is that it treats the options discretely and not in the context of a broader international political process. This is not to say that the study implies that one of the options may be pursued only at the expense of the others, but that it does not describe an inchoate process by which the unilateral actions and non-actions of individual states result in a form of common law.[6] The results of this inchoate process may evolve into formal agreements, depending on circumstances.

In fact, much of what passes for the practical international regulation of military space activities today has emerged from an inchoate process. The formal agreements are less important in influencing the conduct of military activities in space. For example, nations have chosen not to take military actions against satellites flying over their territories in times of peace, although they certainly do so against military aircraft that penetrate their airspace without authorization. As a result, nations treat territorial airspace in military terms in a way that is fundamentally different from how they treat outer space, even though there is no formal international agreement that distinguishes between the two.[7] This critical distinction, while broadly accepted by states today, resulted from a process utterly lacking in formality and order. It stemmed from nothing more than emerging patterns of behavior. This is not to say that the inchoate process will never lead to a formal agreement or that formal agreements are inappropriate in all instances.[8]

Assessing the Options

Despite this weakness, the McGill University study provides a point of departure for exploring how this inchoate approach to regulating military space activities at the international level may be pursued in the future. Such an exploration starts with assessing the strengths and weaknesses of five discrete options for the international regulation of military space activities.

formal agreements are less important in influencing the conduct of the military

Maintain Existing Legal Regime for Regulating Military Space Activities

The process for establishing international regulation of military activities in space is not devoid of formal treaties and other international agreements. This body of formal agreements is anchored by the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, of 1967, frequently referred to simply as the Outer Space Treaty.[9] While the

government policy guidance regarding military activities in space, but it will not address the domestic legislative and regulatory options.

[6] *Webster's Encyclopedic Unabridged Dictionary of the English Language* defines inchoate, among other ways, as "not organized; lacking order."

[7] This distinct treatment of outer space and territorial airspace emerged despite contentions by the U.S. Air Force that both were part of a continuum. For a description of the Air Force's views on this issue, see Benjamin S. Lambeth, *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space*, (Santa Monica, Calif.: RAND, 2003), pp. 37–59.

[8] The United States recently cast the sole vote in opposition to a United Nations General Assembly resolution to develop additional transparency and confidence-building measures regarding activities in outer space. The broad scope of the resolution and the open-ended agenda it establishes invited U.S. opposition. A more narrowly drawn resolution on transparency and confidence-building measures, however, could serve U.S. interests if it codifies a clear pattern of behavior that has served U.S. interests to date. For a text of the resolution, see "Resolution Adopted by the General Assembly: 60/66. Transparency and confidence-building measures in outer space activities," 61st plenary meeting, 8 December 2005.

[9] For the text of the Outer Space Treaty and a brief description of the negotiating history, see United States Arms Control and Disarmament Agency, *Arms Control and*

content of the Outer Space Treaty is far broader than the regulation of military activities in space, its provisions include a number of limitations on such activities. Article IV prohibits the placement of weapons of mass destruction in orbit around the Earth, on the Moon and other celestial bodies, or anywhere else in outer space. The same article also prohibits the placement of military installations, the conduct of weapons tests, and the conduct of military maneuvers on the Moon and other celestial bodies.

Other treaties are more appropriately described as arms control treaties that contain provisions related to military activities in space. For example, Article I of the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, commonly referred to as the Limited Test Ban Treaty, prohibits the conduct of nuclear weapon test explosions in outer space.[10]

Continuing to observe the existing regime of international agreements regulating military activities in space is essentially an argument for maintaining the status quo. The most common argument against this option is that the existing legal regime is not broad enough and that some military activities currently not prohibited by the regime should be banned. These arguments most frequently come from those seeking to limit U.S. military options in space. Among the activities that some would seek to ban are the development, testing, and deployment of anti-satellite weapons and space-based non-nuclear ballistic missile defense interceptors.[11]

Other arguments against simply maintaining the legal status quo assume there are fundamental shortcomings in the current regime's existing provisions or the potential for significant advantages derived from new approaches. If the current legal regime contains errors of omission, as some contend, it almost certainly contains errors of commission. For example, Article IV of the Outer Space Treaty prohibits the placement of military installations on the Moon. Simply accepting the status quo in perpetuity in this case assumes that the United States will never have a compelling security interest in placing a military installation on the Moon. At a minimum, it is plausible that the United States will find such an interest at some point in the future.

Strengthen Existing International Legal Regime for Regulating Military Space Activities

This option would identify ways to broaden the application of the existing international legal regime regarding military space activities that fall short of amending existing agreements or negotiating new ones. Among these are (1) seeking universal state participation in all five multilateral space law treaties; (2) using the consultative mechanism in Article IX of the Outer Space Treaty to regulate military activities in accordance with proper interpretations of the Treaty; (3) increasing transparency regarding military activities in space by expanding the information that state parties provide under the 1975 Convention on the Registration of Objects Launched into Outer Space, or Registration Convention; and (4) adding a dispute settlement mechanism to the procedures of the International Telecommunications Union, particularly with regard to preventing "harmful interference" with military space missions.[12]

In substantive terms, this option suffers from the same shortcomings as those that apply to the option of maintaining the international legal

Disarmament Agreements: Texts and Histories of the Negotiations (Washington, D.C.: ACDA, 1990), pp. 52–63.

[10]For the text of the Limited Test Ban Treaty and a brief description of the negotiating history, see ibid., pp. 37–49.

[11]L. Skotnikov, Permanent Representative of the Russian Federation, Statement at Plenary Meeting of the Conference on Disarmament, "Prevention of an Arms Race in Outer Space," 26 August 2004. Cited hereafter as Skotnikov Statement.

[12]Institute of Air and Space, "Policy and Legislative Options," pp. 7–10.

status quo. Fundamentally, it leaves little room for addressing developing problems regarding the regulation of military activities in space or for remedying existing problems within the international legal framework. The proper scope of interpretation under the various applicable treaties, and most particularly those in the category of regulating both civilian and military activities in space, is simply too narrow.

Further, any attempt to go beyond the traditional scope of interpreting a treaty will be very risky. In the United States, the Senate, which has the constitutional authority to consent to the ratification of treaties, may quickly conclude that a far-reaching reinterpretation of an existing treaty is an attempt to circumvent it. This is because the executive branch is legally bound to execute a treaty ratified by the Senate in a manner that is consistent with its terms. Substantive changes in a treaty require formal amendment, subject to Senate advice and consent. As a result, a proposal to expand significantly the reporting requirements under the Registration Convention by interpretation, for example, could prompt objections from the U.S. Senate.[13]

the Senate has been particularly reluctant to approve treaties with far-reaching security implications

The Senate also has been particularly reluctant to approve treaties with far-reaching security implications that include mandatory dispute settlement powers lodged in international organizations. This issue is a contributing factor in the U.S. determination not to ratify the United Nations Convention on the Law of the Sea.[14] An attempt to establish such a mechanism under the International Telecommunications Union will likely meet similar objections.

Adopt New Multilateral Agreements to Regulate Military Space Activities

This approach would remedy perceived shortcomings in the existing legal regime for regulating military activities in space by formally amending the regime, in many cases by treaty. Substantive proposals to do this include: (1) amending the Registration Convention to expand transparency, which, as noted above, would attempt to do so by interpretation; (2) a multilateral treaty establishing a code of conduct governing military activities in space;[15] (3) a multilateral agreement to ban a specific type of space-based weapon, such as an anti-satellite weapon; and (4) a multilateral agreement to ban comprehensively all types of "space-based weapons."[16] The strength of this approach is that it affords states the opportunity to address the full array of issues regarding the conduct of military activities in space.

The process of negotiating new agreements, however, has a fundamental drawback. Leaving aside the specific objections to specific future agreements, including issues of verification and enforcement, the problem with new treaties or formal agreements is that the negotiation process is too blunt and inflexible to make immediate contributions to strengthening U.S. national

[13]Compliance with the Registration Convention has been spotty. The issue of obtaining compliance with Convention should not be confused with the issue of expanding the substantive requirements of the Convention through reinterpretation. The Senate is not likely to object to efforts to obtain compliance, while it is likely to object to certain reinterpretations. For an explanation of the problems of compliance with the Registration Convention, see Jonathan McDowell, "Adherence to the 1976 Convention on Registration of Objects Launched into Outer Space."

[14]Marjorie Ann Browne, "The Law of the Sea Convention and U.S. Policy," (Washington, D.C.: Congressional Research Service, Library of Congress, 2 March 2004), p. 10.

[15]For a comprehensive description of a code of conduct governing activities in space, see "Code of Conduct for Outer Space," (Washington, D.C.: Henry L. Stimson Center).

[16]Skotnikov Statement.

security relative to space-based activities. Technological advancements are too rapid to regulate through this process. This is the case despite the relatively long timelines for the development and deployment of space systems. The negotiations will generally lag behind the technological advancements.

The alternative is to negotiate sweeping prohibitions without understanding what technologies may be applicable. This alternative will lead to confusion and ultimately prove unable to stand the test of time. For example, Article V of the 1972 Anti-Ballistic Missile (ABM) Treaty sought to ban the development, testing, and deployment of all possible ABM systems or components based in space, among other places. Article VI sought to ban giving non-ABM systems an ABM capability.[17] ABM Treaty negotiators, recognizing this problem, attached Agreed Statement D to the Treaty.[18] This statement conceded that the prohibitions included in the Treaty would be subject to further negotiations if ABM technologies "based on other physical principles" emerged. This contradiction led to an explosive debate over the "narrow" and "broad" interpretations of the ABM Treaty in the United States.[19] In an extraordinary step, the United States withdrew from the ABM Treaty in 2002. While many important treaties, including the ABM Treaty, contain withdrawal provisions, exercising the withdrawal provisions is rarely done. The sweeping nature of the prohibitions included in the Treaty was a contributing factor in President George W. Bush's decision to withdraw.[20]

Adopt New Military Space Agreements at the Bilateral or Regional Level

This option attempts to limit the procedural complexity stemming from the negotiation of broad-based multilateral treaties. It also recognizes that the preeminent forum for such broad-based negotiations, the United Nations Conference on Disarmament, is ineffective.[21] This option also recognizes that even broadly accepted arms control agreements can be negotiated by a few states at the outset. The Limited Test Ban Treaty, for example, was initially negotiated by a five-state subcommittee of the Conference on Disarmament in 1955.[22]

The chief shortcoming of this option is the same as the option above. The negotiation process is likely to remain lengthy, and the pace of technological advancement is all but certain to outstrip the pace of negotiations. This approach also carries the inherent shortcoming that the geography of space makes it an unlikely subject for bilateral or regional negotiations that could later have global applications. For example, negotiations to set demarcations of territorial waters between states have helped to establish more broadly accepted principles on rights of transit for shipping. Space does not offer a similar opportunity. In fact, regulating military activities in space is best suited to a broadly participatory set of negotiations if a formal negotiating process is the preferred approach. Otherwise, the bilateral and regional process could become unwieldy, particularly if more states engage in activities in space.

[17]For the text of the ABM Treaty and a brief description of the negotiating history, see United States Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements*, pp. 157–161.

[18]Ibid., p. 162.

[19]For a brief description of this debate, see Lt. Col. Peter L. Hays, *United States Military Space: Into the Twenty-First Century* INSS Occasional Paper 42, (USAF Academy, Colo.: Institute for National Security Studies, September 2002), pp. 92-95.

[20]Carnegie Endowment for International Peace, "Administration Missile Defense Papers," (Washington, D.C.: Carnegie Endowment, July 2001).

[21]Task Force on the United Nations, "American Interests and UN Reform," (Washington, D.C.: United States Institute of Peace, 2005), pp. 74 and 84.

[22]United States Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements*, pp. 37–44.

Adopt Unilateral Declarations

Arms control advocates sometimes point to this approach as a means for initiating a diplomatic process that will prevent the "weaponization of space." Specifically, they point to Russia's October 2004 unilateral declaration at the United Nations Conference on Disarmament that it would not be "the first [state] to deploy any weapons in outer space…."[23] In fact, the option of pursuing unilateral declarations is the one most in keeping with the inchoate process for regulating military activities in space.

The critical difference between the option of issuing unilateral declarations and the inchoate process is that the inchoate process is far broader, both substantively and in the means of pursuit. Substantively, the inchoate process is not focused exclusively or even predominantly on arms control. At the outset, President Dwight Eisenhower sought to use the inchoate process to establish the freedom of passage for vehicles through space.[24] His effort had little to do with arms control but much to do with monitoring the Soviet Union.

Moreover, unilateral declarations are but one effective procedural tool available to the inchoate process. Other tools include unilateral actions, collective actions, and joint declarations. In fact, unilateral and collective actions are the most effective because the pattern of behavior that emerges is likely to have the most powerful impact on regulating military activities in space. In this case, the cliché that actions speak louder than words is clearly applicable. Further, the inchoate process, unlike the option of issuing unilateral declarations, is anything but transparent. Many of the actions the United States has taken in space were based on secret presidential directives and National Security Council documents.[25]

Past Operation of the Inchoate Process

Recognizing that the inchoate process has been used extensively in the past to regulate military activities in space is essential to understanding its merits as a procedural approach for regulating such activities in the future. Depending on this approach in the future will not represent a sharp departure from the approach that has been used to date. Three examples demonstrate why this is so.

Dominance of Intelligence Operations over Military Operations

As noted, the Eisenhower Administration sought to establish a U.S. national security presence in space for intelligence reasons more than for military reasons. This determined national policy rendered international agreements to regulate national security activities in space problematic, given that the relationship between intelligence and the diplomatic process is at best tenuous. This limitation served to restrain such diplomacy even in the narrower area of regulating military activities in space. For example, it is unclear at what point an intelligence activity becomes a military targeting activity.[26] In the end, both the United States and the Soviet Union came to accept such satellite

the inchoate process is not focused exclusively or even predominately on arms control

[23]Center for Defense Information, *CDI Russia Weekly*, (Washington, D.C.: CDI, 14 October 2004).

[24]R. Cargill Hall, "National Space Policy and Its Interaction with the U.S. Military Space Program," in *Military Space and National Policy: Record and Interpretation* (Washington, D.C.: George C. Marshall Institute, 2006); and McDougall, *Heavens and Earth*.

[25]R. Cargill Hall, compiler, "Presidential Decisions: NSC Documents, Supplement: Newly Declassified Excerpts," (Washington, D.C.: George C. Marshall Institute, National Security Space Project, 2006).

[26]The Soviet Union, for example, rejected President Eisenhower's "Open Skies" proposal in 1955 in part because it viewed such monitoring as a targeting activity. See Hall, "National Space Policy and Its Interaction with the U.S. Military Space Program," p. 2.

monitoring without a specific international agreement legitimizing these activities. In short, the pattern of behavior between the two superpowers was a more powerful driver than the diplomatic process.

This is not to say that the predominant role of intelligence activities in space closed off all formal diplomacy for regulating military activities in space, just that formal agreements followed the pattern of behavior established primarily by the United States and the Soviet Union. Article IV of the Outer Space Treaty banned the deployment of weapons of mass destruction in space and prohibited the placement of military installations on celestial bodies such as the Moon. Further, there were limited provisions in later treaties that did extend legitimacy to space-based intelligence activities. For example, Article XII of the ABM Treaty barred interfering with "national technical means of verification" of the Treaty's provisions, and Article V of the 1972 Interim Agreement Between the United States of America and the Union of Soviet Socialist Republics on Certain Measures with Respect to the Limitation of Strategic Offensive Arms contained a similar provision.[27] The limited areas of formal agreement, however, meant that the process of tacitly accepting national security activities in space, consistent with the inchoate process, was the dominant approach to international regulation.

no treaty defines the upper limit of airspace and the lower limit of space

Lack of Demarcation Between Territorial Airspace and Outer Space

To this day, there is no formal treaty or non-treaty international agreement that defines the upper limit of territorial airspace and the lower limit of outer space. The Outer Space Treaty does not include a definition. Nevertheless, states have generally come to accept that there is a fundamental difference between the two and behave in a way that tacitly acknowledges that there is some kind of demarcation line.

The lack of a formal definition, generally speaking, has not led to unintended conflicts or destabilizing actions between or among states. While the fact that there exists a zone where aircraft cannot fly due to the lack of atmosphere and where satellites are unable to maintain orbit contributes to this fortunate outcome, it is also an argument that demonstrates the strength of the inchoate process for regulating military activities in space. The informal and unstructured approach to regulating military activities in space, even with respect to something as simple and fundamental as establishing the geographic definition of space, has produced few adverse outcomes.

Distinctions between Space and Celestial Bodies as International Territory and Space Vehicles as Sovereign Property

This example demonstrates how the inchoate process can lead ultimately to formal international agreements. At the outset of the space age, it was unclear whether space was an extension of territorial airspace. It was also unclear whether satellites, like national flag vessels on the high seas, would be afforded the protection of sovereign property. As the United States and the Soviet Union, by their behavior, came to accept outer space as international territory, they also behaved in a way that treated their satellites as sovereign property.

In 1961, the United Nations General Assembly (UNGA) adopted Resolution 1721, which called for national authorities to register satellites with international authorities.[28] In 1963, the UNGA adopted Resolution 1884, which designated states

[27]For the text of the Interim Agreement, see United States Arms Control and Disarmament Agency, *Arms Control and Disarmament Agreements*, pp. 169–171.

[28]Hays, *United States Military Space*, pp. 80–81.

as the responsible powers for all activities in space and sought to assign states jurisdiction regarding spacecraft.[29] The issue of national jurisdiction over spacecraft was formally codified in the Outer Space Treaty in 1967.[30] Agreements requiring the return of satellites to the launching state (Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space), establishing liability for the damage caused by satellites and other spacecraft (Convention on International Liability for Damage Caused by Space Objects), and registering satellites (Convention on Registration of Objects Launched into Outer Space) were adopted in 1968, 1972, and 1976, respectively.[31]

While national entities were ultimately given jurisdiction over the spacecraft they launched or registered by formal agreements, these agreements followed the behavior patterns established primarily by the United States and the Soviet Union. They did not establish initial rules in abstract terms that the early space powers were then forced to observe.

The Moon Agreement and Proceeding with Formal Agreements First: An Example of Overreaching?

If formal agreements followed established patterns of behavior regarding national jurisdiction over satellites and other spacecraft, the opposite approach was taken to prohibit claims of sovereignty over and the emplacement of military installations on the Moon and other celestial bodies. Article II of the Outer Space Treaty prohibits claims of sovereignty, and Article IV prohibits the placement of military installations. The Outer Space Treaty was opened for signature in 1967 and entered into force in 1968, well before Neil Armstrong's July 1969 Moon landing.

The general prohibitions regarding celestial bodies established in the Outer Space Treaty were strengthened and specified in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.[32] Commonly referred to as the Moon Agreement, it was opened for signature in 1979 and entered into force in 1984. The United States has opted not to join, and only 12 states are currently participants; an additional four states have signed the Agreement but have yet to ratify it.[33]

The mere fact of such limited participation in the Moon Agreement should serve as a warning about attempts to regulate either commercial or military activities in space by initially adopting sweeping prohibitions that are not based on at least an initial pattern of behavior by relevant states. In addition, circumstances serve to indicate, although do not prove, that limitations imposed by the relevant provisions of the Outer Space Treaty and the Moon Agreement have curtailed efforts to develop the Moon, whether for economic or military gain. Klaus Heiss of High Frontier, for example, has argued that technological advancements should make it feasible to reap both economic and national security gains from a permanent human presence

[29]Ibid., p. 80.

[30]Ibid., pp. 81–86.

[31]Institute of Air and Space, "Policy and Legislative Options for Parliamentarians Regarding Possible Deployment of Further Military Capabilities in Outer Space," p. 5; see also M.V. Peterson, *International Regimes for the Final Frontier* (Albany, NY: State University of New York Press, 2005).

[32]For the text of the Agreement, see *United Nations Treaties and Principles on Outer Space: Text of Treaties and Principles Governing the Activities of States in the Exploration and Use of Outer Space, Adopted by the United Nations General Assembly* (New York: United Nations, 2002), pp. 27-35.

[33]U.S. Department of State response to author's query, 24 May 2006. The following states have ratified the Moon Agreement: Australia, Austria, Belgium, Chile, Kazakhstan, Mexico, Morocco, the Netherlands, Pakistan, Peru, Philippines, and Uruguay. The following states have signed the Moon Agreement but have not ratified it: France, Guatemala, India, and Romania.

on the Moon.[34] Yet attempts to develop the Moon have not been made. The current circumstances certainly suggest that the prohibitions regarding the exploitation of the Moon that are present in both the Outer Space Treaty and the Moon Agreement have been a contributing factor in the lack of a determined effort to establish a permanent human presence on the Moon. The opportunity costs derived from this lack of effort are incalculable.

The Inchoate Process: How It May Work in the Future

Past use of the inchoate process for the regulation of both broader national security and narrower military activities in space provides compelling evidence that this process can continue to work in future. The inherent flexibility and adaptability of this process mean that advances in technology, changes in the threat and other political circumstances, and changes in military requirements will not undermine its effectiveness as a tool. The same characteristics will reduce the risks to national security resulting from miscalculation or mistake in negotiating and entering into formal treaties and other international agreements.

As the United States continues to use the inchoate process to regulate military activities in space, it should observe seven guiding principles.

Establishing Clear and Determined National Policy. Precisely because an inchoate process for regulating military activities in space at the international level is informal and open-ended, it requires a clearly defined and visionary national policy toward space. Only a clear national policy can specify properly the patterns of behavior that will define the scope and content of international regulation of future military activities in space that serves the national interest. The visionary and determined leadership of President Eisenhower at the outset of the space age served to drive the inchoate process regarding the international regulation of all national security–related space activities for several decades. This is not to say, however, that all aspects of this policy will be transparent to foreign states and the public at large. President Eisenhower's policy was no less clear or determined because major portions of it were kept secret.

The pillars of this national policy should include—but should not necessarily be limited to—the following:

Adopting a maritime-based model. Past actions regarding the management of U.S. military activities in space have been more in keeping with the maritime tradition than with the application of air power. Roughly speaking, the United States has treated outer space more like the high seas than territorial airspace. It has treated satellites and other spacecraft more like naval vessels in international waters. The exception has been the treatment of celestial bodies, particularly the Moon. The maritime tradition assumes that unclaimed territories would be subject to national appropriation as a natural outgrowth of the process of exploration. Ties to the appropriated lands, both commercial and military, were maintained through the application of sea power.

the United States should seek practical control over high-value areas of the Moon

U.S. national policy regarding military activities in space should sustain and expand upon the traditions already partially established regarding the treatment of outer space and satellites and spacecraft. Regarding the military exploitation of celestial bodies, and most particularly the Moon, U.S. policy should move away from existing precedents and toward a policy more in keeping with the maritime

[34]Klaus P. Heiss, "Tapping the Wealth of the Moon," *The Journal of Social, Political and Economic Studies*, Vol. 29, No. 1 (Spring 2004).

tradition. Specifically, the United States should seek to obtain practical control over high-value areas of the Moon, although the point at which this will require changing the existing web of international agreements regarding the Moon and other celestial bodies is unclear.

Defending the homeland against attacks from and through space. The highest priority of any nation's defense policy is to protect the homeland against attack. It matters little, from the broad perspective, whether such attacks originate from across borders on land, from the sea, through the air, or through space.

Today, the greatest threat to the U.S. homeland from space is ballistic missiles. Since most types of these missiles spend significant portions of their flight times in space, the most effective defenses will likewise be deployed in space.[35] U.S. policy should direct the military to deploy effective space-based interceptors for countering ballistic missiles in flight as soon as possible.

Ensuring the survivability of space assets. The U.S. Navy's first order of business is to design, build, and deploy vessels that can operate in the maritime environment and defend themselves against attack. This means that the Navy must also maintain a fleet that is large enough for the loss of vessels to natural causes or purposeful attack not to render the Navy incapable of fulfilling its missions.

The same approach should apply to U.S. military spacecraft. They should be designed to protect themselves through both active and passive defenses. This starts with a robust capability to detect, track, and target any and all threats to their survival. U.S. policy should further direct that the fleet of spacecraft is large enough that replacements may be deployed quickly and efficiently in the event of losses.

Protecting space lines of communication. The Navy recognizes that the seas are places through which international military forces and commerce transit. Despite the fact that international waters are outside the national jurisdiction of the United States, the Navy takes it upon itself to provide the practical means to insure the security of these channels of activity by confronting states that make unjustified territorial claims or that take forceful action to interrupt peaceful transit. Space also hosts important channels of military and commercial activity. These channels are expanding in both volume and importance. U.S. policy should insure that U.S. space forces are capable of protecting these channels against attack. The task of protecting space lines of communication can start with the development of military capabilities to protect U.S. government and commercial satellites against attacks designed to curtail operations or disrupt their orbits.

Protecting rights of passage and commerce. From the outset of the space age, it has been U.S. policy to establish the right of passage through space. This policy has been largely successful. This makes space functionally equivalent to the sea regarding the exercise of these rights.

It is critical to recognize that, ultimately, these rights at sea are protected not by international agreements that proclaim them, but by the might of the U.S. Navy. International agreements proclaiming the same rights regarding space will likewise prove insufficient to protect them.[36] U.S. military power must be sufficient to counter

[35]For a detailed description of how best to counter ballistic missiles with space-based interceptors, including how to address issues related to the international regime governing military activities in space, see *Missile Defense, the Space Relationship, and the Twenty-First Century, Report of the Independent Working Group on Missile Defense* (Institute for Foreign Policy Analysis, Cambridge, Mass., and Washington, D.C., 2006).

[36]For discussion of the complex relationship between military and civilian operators in space, see Elizabeth Waldrop, "Integration of Military and Civilian Space Assets: Legal and National Security Implications, *Air Force Law Review*, Spring 2004.

any significant challenges to these rights, both by states and non-state actors.

Maintaining the ability to project power through space. Projecting U.S. power over the sea has been a key Navy task since shortly after the founding of the nation. During World War II, the German government revolutionized warfare when it demonstrated its ability to project military power through space by launching V-2 rockets. The United States and the Soviet Union came to dominate this capability during the Cold War by fielding large numbers of nuclear-armed ballistic missiles. Many nations are now following suit by fielding their own ballistic missiles.

In the future, power could well be projected through space by means other than ballistic missiles. These could include manned space planes and directed energy weapons. U.S. policy should therefore direct that the military maintain an unquestioned advantage in the means of projecting power through space. This is not to say that procuring and deploying these capabilities will be an easy task. Ultimately, it will depend on bringing the relevant technologies to maturity.

Adopt Flexible Tactics

If the inchoate process for regulating military activities in space at the international level demands a determined national policy to make it useful in furthering the national interest, it also requires flexible tactics. The chief advantage in the process's informality is that it will not result in the establishment of international rules that redound to the nation's disadvantage following the occurrence of unforeseen events.

Therefore, U.S. policy should not allow the appearance of inconsistency to prevent it from adopting new and different approaches to maintaining its military advantage in space. For example, a U.S. technological breakthrough on a flexible and cost-effective means for removing space debris may allow an approach to protecting space lines of communication that emphasizes mitigation over prevention. Indeed, responding to such developments should be seen as a natural part of the establishment of a pattern of behavior that will form a sturdy basis for the international regulation of military activities in space. It is in keeping with the common-law tradition in the domestic setting.

Recognize the Preeminence of State Sovereignty as the Core of the Inchoate Process

A rational process for regulating military activities in space at the international level must be based on recognition of the preeminence of state sovereignty. The system of state sovereignty is under attack from forces below and above; it needs to be defended.[37] The forces that are attacking state sovereignty from below are those of civil conflict and chaos and are not relevant to the issue of regulating military activities in space. On the other hand, the forces attacking state sovereignty from above are quite relevant.

U.S. policy should direct the military to maintain an unquestioned advantage in projecting power through space

Leaders of the United Nations Secretariat and UN-related organizations are demonstrating an ambition to override state sovereignty by arrogating to them the power to arbitrate disputes between states.[38] The inchoate process is ideally

[37]For forceful arguments in favor of shoring up the state system, see Jeremy A. Rabkin, *The Case for Sovereignty: Why the World Should Welcome American Independence* (Washington, D.C.: AEI Press, 2004), and George P. Shultz, "A Changed World," The Henry A. Kissinger Lecture at the Library of Congress, 11 February 2004, as transcribed by the Foreign Policy Research Institute.

[38]The mandatory dispute settlement procedures under the 1982 United Nations Convention on the Law of the Sea are prime examples of this arrogation of power. This example is particularly relevant to the issue of the international

suited to thwarting this arrogation of power because it is largely incompatible with the creation of international organizations that have every incentive to expand their authority. Under no circumstances should the United States enter into a treaty or other international agreement that gives an international organization the authority to arbitrate disputes between participating states regarding military activities in space. At most, the powers of such international organizations should extend only to mediating such disputes.

Account for the Presence of Private Assets in Space

Clearly, space is not the exclusive domain of governments. Private entities have an extensive presence in space as well. The inchoate process for regulating military activities in space provides sufficient flexibility to allow national authorities, and most specifically military authorities, to establish responsibilities for defending privately held assets in space. Ultimately, it is the private sector's use of space that will generate wealth and prosperity.

The proper role of national militaries in defending the space-based assets of private citizens is not entirely clear at this time. In the case of the United States, the military has not focused as much attention on defending the privately held space assets of U.S. citizens or corporations as it has on defending government assets that will provide direct support to space-related and other military operations.[39] This is not solely an issue of national policy. The responsibilities the U.S. military assumes in this area are likely to set the standard for other nations. The inchoate process for regulating these activities at the international level will allow national militaries to establish the pattern of behavior that can win broad understanding and support.

Recognize that Intelligence Activities in Space are Becoming Less Dominant

At the outset of the space age, intelligence activities dominated military activities in space. The inchoate process was particularly suited to this circumstance because much of this intelligence activity was presumed to be "extra legal" and beyond the reach of formal diplomacy.[40] Clearly, the dominance of intelligence activities in space is ebbing, and the direct military uses of space are coming to the fore. Nevertheless, the inchoate process for the international regulation of national security and military activities in space can continue to be effective even though more open military activities in space are becoming the more powerful driver.

Given the more open nature of presumably legal military activities, however, the pressure to adopt formal regulations at the international level will grow. On balance, giving in to this pressure will be unwise. The U.S. military, although in a somewhat different manner, will be able to take advantage of the flexibility inherent in the inchoate process, as the intelligence community has to date. This is not an argument in favor of the military adopting methods more in keeping with the intelligence community, but to recognize that the inherent flexibility in the inchoate process will provide the military wider opportunities to adapt to technological advances and international political developments in space.

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regulation of military activities in space because these dispute settlement procedures could be used to curtail U.S. Navy operations. See Baker Spring, "The United Nations Convention on the Law of the Sea," testimony before the House Committee on International Relations, 12 May 2004.

[39]For example, the military's *Joint Doctrine for Space Operations* hardly mentions the military's role in defending the interests and assets of private U.S. citizens operating in space. See Joint Chiefs of Staff, *Joint Doctrine for Space Operations*, Joint Publication 3-14, 9 August 2002.

[40]R. Cargill Hall, "National Space Policy and the U.S. Military Space Program," p. 2; and Gerald M. Steinberg, *Satellite Reconnaissance: The Role of Informal Bargaining* (New York: Praeger Publishers, 1983).

Focus on Facilitating the Conduct of Military Space Activities, Not Limiting Them

A key advantage of the inchoate process for regulating military activities in space is that it affords the U.S. military greater freedom of action. Many, however, view the process of regulating military activities in space predominantly as an arms control exercise.[41] Arms control is designed to deprive national militaries of their freedom of action. On the other hand, not all international regulations, particularly those that are informal and observed as a matter of practice, limit freedom of action. For example, international regulation that establishes rights of passage will increase the military's freedom of action. Such regulations, generally speaking, are not products of an arms control process.

While space arms control can have a role in the international regulatory process, it should be pursued cautiously and applied narrowly. Generally speaking, the United States should be conscious of two things regarding space arms control: First, competitor states, recognizing the U.S. lead in military space capabilities, will attempt to use arms control to buy time and ultimately to catch up with the United States; and, second, a space arms control agreement will serve the national interest if it effectively blocks an unwelcome advancement by a competitor state while not denying the U.S. military a valuable capability.

From this perspective, a nonproliferation approach to space arms control is likely to be superior to comprehensive bans on certain weapons or systems. An effective nonproliferation policy, for example, could result in an approach that encourages states to abandon programs for deploying their own space systems in exchange for select services provided by U.S. systems. The access to such services would be curtailed if the services were used for inappropriate purposes. Such a nonproliferation policy does not necessarily require formal treaties or agreements.

Consider that Space is Already "Weaponized"

Certain arms control advocates argue that if the United States takes certain steps, such as deploying space-based missile defense interceptors or anti-satellite weapons, it will be the first to weaponize space. This argument is based on the assumption that space is not now weaponized.[42] Inconvenient for the proponents of this view is the fact that space was weaponized at the time the Germans launched the first V-2 rocket during World War II. The clever use of definitions, such as one that excludes ballistic missiles, is designed to make it appear that the United States will be acting in a provocative way if it takes these steps.

competitor states, recognizing the U.S. lead in military space capabilities, will attempt to use arms control to buy time

This line of reasoning is flawed. For example, it would assert that for the United States to defend its territory against a missile attack that has already been launched if the defensive interceptors are located in space is somehow provocative. By this logic, the initial launch of the missile attack by a U.S. enemy is not provocative. The space-based defensive response is defined as unacceptably provocative. U.S. civilian and military leaders, under certain circumstances, must be prepared to explain to the public that the steps they are taking regarding military activities in space are reasonable and entirely in keeping with similar military actions in other contexts,

[41] Michael Krepon, *Space Assurance or Space Dominance?*

[42] Jeffrey Lewis, "What If Space Were Weaponized? Possible Consequences for Crisis Scenarios," Center for Defense Information, 5 August 2004.

such as operations on land, at sea, and in the air. Otherwise, these leaders must be prepared to explain to the public, in the wake of an attack, why they did not utilize all available measures to defend the nation.

The Inchoate Process and the Path Ahead

The drive to regulate military activities in space at the international level is nothing new, and those concerned about strengthening U.S. military capabilities in space need not necessarily resist the effort in all instances. The key to whether specific international regulatory efforts contribute to or undermine the relative military advantage of the United States in space will depend on how and to what end these efforts are undertaken.

The United States has little to fear from an international regulatory process that is inchoate. From a position of strength, the U.S. military can use this process to establish patterns of behavior that largely accommodate its mission requirements. On the other hand, the military has much to fear from formal agreements that include sweeping provisions.

On the positive side, the U.S. military is likely to find that certain international regulatory measures actually enhance its ability to achieve its aims. Achieving positive outcomes depends on the U.S. military's understanding clearly what it aims to achieve in space and acting deliberately in achieving those aims. In most instances, and perhaps in spite of vocal opposition, other states are likely to accept those actions as a new standard of behavior governing the actions of all militaries in space. In the end, the U.S. military may find that the inchoate process for regulating military activities in space will help it to attain an as yet unrealized capability of mastering space.

ESTABLISHING SPACE SECURITY: A PRESCRIPTION FOR A RULES-BASED APPROACH

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The question of what constitutes the proper military uses of space is not just a debate over space weapons and attacks on satellites. It is a debate that sheds light on the fundamental decisions that states and their citizens will have to make over the next century as we both explore and exploit space for its scientific, strategic, and economic value. Furthermore, the context of this debate changes year to year as the physical and political environment of space changes.

Complicating the debate is the fact that while prescriptions for response to the changing space environment differ, the goal for most of those involved is the same: maintaining reliable access and use of space for all peaceful actors – including militaries. Arguments surrounding space weapons or treaties normally do a great disservice to the fact that most of the participants in these debates agree on more things then they perhaps realize.

Before attempting to lay out what we believe to be the most reliable and stable U.S. strategy for reaching this goal, it is important to review some of the basic facts that provide a backdrop to this debate.

The Space Environment

The specter of space warfare currently is not the main threat to global space assets. Today, the main culprit is space itself. Rather than a benign haven, space is a hazardous place fraught with potential dangers to fragile satellites and spacecraft.

Satellites orbiting Earth have to contend with a variety of natural dangers on almost a daily basis. Significant hazards that can disable or damage satellites include solar radiation, geomagnetic storms, and ionization. Satellite operators have to monitor continually the effect of the space environment on the upper reaches of the atmosphere, which can expand and drag down Low-Earth Orbit (LEO) satellites.

Further, as more and more states and commercial users seek to exploit the advantages provided by space systems for both economic gain and military applications; usable near-Earth space is beginning to become crowded. With the increase in the number of states owning and operating satellites from two – the United States and the Soviet Union – during the Cold War to 41 today (a number that is growing),[1] the potential for interference, collisions, tensions, and competition is increasing. There are some 813 known working satellites on orbit, with about a dozen states able to launch their own satellites.[2] The

[1] Union of Concerned Scientists, "Satellite Data Base" Theresa Hitchens, "International Satellite Innovation and Cooperation," presentation to Military Satellites 2006, Washington, D.C., 18 April 2006, CDI Military Satellites 2006.

[2] Ibid.

Space and Defense, Fall 2006, pp. 15-28.
Center for Space and Defense Studies
Department of Political Science, US Air Force Academy

growing population of satellites and satellite operators – including commercial actors not responsible to any one government – could lead to increasing conflict over access to desired orbital slots, radio frequency interference, and liability for malfunctions or collisions that damage other satellites. Already, several states have made decisions about uses of radio frequency spectrum and satellite launches that have resulted in spats with other spacefaring countries – and in some worrying cases, states have questioned the legitimacy of the voluntary International Telecommunications Union (ITU) process for parceling out spectrum usage and orbital slots for communications satellites.[3] Another complicating factor could be the emergence of a true space tourism industry, which would raise new issues for deconflicting launches and tracking space objects.

The proliferation of satellite technology is not only horizontal but also vertical – meaning that the level of technological sophistication among space actors is growing, with more and more states acquiring capabilities such as high-resolution imagery, high-speed, broadband satellite communications and low-cost, highly maneuverable microsatellites.[4] This dual-pronged proliferation of satellite technology has subsequently resulted in more states applying space capabilities to the military sphere, possibly leading to increased suspicion and tension among spacefaring powers. In particular, U.S. defense officials have expressed concern about possible threats to U.S. space systems, as well as the growing need to prevent potential adversaries from deriving military benefit from space systems in times of conflict. In addition, with a number of spacefaring powers now discussing schemes for conducting manned research on the Moon, asteroids or other planets, the potential for disputes about access to planetary resources is again emerging as an issue of discussion and debate among experts.

proliferation of satellite technology is not only horizontal but also vertical

But it is widely agreed that the greatest "environmental" threat currently facing space operations is orbital debris. U.S. Air Force Space Command currently tracks over 9,400[5] manmade space objects routinely, and has detected some 4,500 more that cannot yet be positively identified or routinely tracked.[6] The objects that can be tracked reliably by the Space Surveillance Network's 30-odd radars and optical facilities range in size from large satellites down to objects ten centimeters in diameter.[7] Even more threatening is the amount of smaller-sized debris that cannot be seen, or can only be detected momentarily. Nuts, bolts, paint flecks, and frozen droplets of un-burned rocket fuel all whiz around the Earth at speeds approaching seven to eight kilometers per second. At these speeds (and at greater relative speeds), debris impacts have the effect of liquefying metal and causing catastrophic failure of satellites.[8] For example, on 29 March 2006, the Russian Ekspress AM11 communications satellite stopped operating; the cause was determined as a hypervelocity debris

[3]Indonesia, China, the United Kingdom, and Russia are among those countries who have been involved in disputes over orbital slots; for an overview of the ITU process and challenges to the regime see, Theresa Hitchens, *Future Security in Space: Charting a Cooperative Course*, (Washington D.C.: Center for Defense Information, September 2004), pp. 39-50.

[4]Hitchens, "International Satellite Innovation and Cooperation."

[5]NASA, *Orbital Debris Quarterly News*, Sara Portman, ed, Volume 10, Issue 1, January 2006, p. 7. See also U.S. Strategic Command (STRATCOM) Fact Sheet, Space Control:Reentry Assessment and Space Surveillance (last updated March 2004) Offutt Air Force Base, Neb.: U.S. Strategic Command Public Affairs Office.

[6]Author email exchange with a NASA official.

[7]STRATCOM Fact Sheet, "Space Control: Reentry Assessment and Space Surveillance."

[8]For more on laboratory testing of hypervelocity impacts see NASA Orbital Debris Program Office.

impact.[9] Such impacts, particularly in Geosynchronous Orbit (GEO) where the satellite (and most other large communications satellites) was stationed, are rare; National Aeronautics and Space Administration (NASA) computer models predict only about ten catastrophic collisions over the next 200 years.[10] But according to a recent study by NASA debris experts J.C. Liou and Nicholas Johnson, even without any new launches, the debris population will increase in the coming centuries.[11] "In reality the situation will undoubtedly be worse, because spacecraft and their orbital stages will continue to be launched," Johnson said.[12]

The U.S. Air Force understands the danger of debris generation and the unintentional negative consequences that debris can have. Deputy Under Secretary of the Air Force Gary Payton recently spoke out against debris generating anti-satellite weapons, stating, "We'd be fools to actually get into the kinetic energy anti-satellite business. It would be hugely disadvantageous for the U.S. to get into that game."[13] Nonetheless, there remain those in the U.S. national security community promoting the use of debris-creating kinetic energy anti-satellite (ASAT) weapons and space-based kinetic energy interceptors for attacking ballistic missiles, as well as weapons based in space that in and of themselves, by virtue of their on-board fuel and desirability as targets, would present a debris hazard.

[9] *SpaceDaily.com*, "Russian Satellite Failure Caused by Space Garbage," 17 April 2006, accessed from Russian Satellite Failure Caused by Space Garbage.

[10] Mike Toner, "Final Frontier Littered with Junk," *Cox News Service*, 27 February 2006.

[11] J.C. Liou and N.L. Johnson, "Risks in Space From Orbiting Debris," *Science*, Vol. 311, 22 January 2006.

[12] Toner, "Final Frontier Junk."

[13] Jeremy Singer, "USAF Interest in Lasers Triggers Concerns About Anti-Satellite Weapons," *Space News*, 1 May 2006.

The Way Forward

The above facts about the current "state of space" leave U.S. decision makers with a weighty dilemma: how best to guarantee reliable access and use of space for all peaceful actors, including the U.S. military, while at the same time preventing dangerous and destabilizing behaviors in space or conflicts that threaten space assets.

Some believe that the deployment of ASATs and space weapons now, before there is a recognized or developed threat, would serve to dissuade any use of force against potential U.S. targets in space, as well as improve ground-strike capabilities. Others believe that space is an inherent sanctuary and that the proper response is a pre-emptive arms control treaty, barring all weapons, not just weapons of mass destruction,[14] from space. In our view, the best approach to ensuring future security in space can be found somewhere in the middle of this spectrum. Establishing good practices by all actors, based on solid behavioral norms and the rule of law, are at the heart of the approach laid out below.

If space is a sanctuary, this is due to political will as well as technological and economic limitations. During the Cold War, the United States and the Soviet Union – after testing, and in some cases temporarily deploying, space weapons – realized the intricate linkage between space assets and nuclear forces and the inherent dangers of deeming satellites legitimate physical targets. The primary issue was one of stability: with space assets (i.e. spy satellites) serving as key strategic nuclear warning systems, any actions that were perceived by either side to threaten their secure functioning could have dire consequences, including accidental nuclear war.

[14] The Outer Space Treaty of 1967 banned the stationing of weapons of mass destruction in orbit. While there is some debate as to whether the "peaceful purposes" dictum of the OST bans the use of other types of weapons in space, it is generally accepted that stationing or use of conventional weapons in space is not proscribed.

Thus, neither side moved to deploy permanently either anti-satellite weapons or weapons based on orbit. While the Cold War is over, the dynamics of the space-nuclear stability equation have changed little – with the only issue being the emergence of new space and nuclear weapons players who arguably have tense and inherently less stable relations among each other than did the United States and Soviet Union.

In addition, although access to space is growing, it always has been and remains today a very expensive place to operate and satellites are high-cost, high-value assets, meaning that cost considerations are always at the forefront in weighing national security tradeoffs. A risky security environment for satellites would inevitably raise costs for all space actors.

The fact of the matter is that space as it relates to national security cannot be treated the same as the Navy treats the sea or the Air Force treats the sky. It is physically different, and the concepts of dominance and superiority have fundamentally different meanings and connotations in space. The laws of physics and the globalization of space access dictate that no one nation, one person or one entity can "own" space; and, more importantly, means that the actions of any one actor in space cannot fail to have direct repercussions upon the space-based assets of others. The physical and cost environments of space described above alter the threat perceptions of states and create a large gap between policy, capability, and political will. By this, we mean that policies that call for space weapons cannot, by themselves, remove the technological roadblocks to develop those weapons, nor can they necessarily create the political and diplomatic impetus to actually pay for or use them. Even if such weapons are technically, economically and politically feasible, the use of anti-satellite or space-based weapons are likely to cause more harm than good to the future access to and use of space across the board, especially if the weapon is debris-generating or if it can easily be countered with a low-cost debris-generating weapon.

Debris-generating weapons, in particular, present a lose-lose situation, as Payton outlined above. Further, there is a danger that the advent within the U.S. military of dedicated ASAT weapons using temporary and reversible means, while directly avoiding the debris problems of kinetic or high-powered directed energy weapons and certainly preferable to such destructive weapons, could lead other states to choose less advanced, cheaper means to counter U.S. technological superiority. Much as we see in Iraq with relatively low-cost improvised explosive device (IEDs), the rules of warfare will be hard to dictate in space, as they are on the ground.

space cannot be treated the same way the Navy treats the sea or the Air Force treats the sky

Moreover, because space is a global commons and most satellites are used for civil or commercial activities, warfare in space would be certain to debilitate its use for near- and mid-term economic and scientific development. The rise of tensions and the threat of warfare would undercut future cooperation on space exploration, and thus hamper long-term scientific development that would benefit future generations.

For all of these reasons, we hold that a space war fighting strategy based on dedicated ASATs and space-based weapons would undercut, rather than enhance, U.S. national security and global security in space. Present U.S. policy and strategy should instead be focused on establishing good practices and the rule of law in space in order to foster a stable basis for interaction among space actors.

Unfortunately, as fears about the security of space assets grow, several states – led by the United States but also including China, India, and Israel

– are debating the need to both protect their space assets and prepare for space war by building capabilities to disrupt or destroy the space assets of potential enemies. This insecurity is in itself dangerous because it threatens to lead to a vicious circle whereby one nation reacts to "defend" against a perceived threat, leading a second nation to feel threatened by the first's defensive actions and take its own "defensive" actions that further escalate the tensions – or even create tensions that were not present in the first place.

At the same time, we cannot ignore that U.S. space assets – including its important military assets – are vulnerable, and may be subject to future threats. This is a serious issue and one that requires a coherent effort to address. A strategy to protect global space access and keep space free from warfare does not, and should not, require the United States to accept victimization and be left defenseless. There are common sense steps that leadership in the United States can take to ensure the safety and security of its space assets. Furthermore, there are steps that the United States can take in concert with its political and economic partners to increase all states confidence in secure and peaceful access to space.

debris as small as one centimeter in diameter can cause catastrophic damage to a satellite

Improve Space Surveillance and Tracking

One of the immediate, and most important, ways that space security can be improved would be through an improved, better-structured system for space surveillance and tracking. "Seeing" what is going on in space is critical for detecting and monitoring space debris, as well as for following satellites and spacecraft in order to predict and avoid potential collisions. It is also important for diagnosing satellite failures, and for detecting and monitoring potential deliberate threats against space assets. Effective space surveillance would also be the underpinning for the development of an international space traffic management regime (discussed below). Finally, space surveillance and tracking provides an essential element in any effort to build confidence and dampen threat perceptions by increasing transparency among actors.

Unfortunately, surveillance and tracking capabilities currently are not sufficient. There are technical limitations that require concerted efforts to overcome. Finding and reliably tracking space objects, especially debris, remains a major challenge, requiring a network of radar and optical sensors and complex computer modeling capabilities to project orbital trajectories. Neither of the world's two major space surveillance networks, the U.S. Space Surveillance Network (SSN) and the Russian Space Surveillance System (SSS) can reliably track debris smaller than ten centimeters in diameter (the size of a baseball) in LEO, even though debris as small as one centimeter in diameter can cause catastrophic damage to a satellite. Further, neither system can reliably detect or track objects smaller than about one meter in diameter in the critical GEO where most of the world's communications satellites are stationed. Neither the SSN nor the SSS is able to track space objects in real time, as this would require much larger numbers of sensors. Finally, as an artifact of the Cold War, neither the U.S. nor Russian network provides good coverage of near-Earth space in the Southern Hemisphere since each network was optimized to focus on the other side's space systems.[15]

Process issues for sharing space launch and space surveillance data also are becoming a question as more space actors emerge. Only the United States routinely shares space surveillance data with other space actors, and that process has become more complicated due to increased concern in the United States about the security of

[15]Hitchens, "Future Security in Space," p. 31.

its own space assets. While the international space industry has informal protocols for communications about the launch, subsequent whereabouts and health of commercial satellites, there is not a routine, codified process for data and information sharing in existence. Current international instruments for registering satellite launch and radio frequency/orbital slot allocations – maintained by the United Nations (UN) and the International Telecommunications Union (ITU) respectively – are poorly complied with and inadequate.

Further, the fact that the U.S. Air Force's SSN has a de facto monopoly on surveillance and tracking data unfortunately is perceived by a number of space actors outside the United States as a potential problem. There are emerging fears, including among U.S. allies and friends, that a U.S. decision to refuse to provide data could impinge on other state's ability to access space; or that data provided by the U.S. may not be reliable, as was the case with U.S. intelligence provided to the international community in the run up to the American invasion of Iraq. While we are not making a value judgment on the validity of such fears, the fact that such perceptions exist is, in and of itself, a worrisome development with regard to the growing level of tension among space actors.

Thus, as critical first steps towards both protecting U.S. space assets and for ensuring future access to space for all, the United States should take a leadership role in addressing space surveillance needs. This should include technical research and development to improve the capabilities of the SSN, particularly with regard to detecting and tracking smaller sized space debris and gaining more clarity about the environment in GEO. Fortunately, the U.S. Air Force has made space surveillance – and what the service dubs "space situational awareness," a term that includes satellite monitoring and diagnostics – a high priority. For example, the service is working to improve its network of ground-based telescopes to enhance images digitally and make it easier to combine the images obtained with other sources to create more detailed pictures.[16] Unfortunately, several other key programs are in trouble. The Space Based Space Surveillance (SBSS) system – expected to comprise four or five satellites carrying optical sensors for tracking objects in LEO and designed to augment the ground-based network which cannot see through cloud cover – is behind schedule and the single space surveillance satellite it is supposed to replace is likely to reach the end of its life before the first satellite of the new system can be launched.[17] Another satellite effort, called the Orbital Deep Space Imager and designed to detect and track objects in GEO, was canceled by the Air Force in early 2006.[18] The Air Force should redouble efforts – and the Congress should support those efforts – to speed SBSS and retarget funding to the Orbital Deep Space Imager as soon as possible, among other efforts to robustly fund required updates to the SSN.

With regard to data sharing, the U.S. Department of Defense (DOD) should move more rapidly to set clear processes and guidelines for its new Space-Track program for disseminating orbital data to other states, commercial users and researchers. Interim guidelines have been put forward, but it remains unclear how the system may work in future. In addition, DOD should reverse its policies aimed at applying restrictions on how approved users publish and redistribute the data and analyses based on the data. Currently, researchers must have written permission from the Office of the Secretary of Defense to pass on or publish data gathered through Space-Track, including basic data such as the number of debris in the current SSN catalog. The basic orbital elements of any space object –

[16]John A. Tirpak, "Securing the Space Arena," *Air Force Magazine Online*, Vol. 87, No. 7, July 2004.
[17]Jeremy Singer, "Air Force Plans SBSS Studies," *Space News*, 27 February 2006.
[18]Ibid.

that in the past were published by NASA free to anyone who wanted to view them – are of next to no use to those who might wish to target satellites; further a determined attacker could find ways to do so without access to that data.[19]

U.S. government and DOD officials should also be encouraging other states to build capacity, particularly in the area of sensors and collision avoidance models. Although there is naturally some concern on the part of the intelligence and military space community about improved capabilities on the part of non-U.S. actors leading to potential threats to U.S. satellites, there also could be some value to additional, complementary space surveillance assets. For one thing, non-U.S. data could be used to verify findings by the SSN – something that in a crisis situation could be very helpful politically. Several European countries currently operate radar and telescope facilities that are used, on an occasional basis, to detect and track debris. Indeed, the European Union and the European Space Agency are contemplating a program to link current European assets into a unified network that could function independently of the U.S. SSN. The United States should work with its European allies to encourage such a program, but at the same time urge the Europeans to craft a network that would fill current gaps in the SSN and that would function at least partially in tandem with it. This would require that the U.S. space surveillance community move away from its cultural proclivity toward excess secrecy; and that the Europeans suppress any knee-jerk anti-American reaction to the idea of complementarities. But there is no reason that space surveillance data provided by overlapping, but separate networks, could not be produced in a fashion that would protect necessary secrecy regarding national capabilities but at the same time allow wide sharing of basic, critical data.[20]

the United States should resurrect its moribund process for pre-launch and post-launch notification

Finally, the U.S. government should work with the commercial satellite industry – and the international community – to establish clear processes for industry-to-industry communications, and to build and support a more robust system for registering satellite operations data. For example, immediate efforts should be undertaken to improve (and improve compliance with) the UN Satellite Registry, including requiring registrants to report when an object has moved from its initial insertion orbit, becomes dysfunctional or its orbit begins to decay. In addition, the United States should resurrect, on a multinational basis starting with those states capable of space launch, its moribund bilateral effort with Russia to develop a process for pre-launch and post-launch notification. The U.S.-Russia agreements were primarily aimed at providing transparency about ballistic missile launch, but were quite detailed and the data exchange proposed would be inherently applicable to space launch and the prevention of interference or collision.[21]

[19]Theresa Hitchens "Safeguarding Space: Building Cooperative Norms to Dampen Negative Trends," *Disarmament Diplomacy*, No. 81, Winter 2005, p. 59.

[20]Theresa Hitchens, "The Next Galileo Flap? EU Space Surveillance Move Provides Opportunities, Challenges, for U.S.," *Space News*, 16 May 2005.

[21]For more information regarding the June 2000 U.S.-Russian Joint Data Exchange Center and the subsequent December 2000 U.S.-Russian Pre- and Post-Launch Notification Agreement, see: Lt. Col. Peter L. Hays, USAF, United States Military Space: Into the Twenty-First Century, INSS Occasional Paper 42, USAF Academy, Colo.: Institute for National Security Studies, September 2002, p. 96,; and U.S. Department of State Fact Sheet, "Memorandum of Understanding on Notification of Missile Launches," 16 December 2000.

Redundancy and Protection

Multiple reports have pointed to the vulnerabilities that stem from the United States' increased dependency on space assets for military operations, homeland security, and economic prosperity. These include the 2001 "Report of the Commission to Assess United States National Security Space Management and Organization," chaired by Donald Rumsfeld prior to his appointment as U.S. defense secretary, and known as the Space Commission Report. The report famously warned of the potential of a "Pearl Harbor" in space, and stated: "[The] present extent of U.S. dependence on space, the rapid pace at which this dependence is increasing and the vulnerabilities it creates all demand that U.S. national security space interests be recognized as a top national security priority."[22] It is true that U.S. satellite systems have both inherent, and unfortunately sometimes engineered, vulnerabilities – both with regard to the basic space environment and to potential deliberate attacks. The prescription for resolving this situation is the development and implementation of a coherent strategy for both protection of space systems – including their terrestrial nodes – as well as for providing redundant capabilities both in space and terrestrially.

On this front, there already has been slow progress. In recent years, DOD officials have been particularly worried about the vulnerabilities of commercial satellites, given that the military is heavily reliant on commercial providers for its own communications needs – especially in wartime, when some 65-80 percent of military communications is carried over commercial bandwidth.[23] A February 2004 report by a special Satellite Task Force of the President's National Security Telecommunications Advisory Committee (NSTAC) highlighted commercial satellite vulnerabilities, including the lack of encrypted uplinks and downlinks.[24] DOD subsequently launched a sustained effort to work with the CEOs of major commercial providers to come up with criteria and commercial best practices to address security concerns and establish reporting processes for problems.[25] This effort should continue to receive priority U.S. government attention, and be expanded to include working with U.S. allies and friends. Not only are many commercial satellite providers multinational companies, but also allied satellite capabilities are crucial to joint operations in times of crisis and war. In addition, in Europe there is an increasing awareness of the importance of satellite services to security and to European militaries – an awareness that should help provide a foundation for any U.S.-led efforts to build processes that would underpin mutual security interests.

The use of redundant systems and subsystems, terrestrial back-up links, unmanned aerial vehicles (UAV), high altitude airships, and on-orbit spares can help to alleviate single point failures and also provide needed emergency assets. Again, the U.S. Air Force in particular has recognized the potential value of non-space systems for providing space-like capabilities and is actively pursuing UAVs and high-altitude solutions.[26] Initiatives such as the Operationally Responsive Space (ORS) program,[27] designed to

[22] Report to Assess United States National Security Space Management and Organization, 11 January 2001, (hereafter, Space Commission Report), p. ix.

[23] Richard H. Buenneke, "Commercial Satellite Communications: Supporting Defense Transformation." .

[24] The President's National Security Telecommunications Advisory Committee, Satellite Task Force Report, Fact Sheet, February 2004; author conversations with several government and industry officials involved.

[25] Buenneke, p. 9

[26] Jeffrey Lewis, "It's a Bird, It's a Plance, It's a....Stratelite?" *Defensetech.org*, 18 December 2004; "Lockheed Wins $149.2M Contract for High Altitude Airship (updated)," *Defense Industry Daily*, 16 January 2006,.

[27] For an overview of the concept of ORS and some of the difficulties that planners and engineers are encountering

ensure rapid access to space and reconstitution of lost satellites, and the advent of microsatellites that can be networked to provide the same functionality as one large satellite, also could be used to help to alleviate these failure points – as well as provide a revolutionary improvement in satellite costs and capabilities. However, it should be stated that both ORS systems and microsatellites could also be weaponized, and the perception that such technologies are being developed for offensive or destructive purposes must be balanced by responsible rules for their use (see below). That said, more priority – and funding – should be placed on finding ways to prevent satellite capabilities from becoming single point failures for the U.S. military and national security community.

both Operationally Responsive Space systems and microsatellites could be weaponized

Civilian Cooperation

Many of the tensions during the Cold War were dampened to some degree by civilian space cooperation between the Soviet Union and the United States. The transparency gained by both sides and the subtle shifting in perceptions that came in the wake of Apollo-Soyuz also cannot be discounted. But joint missions such as Apollo-Soyuz provided not just the political appearance of cooperation; they also laid the groundwork for substantive Russian-U.S. cooperation in space today. Without cooperation during the Cold War, and smart engagement with Moscow immediately after the fall of the Soviet Union, the United States would most likely lack access to the International Space Station in light of the current state of the Space Shuttle fleet.

Today, while there is no "cold warrior" competitor to the United States, civilian cooperation with states such has China would give each nation an opportunity to gauge each other's plans in space. Many in the U.S. government understand the benefits of cooperation, including from a strategic and intelligence context. Recent discussions of cooperation with China on space endeavors, including the visit to China by NASA administrator Michael Griffin, are positive steps in building economic and strategic confidence between the two states at a time when the two militaries seem to be on a collision course with regard to space.

However, there are still major barriers to international cooperation – not only with China – that one day may lead to conflict. Current export regulations, such as the International Traffic in Arms Regulation (ITAR), while designed to ensure that select technologies do not reach the hands of those wishing to attack U.S. targets, also has the unintended consequence of limiting the amount of beneficial cooperation that can occur between states in the space arena. ITAR not only restricts cooperation between the United States and China, but between the United States and its allies as well as U.S. companies and any foreign entity. These export restrictions do not just limit the amount of business that can be done between states; they have also been identified as contributing causes to the failure of missions. For example, following the recent failed NASA DART (Demonstration of Autonomous Rendezvous Technology) mission designed to test automatic maneuvering in space, the mishap investigation board pointed to ITAR regulations that created "perceived restrictions" in what NASA engineers could discuss with the foreign designers of a main component that was found to be a root cause of the malfunction.[28]

International cooperation between non-U.S. companies is still proceeding but at a glacial pace. The United States would be wise to re-evaluate if

see Jeremy Singer, "Responsive Space," *Air Force Magazine*, Vol. 89, No. 3, March 2006,.

[28]NASA, "Overview of the DART Mishap Investigation Results," 15 May 2006, The full report itself was not released due to ITAR concerns.

ITAR regulations governing space activities, particularly commercial and civil activities, are still in the best interest of U.S. companies and international security, especially if those regulations prevent cooperation that can lead to valuable confidence building measures. The measures in train to find ways to cooperate with China, while protecting genuine national security concerns, also must be continued, prioritized, and supported by Congress and across the U.S. space community.

Code of Conduct

The 2001 Space Commission Report also contained an important, but oft-overlooked recommendation:

> The U.S. will require…engaging U.S. allies and friends, and the international community, in a sustained effort to fashion appropriate "rules of the road" for space.[29]

Rules of the road, or codes of conduct, are not new to the military sphere. They are tried and tested ways to shape behaviors and avoid dangerous misunderstandings and conflicts. Perhaps the most successful and famous set of rules of the road is the 1972 Incidents at Sea Agreement (IncSea), signed between U.S. Secretary of the Navy John Warner and his Soviet counterpart. Thirty other navies signed subsequent agreements.[30] Today, the administration of President George W. Bush and the U.S. Armed Forces champion a number of executive-level codes of conduct designed to fight proliferation of dangerous materials necessary for the construction of weapons of mass destruction (e.g. – the Proliferation Security Initiative and the International Atomic Energy Agency Code of Conduct on the Safety and Security of Radioactive Sources).

A code of conduct for space would not have to be negotiated in a multinational forum like a treaty, nor would it need to be subject to ratification in the U.S. Senate. A sustained effort on the part of the United States would only require finding another state, or states, willing to agree upon appropriate rules. It could even be argued that if the United States unilaterally declared that it would follow certain rules in space, other states would join, based on U.S. space leadership. However, due to the current political context, an international effort, even if limited to a select number of countries, would be preferable to a unilateral declaration.

Key elements of a code of conduct for responsible spacefaring states would include debris mitigation, traffic management, and the preannouncement of dangerous maneuvers such as close passes or docking.

Debris Mitigation

The United States has been a leader in the arena of space debris mitigation, fully supporting and promoting international efforts to develop a voluntary set of guidelines for space operators. In 2002, the Inter-Agency Space Debris Coordinating Committee (IADC), comprising the space agencies of China, France, Germany, India, Italy, Japan, Russia, Ukraine, the United Kingdom and the United States, plus the European Space Agency (ESA), issued a set of technical guidelines for debris mitigation. Those proposed guidelines were submitted to the UN Committee on the Peaceful Uses of Outer Space (COPUOS) for consideration by member states. After several years of political jockeying, a less technically specific version of the IADC guidelines were crafted by a working group in June 2005 and accepted by COPUOS's Scientific and Technical Subcommittee at the organization's March 2006 meeting.[31] The voluntary guidelines,

[29]Space Commission Report, p. 18.

[30]Michael Krepon, "Ground Rules for Space," *Bulletin of the Atomic Scientists*, May/June 2005, p. 68.

[31]United Nations Press Release, "Outer Space Scientific and Technical Committee Concludes 43rd Session in Vienna," UNIS/OS/329, March 8, 2006; author

which include a provision pledging signatories to avoid the intentional destruction of space objects that would create long-lived debris,[32] are now being reviewed by individual national governments and are expected to be finally approved in 2007.[33] Not only should the United States accept these guidelines, but it should also continue to push for more progress in the international arena. One effort that the United States could lead would be military-to-military discussions among spacefaring states aimed at pledging to uphold strictly the mitigation guidelines including during weapons tests. In addition, the United States should work with other spacefaring states to establish, based on the voluntary guidelines, legal structures that could reinforce compliance with best debris practices at the international level – so as to create a level playing field for industry and at the same time avoid backsliding, particularly by those states seeking entry to the international market by offering cheap launch and satellite services to the detriment of voluntary rules which are perceived to increase near-term costs. For example, a working group at COPUOS's legal subcommittee should be stood up to explore how the Liability Convention could be used, or amended, to enforce strictures against debris creation. In the meantime, debris mitigation guidelines would be easily absorbed into a space code of conduct.

Traffic Management

Space traffic management is also an arena where there is slow progress toward creating rules-based processes that could help avoid interference, collision, and conflict in space. Since 2001, U.S. and international industry and scientific organizations have been examining the issues involved with coordinating space launch and on-orbit operations – many of which overlap with the discussions regarding debris mitigation. One of the first major reports on the subject was issued in 2001, following a series of workshops held by the American Institute of Aeronautics and Astronautics, called "Addressing the Challenges of the New Millennium." That report highlighted the fact that current international laws and regulatory structures fall short in providing "clear legal guidance," and that there exist no rules that "prohibit new satellites being launched into orbits that could later threaten existing satellites" or rules regarding maneuvering of spacecraft.[34]

The most recent, and comprehensive, report was issued by the International Academy of Astronautics in September 2005. The "IAA Cosmic Study[35] on Space Traffic Management" lays out the many space traffic challenges, overviews the current legal and regulatory framework, and puts forward a framework of required elements for addressing space traffic in the launch phase, the on-orbit operations phase, and the re-entry phase for debris.[36] Some major elements of the IAA framework include clarifying liability for damages in outer space, the

the United States could lead military-to-military discussions to uphold strict debris mitigation during weapons tests

conversations, 30 March 2006, with a government official who attended the meeting.

[32]Committee on the Peaceful Uses of Outer Space, "Intercessional Meeting of the Working Group on Space Debris of the Scientific and Technical Subcommittee: Progress Report of the Chairman of the Working Group on the Results of the Intercessional Meeting," A/AC.105/2005/CRP.18, 16 June 2005.

[33]Author conversations with a government official who attended the meetings, 30 March 2006.

[34]American Institute of Aeronautics and Astronautics, "International Space Cooperation: Addressing Challenges of the New Millennium," 6th International Space Cooperation Workshop Report," International Activities Committee, March 2001, p. 9.

[35]The term "cosmic" study means that the report has been approved by the IAA Board at its highest level.

[36]Kai-Uwe Schrogl and Petr Lala, coordinators, " IAA Cosmic Study Space Traffic Management," International Academy of Astronautics, 18 September 2005, Executive Summary, pp. 1-11.

establishment of "right of way rules" for objects on orbit, establishing prioritization rights for maneuvering, notification pre-launch, upon maneuvering and when de-orbiting (as noted above) and a number of debris mitigation mechanisms mentioned previously in this article.[37] The study concludes that by 2020 "an inter-governmental agreement could be drafted, building on but not replacing the principles incorporated in the existing space treaties. . . . This international inter-governmental agreement would comprise a legal text, which cannot be changed easily, and technical annexes, which can be adapted more easily, (modeled on the texts of the ITU….)"[38]

The United States could, and should – as it has done in the debris mitigation issue – take a leadership role in building off the IAA work toward a coherent legal framework governing space traffic management. This would benefit the U.S. commercial satellite industry by establishing a level playing field for space operations and would benefit U.S. civil and military space programs by establishing a process for avoiding conflicts and improving transparency regarding other space actors. A key priority for ensuring space security in the future will be just that: establishing norms of behavior and rules of law that can govern the activities of space actors in peacetime, including conflict resolution mechanisms, sanctions, and appropriate military responses for those who would seek to threaten the safety of other space actors.

Dangerous Maneuvers

The IAA report also recommends a concept called "zoning" and in tandem the importance to notify other satellite operators of planned maneuvers. Zoning would be the space based analog of a common naval and ground-based military interaction, namely "special caution areas." For example, the 1989 Prevention of Dangerous Military Activities Agreement between the United States and the Soviet Union calls on land forces to initiate and remain in constant contact if they are within predefined areas. While zoning in space would have to have a different physical implementation than special caution areas on the ground, the concept would increase security by reducing tensions and perceived threats. Essential to a monitored and verifiable zoning implementation would be improved space surveillance capabilities (as described in the previous sections).

As confirmed by DART, even planned civilian maneuvers in space can result in collisions. It is therefore important that responsible spacefaring states agree to pre-notify each other before any dangerous maneuvers – such maneuvers would have to be defined by the states agreeing to the rule, but may include docking, repair, or close proximity autonomous operations.

Codes of conduct exist for almost every sphere of military operations and international cooperation – except space. Space also deserves such rules of the road. While no rule can prevent bad actors from breaking them, an agreed upon code of conduct will encourage good behavior, increase confidence in international relations, reduce tensions, and provide the legal and international support required to identify and respond to rule breakers.

Responsible Hedging

It is also in the best interest of the United States to maintain responsible hedges against an actor who would choose to break the code of conduct or shatter the long-standing informal space weapons moratorium. These hedges would serve as both a deterrent and retaliatory function, allowing the United States to quickly respond to unwise actions of a state or a non-state actor.

[37] Ibid.
[38] Ibid., p. 10.

The United States already has overwhelming conventional capability that can serve as a hedge against states. Since attacks on satellites can be viewed as attacks on a state itself, under principles of self-defense, the United States would theoretically have the right to attack terrestrial targets of any nation or actor responsible. This can readily be achieved with the current arsenal of strike weapons. In addition, if the leadership in the United States decided that it must respond "in kind" to an attack on its satellites, and that such action outweighs the consequences of using such a weapon, it could adapt a number of current elements of its arsenal for the mission – including missile defense interceptors, maneuverable microsatellites, and, in particular, jamming equipment that interferes with a satellite's uplinks and/or downlinks. The latter option is one that is perhaps most useful in the real world, given the dual-use, multinational nature of the satellite population, because it would allow reinstatement of the satellite's functions once hostilities were over.

The last element of a hedging strategy is responsible research and development of space negation capabilities, which stops short of testing and deployment. Unlike the Cold War when testing of nuclear weapons was required to demonstrate deterrence, the fact that satellites can be targeted and destroy is indisputable. While testing may increase confidence in a certain weapon system, this is outweighed by the negative political and perhaps debris-generating consequences of such tests, thereby reducing confidence in the availability and reliability of U.S. satellites themselves – and the weapon systems which they support. Research on basic technologies (many of which have dual-use potentialities in any case) makes sense; taking weapons out of the lab and testing them does not.

Some would argue that a President needs as many options available as possible during a crisis situation, and therefore the United States must test and deploy space weapons now to be available when needed. However, the usefulness of ASATs and space-based weapons in a crisis situation is unclear at best; taking out a satellite would certainly not ratchet down tensions, and in fact could lead to immediate retaliation on U.S. space assets. U.S. security is best served by an international security environment that is free of space weapons, so it makes little sense for the United States to be the first to undermine the current status quo. Further, it is a fact of life, and a fact of international security, that sometimes refusing to close one's options results in less, not more, stability in relations with others. A hedging strategy is prudent only as long as it is constructed so as to avoid prompting others to fear that it is a cover for a clandestine, more aggressive strategy.

the last element of a hedging strategy is research and development of space negation capabilities short of testing and deployment

Exploration Rules

The Vision for Space Exploration outlined by President Bush in 2004 calls for a large expansion in human exploratory missions. It also seeks international cooperation and commercial partnerships to help reach this goal. In parallel to the planned technological research and development that must be undertaken to realize this vision and efforts to seek partnerships to make it a reality, it would also be wise to begin discussions on what rules and codes should govern such exploration in future. Such confidence-building measures would not only be needed to guarantee that states, individuals, and the private sector have the correct distribution of rights, responsibilities, and opportunities in space but that any increased exploration and scientific and commercial exploitation does not open new avenues of conflict. Discussions about other modes of confidence building regarding

exploration would be perfectly legitimate for the United States to press with other states seeking partnership roles in NASA's program.

Negotiate a Weapons Ban

Once the above steps are undertaken, and to some extent completed, states could then come together and negotiate banning the deployment of some or all ASATs and space weapons. This would not be the goal of the above steps, but instead, such a treaty-based arms ban would complement and re-enforce already agreed upon rules and practices – such as the moratorium on testing and deployment and the linking of debris to the Liability Convention. Further, such negotiations could happen on a step-by-step basis. For example, since space debris is a clear and present danger to all space actors, it seems obvious that it would be in everyone's self interest to craft a treaty designed to prevent the testing, deployment, and use of debris-creating weaponry. Such an agreement could also provide a basis for any further discussions about arms control in space. Important, and not to be dismissed, issues that would require serious and difficult negotiations include the feasibility of a sweeping ban on conventional space weapons and the verification of compliance. It should also be noted that states will only sign treaties if it is in their best interest and if doing so will result in a net security gain. It is to be hoped that an increase in shared exploration, monitoring, perceived mutual interests, and security and stability in space will lead states to the conclusion that breaking the space weapons taboo would be a step backward. Thus, our approach to the issue of weapons bans is to see that possibility only as a follow-on to establishing the necessary foundation of peaceful norms, behaviors and practices, rather than a first step toward achieving space security.

America's Leadership Role

This article sets out elements of a possible framework for ensuring long-term security in space in a manner that would support and even improve U.S. national security and global space security. The central core of our concept is the belief that it is critical to protect reliable access to and use of space for commercial, civil, and military actors around the world, and make way for new actors as well, so that humankind can continue to benefit from the life-saving services provided and the knowledge gained by space assets. This framework relies on the establishment of norms of behavior, best practices, and rules of law. It is arguably the case that the technology revolution of the past two decades as applied to the use of space has outstripped the normative and legal instruments set up primarily during the 1960s. Space is too important to allow a kind of Wild West situation to evolve (or perhaps devolve) among space actors. Unfortunately, the present rhetoric in the United States that emphasizes a strategy of space dominance and control – and ultimately war fighting "in, from, and through space" – is fueling tensions rather than dampening them. We believe that the United States instead should be a leader, as it traditionally has been here on Earth, in developing and applying behavioral norms and the rule of law in space. And the time for embracing such a leadership role is now, before the negative trends toward competition and conflict in space accelerate and the situation becomes much more complicated and difficult to address. It is our hope that a broadening and deepening of the current debate about space weaponization among policy makers, military leaders, lawmakers, and the public will establish a better understanding of the requirements for space security, and the criticality of ensuring a stable and peaceful space environment for all actors. No one can own space, and neither can any one be safe in space without ensuring the safety of all.

SPACE CONTROL, DIPLOMACY, AND STRATEGIC INTEGRATION

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As U.S. space capability came of age in the early 1960s it made substantive arms control negotiations possible. Arms control proponents like to argue that treaties, in turn, legitimated spy satellites by acknowledging their existence and sanctioning their use for verification. But the half-century old relationship between satellite technology and arms control has hardly been marked by such reciprocity. While satellite technology has enabled arms control, arms control has imposed nontrivial constraints on America's strategic exploitation of outer space. In bureaucratic terms, Department of Defense (DOD) exploitation of outer space has been retarded by State Department instruments that were only possible because of military exploitation of space.

That in itself is hardly novel. The military and diplomatic instruments of American power are notoriously uncongenial partners. The bureaucratic orientations of State and Defense are governed by differing, often hostile habits of thought. They represent domestic and international networks with political, indeed partisan, characteristics. Each has a global footprint and a crisis management perspective that frequently negates the perspective of the other. Moreover, the two bureaucratic cultures tend to perceive policy options in either-or terms. When challenges arise abroad, this cultural bifurcation typically casts U.S. response options in mutually exclusive terms: will the U.S. response be military *or* diplomatic – as if the zero-sum nature the "choice" were an eternal verity.

Must it always be so? What if diplomacy *designed* space-related international regimes to enhance the security of U.S. satellites and the integrity of their vital data streams? What if the resultant American freedom of action in outer space were employed not just in compliance with such a framework but in enforcement of it? What if the two processes could rise above their zero-sum traditions and actually supplement one another? In fact, such a strategic partnership is both possible and necessary – possible because diplomacy and space control share the unambiguous common purpose of enhancing U.S. national security; necessary because space control is more than a military challenge. Because it also involves civil, commercial, and diplomatic interests, space policy must culminate in enforceable regimes that take account of each. The analogous relationship between sea control and maritime law demonstrates both the possibility *and* the necessity.

By outlawing repugnant activities like slave trading, drug smuggling, and terrorism on the high seas,[1] maritime law establishes the very frame of reference from which naval rules of engagement begin. The law's jurisdictional protocols, identification

[1] "High seas" is a legal term of art for international waters. National sovereignty extends 12 miles from a nation's shores according to the UN Law of the Sea. Certain environmental protection and national security rights extend to a 200-mile limit under the 1958 Geneva Convention. Thus, it is commonly understood that the high seas, over which sovereignty may not be claimed, begin beyond the 200-mile limit.

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procedures, and signals of purpose and intent tell coast guards and navies when and how to act. Falsely flagged or unflagged vessels can be hailed, interrogated, boarded, seized, disabled, or even destroyed. Flagged ships in U.S. territorial waters must be aided if they are in distress and may be challenged only under specified circumstances. The diplomatic and military instruments of U.S. power thereby interact to the benefit of both toward a common strategic purpose.

This relationship, so deeply embedded in maritime history and tradition, is not presently mirrored in the realm of outer space, and indeed that is the first challenge that space control proponents must face. One obstacle will be the longstanding bifurcation of space assets between those classified for national security purposes and those that perform conventional or nonmilitary missions. The former has included reconnaissance satellites since the day President Eisenhower defined the two mission areas as separate. In 1958, when Eisenhower compartmentalized spy satellites and fostered creation of the United Nations (UN) Committee on the Peaceful Use of Outer Space, the United States faced a single strategically closed adversary who was demonstrably capable of manipulating foreign images of its strength or weakness. Understandably, strategists under these conditions elevated strategic information – the capacity to *observe* an otherwise opaque threat – to the tier of U.S. interests ranked as vital. But that judgment held sway when U.S. space assets were physically beyond the reach of technology and their physical protection therefore less urgent.

Eisenhower's "Peaceful Uses of Space" policy spawned national and international institutions, which spawned space law agreements that are now a half century old. Recognizing the constructive achievements of sea law, these early instruments of space law emulated their predecessors' founding principles. Like the premise that all nations share the right to transit the high seas peacefully, for example, the 1967 Outer Space Treaty assigns international status to outer space. Just as flagging laws tell civil and military authorities whose laws will prosecute illegal maritime behavior, space outlaws are subject to the laws of the state from which they embarked. In both cases the violators relinquish their entitlement to protection from any state.

But if the sea-space analogy can be sustained in regard to the premises of law, it fails catastrophically when the discussion turns to the *enforcement* of law. What if an acknowledged space crime cannot be traced to a given state or to a state party to the Outer Space Treaty? True, the space law violator would still be subject to after the fact enforcement measures just as maritime criminals can be prosecuted upon return to port. But punishment after-the-fact is universally recognized inadequate in regard to sea law, which aims to negate the consequences if not the act itself *before* its effects are achieved. While prosecution after-the-fact may be conceivable in the case of outer space law, the instruments of crime *prevention* are neither in place nor under serious discussion. The resultant capacity differential suggests that peaceful behavior is strategically less important in outer space than at sea. Since that has become an impossible proposition to defend, the rationale for capacity differential must lie in the non-strategic realm.

the sea-space analogy fails catastrophically when discussion turns to *enforcement* of law

To achieve the space control objectives outlined by each of the past five administrations, space strategy must include enforcement measures that include prevention and negation of effects as well as after-the-fact punishment. To the extent that the sea control analogy is useful, however, it must be international law that is enforced, not just national strategy. But that will be possible only if the law is structured in support of strategy and vice versa. That approach to space strategy will require a holistic outlook that takes account of the diplomatic perspective instead of the narrow view that frames each issue in either-or

terms. For either perspective to be relevant the framework must be oriented toward the advancement of what is clearly a vital U.S. national security requirement – secure access to and freedom of action in outer space.

Space Technology's Contribution to Arms Control

Arms control was a largely academic exercise in the service of U.S. public diplomacy before the first successful Corona satellite mission in 1960. The most militant Cold War U.S. national security policy ever articulated – NSC-68 in 1950 – began with the straightforward presumption that the American people would insist "that the free world be continuously prepared to negotiate agreements with the Soviet Union on equitable terms."[2] Presidents Truman, Eisenhower, and Kennedy struggled mightily to reconcile that political reality with Soviet disdain for any agreement that would advance U.S. security. A central ingredient of that bilateral dynamic – from an operational as well as a public relations standpoint – was therefore "verification."

There were two problems with this model. First, verification was not the real impediment. As long as the Union of Soviet Socialist Republics (USSR) defined itself as the "antithesis" of the postwar international status quo, Soviet leaders could hardly accept legal arrangements designed to institutionalize a secure western industrial order. To do so would cast doubt on the communist regime's already questionable claims to legitimacy. Second, any U.S. effort to negotiate in the face of that reality would encounter an operational challenge that *was* related to verification. Soviet negotiators would arrive at a negotiating table fully informed on a bilateral balance of power that was still subject to wide speculation in the West. That would be disadvantageous under any conditions, but Soviet negotiators would also represent a government that was both organized and inclined to conduct orchestrated campaigns of clandestine noncompliance.

analysts could only extrapolate from what they knew of German and U.S. ballistic missile programs

Theory had it that this gaping chasm between a constitutionally open and a strategically closed society could be *bridged* if monitoring provisions allowed U.S. observation of Soviet compliance. Efforts to construct such a bridge from 1945 to 1965 were as creative as they were futile. Truman's 1946 Baruch Plan[3] made a unilateral U.S. nuclear disarmament proposal contingent upon Soviet acceptance of international inspection rights. Eisenhower offered the Soviets blueprints of American defense facilities, access to American airfields, and unimpeded overflight rights using any collection equipment needed, if they would accept his 1955 "Open Skies" proposal.[4] Kennedy tabled one on-site inspection proposal after another at the UN's Eighteen Nation Disarmament Commission. Each was unequivocally rejected.

In truth, the pre-Corona U.S. national security dilemma involved a threat assessment challenge what was far more fundamental than the verification challenge. The intelligence community (IC) knew in the mid-1950s of an energetic Soviet intercontinental ballistic missile (ICBM) research and development (R&D) program, but had "no firm current intelligence on what particular guided missiles the USSR is presently developing or may

[2]S. Nelson Drew, ed., *NSC-68: Forging the Strategy of Containment* (Washington, D.C.: NDU Press, 1994), pp. 76-80.

[3]Bernard M. Baruch, 14 June 1946, UN Atomic Energy Commission. U.S. Department of State *Bulletin*, 23 June 1946, "Proposals for an International Atomic Development Authority."

[4]Statement by President Eisenhower at the Geneva Conference of Heads of Government: Aerial Inspection and Exchange of Military Blueprints, 21 July 1955. *The Geneva Conference of Heads of Government, July 18-23, 1955* (Department of State publication 6046, 1955), pp. 56-59. *Documents on Disarmament, 1954-1959*, pp. 486-492.

now have in operational use." To estimate the missile threat, analysts could only extrapolate from what they knew of German and U.S. ballistic missile programs and Soviet progress in other fields. These indirect indicators, paired with speculation on Soviet intentions, were all that underpinned threat projections. As a result, the 1954 National Intelligence Estimate (NIE) would acknowledge that "estimates of missile characteristics and of dates of missile availability must be considered as only tentative, and as representing our best assessment in light of inadequate evidence in a new and largely unexplored field."[5]

Conditions would change little through the remainder of the decade. Years of clandestine reconnaissance overflights,[6] including the U-2 program beginning in 1956, provided the IC with piecemeal imagery of Soviet deployments, but "insufficient direct evidence to establish the scale and pace of the present Soviet ICBM production and deployment program…." Through 1960, NIEs would rely "on various indirect forms of evidence and on argument and analysis deduced from more general considerations." The data were so ambiguous that the Air Force could predict 150 Soviet ICBMs by mid-1961 and 700 by mid-1963, while the Army and Navy were estimating 50 and 200 respectively with the State Department splitting the difference.[7]

The U.S. arms control agenda of those years involved highly publicized proposals and dialogues, none of which addressed deployed weapons. Grandiose discussions of mutual disarmament and comprehensive nuclear test bans became commonplace while serious discussion was constrained to modest limits on proliferation, testing in the atmosphere and in space, and rules of the road for uncontested regions like Antarctica and the seabed. Ostensibly, discussion of actual weapons was prohibited because the United States could not verify Soviet compliance, and because no Soviet interest was served by removing that obstacle. Disclosure of the more fundamental impediment – that the IC was too blind to conduct garden-variety national security threat assessments – would hardly have advanced U.S. public diplomacy goals.

The latter problem would change dramatically in August of 1960 when the fourteenth Corona mission, carrying Discoverer 14, made seventeen passes over Soviet and East European territory.[8] President Eisenhower and Central Intelligence Agency (CIA) Director Allen Dulles gaped in amazement as photographs developed from sixteen pounds of recovered film were delivered to the oval office. That mission alone showed the President more coverage than all prior U-2 flights combined. The 1.5 million square miles of scanned territory revealed tanks, submarines, bombers, ICBMs, 64 air bases, and 26 surface-to-air missile (SAM) sites.[9] According to Bud Wheelon, who later directed the Corona Program, for policy makers and intelligence analysts, "it was as if an enormous floodlight had been turned on in a darkened warehouse." Indeed,

[5]"NIE 11-6-54: Soviet Capabilities and Probable Programs in the Guided Missile Field," in Donald Steury ed., *Estimates on Soviet Military Power, 1954 to 1984*, (Washington, D.C.: Center for the Study of Intelligence, 1996).

[6]For a partial account of U.S. Cold War reconnaissance missions, see Robert L. Goldrich, "Cold War Shoot-Down Incidents Involving U.S. Military Aircraft Resulting in US Casualties," Foreign Affairs and National Defense Division, Congressional Research Service, Library of Congress, July 1992.

[7]"NIE 11-8-60: Soviet Capabilities and Probable Programs in the Guided Missile Field," Donald Steury, *Intentions and Capabilities: Estimates on Soviet Strategic Forces, 1950 to 1983*," (Washington, D.C.: Center for the Study of Intelligence, 1996).

[8]The date of the first capsule's recovery, 18 August 1960, was the same day U-2 pilot Frances Gary Powers was sentenced in Moscow for piloting the last U-2 flight ever flown over the USSR. The "Discoverer 14" nomenclature would be retroactively changed to comport with the "KH" system when the Talent-Keyhole program was instituted. See Dwayne A. Day, John M. Logsdon, and Brian Latell, eds., *Eye in the Sky; The Story of the Corona Spy Satellites* (Washington: Smithsonian Institution Press, 1998), p. 6.

[9]William E. Burrows, "Imaging Space Reconnaissance Operations during the Cold War: Cause, Effect and Legacy," in *The Cold War Experience*, the Cold War Website, p. 5.

Corona would quickly acquire the "decisive technology" status once reserved for World War II Enigma intercepts.[10] Suddenly, the 1961 NIE would differ markedly from those that preceded it:

> Through KEYHOLE photography over the past three months, we have positively identified three ICBM complexes under construction. Two are near Yur'ya and Yoshkar-Ola, in a region several hundred miles northeast of Moscow, and the third is near Verkhnyaya Salda in the Urals. The paired, road-served pads at those complexes closely resemble those at Tyuratam Area C. Near Kostroma, in the same general region but closer to Moscow, the photography revealed a new clearing suitable for a pair of pads, and we believe this is possibly a fourth complex similar to the others.[11] …[This] new information, providing a much firmer base for estimates on Soviet long-range ballistic missiles, has caused a sharp downward revision in our estimate of Soviet ICBM strength…. We now estimate that the present Soviet ICBM strength is in the range of 10-25 launchers from which missiles can be fired against the United States, and that this force level will not increase markedly during the months immediately ahead.[12]

Over and over the USSR had surprised American governments – from Stalin's provocative foreign policy speech of 1946, to the atomic bomb test of 1949, to the hydrogen bomb test of 1953, to the ICBM and Sputnik launches of 1957. Each had caught the United States off guard. In combination with a bellicose foreign policy and a drumbeat of hostile public diplomacy, these surprises achieved their intended effect of keeping the United States in a state of perpetual anxiety. Corona had, for all intents and purposes, ushered in the end of that era. A window had been opened on the opaque threat. Soviet overstatements about producing ICBMs "like sausages" would no longer manipulate U.S. anxiety levels. On threat cognizance grounds alone, space reconnaissance had permitted the national security community to exhale with relief for the first time since 1945.

As anticipated in NSC-68, the U.S. policy community could not employ such a breakthrough as an exclusive tool of threat assessment. It was true that reliable, unilaterally controlled means of intelligence collection had altered the strategic landscape. It was also true that such transparency had diminished the unilateral risk of an open society negotiating with a militant, hostile, strategically closed adversary. Before the emergence of space reconnaissance the United States did not even know enough about the balance of power to specify the *content* of negotiations. But within a few short years of Discoverer 14, American Strategic Arms Limitation Talks (SALT) negotiators would specify *both* sides' force levels to Soviet counterparts who remained silent on the matter. This was necessary both because the USSR had no intention of sharing such information and because the Soviet representations of their own force levels would have meant little. Red Army officials on the Soviet delegation would protest privately to their U.S. counterparts, in fact, for revealing *too much* information about Soviet forces in the presence of their civilian counterparts.

Beyond verification, space reconnaissance had defined the limits and possibilities of arms control's very substance. Thus, SALT I would equate ICBMs with *silos* and Submarine-Launched Ballistic Missiles (SLBMs) with *tubes* on ballistic missile submarines. Nor were these definitions based on the threat implications of these components. The relationship between "weapons," in threat assessment terms, and "units of account," in arms control terms, would be asserted based on what could be seen and counted by "national technical

[10] Albert D. Wheelon, "CORONA, A Triumph of American Technology," Day, Logsdon, and Latell, eds., *Eye in the Sky,* p. 38.

[11] Kevin C. Ruffner, *Corona: America's First Satellite Program*, (Washington, D.C.: Center for the Study of Intelligence, 1995), p. 137.

[12] "NIE 11-8/11-61: Strength and Deployment of Soviet Long-Range Ballistic Missile Forces," Steury, ed., *Intentions and Capabilities*.

means" (NTM). Thus, the ABM Treaty would limit only *deployed* interceptors and launchers. The fact that large phased array radars (LPARs) were operationally essential long lead-time components of an ABM system, though helpful in threat assessment terms, was an afterthought in arms control terms.[13]

Although space sensors would prove at least as valuable in practice as in theory from a threat cognizance standpoint, the same cannot be said about their contributions to verification. This is not because the product is more informative for the former than for the latter, but because observation is not the same as detection and monitoring is not the same as verifying. Overhead sensors can observe and monitor, but only policy makers can reach the political judgments required to detect and verify. Although enhanced threat awareness would certainly strengthen U.S. confidence in arms control, none of the subsequent Cold War compliance controversies would have been better informed by better monitoring. To say that space reconnaissance "enabled" arms control is therefore an understatement, but the reasons for this go well beyond just its role in verification.

only policy makers can reach the political judgments required to detect and verify

The first actual application of space-based NTM to arms control verification was the 1963 Limited Test Ban Treaty, which relied on Vela satellites' infrared detection technology to identify atmospheric nuclear events. But reliance on space-based reconnaissance for verification also began in earnest just a few years after the first successful Corona launch. In what looked at the time like another in a series of innocuous U.S. proposals, Lyndon Johnson proposed "five major types of potential agreement" in a 1964 address to the Eighteen Nation Disarmament Committee. One of these would "endeavor to agree to explore a verified freeze of the number and characteristics of strategic nuclear offensive and defensive vehicles."[14] Arriving alongside Secretary of Defense McNamara's mutual vulnerability doctrine, the proposal would quickly acquire traction. Within six months there would be open discussion within the administration of using intelligence to *support* verification. Soon a consensus would form by which intelligence might be enough by itself to evaluate Soviet declarations of existing launchers.[15] By the end of 1964 the NSC would be actively contemplating a freeze on ICBM, SLBM, and ABM launchers verified *exclusively* "by our respective national capabilities…"[16]

The State Department would have embraced this idea under almost any conditions, but with McNamara's Pentagon on board it would gain momentum quickly. The only holdout among relevant Executive Branch agencies would be the

[13]President Johnson approved formal instructions to the U.S. SALT delegation calling for an offensive and defensive "freeze" to be presented as a single comprehensive entity. The instructions were "drawn up on the assumption that in each instance we could agree to exclusive reliance on national means of verification." The ABM portion of the proposal would address ABM interceptors and launchers, but *not* radars. See Memorandum from the President's Special Assistant (Rostow) to President Johnson, 29 August 1968. Document 277. Johnson collection, Department of State Website. Tab B to this document, "Strategic Missile Talks Basic Position Paper" instructs the SALT delegation.

[14]Message from President Johnson to the Eighteen Nation Disarmament Committee, 21 January 1964, *Documents on Disarmament, 1964* (Washington, D.C., Arms Control and Disarmament Agency), p. 8.

[15]Memorandum of Conversation, 16 June 1964, Subject: Verification of Freeze …Discussed by the Committee of Principals. Document 36, Johnson collection, Department of State Website.

[16]Memorandum from the Ambassador at Large (Thompson) to the Acting Director of the Arms Control and Disarmament Agency (Fisher), 28 November 1964. Subject: ACDA's Six-Point Suggested Program to Prevent Nuclear Proliferation. Document 52, Johnson collection, Department of State Website. Note: Document's accompanying reference material includes a 23 November 1964 Memorandum from ACDA Director Foster to the Committee of Principals outlining "a renewed and broadly based effort to prevent nuclear proliferation." The fourth of Foster's six proposals is referenced here.

Joint Chiefs of Staff (JCS), which "held that any arms control agreement should provide for adequate verification other than by complete reliance on unilateral intelligence.[17] But the JCS had grown accustomed to being overruled by McNamara on more pressing issues – such as conduct of war in Vietnam – and less than a week after this statement the State Department would signal to Soviet leaders that

> The US would be prepared to discuss the possibilities of placing maximum reliance on unilateral means of verification to meet the major objectives of ceasing further deployment of new missile and anti-missile launch facilities without requiring inspection on either party's territory.[18]

Weeks later, President Johnson would lay groundwork for public acceptance of this approach with seemingly offhand remarks to a group of educators in Nashville:

> We've spent $35-40 billion on the space program, and if nothing else had come out of it except the knowledge we've gained from space photography, it would be worth ten times what the whole program cost. Because tonight we know how many missiles the enemy has and, it turned out, our guesses were way off. We were doing things we didn't need to do. We were building things we didn't need to build. We were harboring fears we didn't need to harbor.[19]

By the end of 1967, the IC itself would confirm "very substantial, though of course not unlimited, capabilities for unilateral verification of measures along lines now being considered for a strategic launcher freeze."[20] Before leaving office in January 1969 the Johnson Administration had solidly coalesced behind a proposal for a unilaterally verified freeze on offensive and defensive launchers – a going-in position that did not even include ABM radars.[21] The Administration had even agreed to refer to overhead reconnaissance systems as *national* (rather than unilateral or external) technical means of verification.[22] On these grounds the Soviet Government would agree to a 30 September venue at which the United States would have tabled this proposal if the August 1968 Soviet Czechoslovakian

[17]Memorandum from the Joint Chiefs of Staff to Secretary of Defense McNamara, JCSM-30-67; 19 January 1967. Subject: Questions Relating to a Possible Freeze Agreement on Strategic Forces. Document 176 Johnson collection, Department of State Website.

[18]Telegram from Department of State to the Embassy in the Soviet Union, 22 January 1967. Document 179 Johnson collection, Department of State Website.

[19]"Satellite Spying Cited by Johnson," *New York Times*, 17 March 1967.

[20]From a reference to Special NIE 11-10-67 in Telegram From Department of State to Embassy in the Soviet Union, 15 February 1967. Document 181, Johnson collection, Department of State Website.

[21]Comments recorded at a Principals Meeting on 22 August 1968 confirm this point. In the course of discussions on how to ban Soviet upgrade of the Tallinn air defense system, for example, Secretary of State Rusk pointed out that, "at the JCS' recommendation, we were not limiting radars." Responding to a comment that the Tallinn system was of little value without new radars, Navy Secretary Nitze "agreed, but said we were not stopping radars." See Record of Meeting of the Executive Committee of the Committee of Principals, ACDA-3024, Document 275, Johnson collection, Department of State Website.

[22]Dialogue at the 22 August 1968 Principals Committee meeting referenced above: "[National Security Advisor Walt] Rostow suggested that a word be picked, and then the delegation establish a legislative record in the talks with the Soviets on the meaning of the word, including reference to observations from satellites. [Acting ACDA Director] Mr. Foster pointed out that the Soviets might object to any formal understanding on this point, although they had already agreed tacitly. Mr. Rostow thought that in this critical case it might be desirable to get a formal understanding. Secretary Clifford stated a preference for either 'unilateral' or 'national' over the word 'external,' which had been agreed upon at the last meeting. *Secretary Rusk said he was quite willing to return to the term 'national' and that it might be useful to have an explanation of the meaning of the term*… Summary of Actions 1: It was agreed that hereafter the term 'national' means of verification would be used in place of 'unilateral' or 'external."

intervention had not put the entire process on hold.[23] With this groundwork in place the Nixon Administration would take office in 1969 and complete negotiation of the Interim Offensive Agreement and the ABM Treaty.

Arms Control's Contributions to Space Control

At least initially, the Soviets would object vociferously to the proposition of uncontested U.S. reconnaissance over their national territory. Within days of the first successful Corona launch, a Soviet journalist would correctly name the highly classified Corona, Samos, and Midas programs, labeling them "illegal espionage satellites." Such "American plans of space espionage [were] incompatible with the generally recognized principles and rules of international law," and the USSR had "everything necessary to paralyze U.S. military espionage both in the air and in outer space."[24]

By now, of course, the United States was accustomed to such overstatements from the Khrushchev regime and confident that its Corona satellites were deployed in orbits beyond the reach of Soviet denial capability, at least for the time being – a *fait accompli* that significantly multiplied their strategic value. Still, for the Soviets to challenge the satellites' compatibility with "generally recognized principles and rules of international law" was hard to ignore. An American U-2 pilot captured in 1960 had gone on trial in Moscow on 18 August – the very day of the first Corona capsule's recovery. Publicly humbled by the downing of a *prima fascia* American spy plane, Eisenhower would be hard pressed to explain the legal distinction between endo- and exo-atmospheric intrusions to the American public. Even if the Soviets could not currently intercept the Discoverer series' elliptical polar flight path, their assertion of the right to do so framed the issue in terms more dependent on technology and orbital dynamics than on the legality of overflight.

Eisenhower's emphasis on secrecy, civil space missions, and "peaceful use of space" diplomacy, would be driven in large measure by these unresolved legal questions until the Soviets launched their own reconnaissance satellite on 26 April 1962.[25] Legal tensions diminished a bit further in 1963 when a UN Resolution set forth the basic components of international space law.[26] The 1972 Interim Offensive Agreement and ABM Treaty – SALT I – would then apply these legalities to NTM providing that:

1. For the purpose of providing assurance of compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with the generally recognized principles of international law.
2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.

[23]Lyndon Baines Johnson, *The Vantage Point: Perspectives of the Presidency, 1963-1969* (New York: Holt, Rinehart and Winston, 1971), pp. 487-489.

[24]The article was written by Grigori Zhukov in *International Affairs*. See James Oberg, "The First Soviet Spy Satellite," *Air Force Magazine*, Jul 1995, p. 82 cited by Burrows, "Imaging Space Reconnaissance Operations during the Cold War," p.8.

[25]The Zenit vehicle – called "Cosmos 4" for cover – would be placed on orbit with the same R-7 booster and Vostok capsule that carried Yuri Gargarin to space 12 July 1961. Its four-day mission would deliver 10-15 meter resolutions. Burrows, "Imaging Space Reconnaissance Operations during the Cold War," p. 12.

[26]Resolution 1962 (XVIII), *Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space*. This Resolution would serve as a precursor to the *Treaty On Principles Governing The Activities Of States In The Exploration And Use Of Outer Space, Including The Moon And Other Celestial Bodies* (The Outer Space Treaty: Signed at Washington, London, Moscow, 27 January 1967, Ratification advised by U.S. Senate 25 April 1967, Ratified by U.S. President 24 May 1967). The latter Treaty provided that space exploration be carried out for the benefit of all countries irrespective of their degree of development, and sought to maintain outer space as the province of all mankind free for exploration and use by all States and not subject to national appropriation.

3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty.[27]

international law *does* serve purposes dismissed by critics, and *is* burdened by enforcement problems obscured by proponents

After space reconnaissance had enabled arms control, it would be pleasantly symmetrical to say that these arms control provisions, in turn, facilitated the free utilization of outer space. While outer space assets arguably acquired a measure of increased legitimacy, however, the reality is less dramatic. The USSR had no choice but to live with intrusive space reconnaissance in 1972 and as their technology matured over the next few years these agreements would not stand in the way of weapons that *could* negate U.S. assets. But if this article's purpose were to challenge the enforceability of international law, it would begin not by questioning arms control's "legalization of NTM," but with prior questions about whether national security can be achieved through negotiation at all. In fact international law *does* serve purposes dismissed by critics, and *is* burdened by enforcement problems obscured by proponents. Because treaty law involves a complex array of legal, diplomatic, and political technicalities, its specialists tend to be treaty proponents who embellish the "mutually reinforcing partnership" between "monitoring" for arms control, and "intelligence" for threat assessment. This is an important point, however, because if treaties can enhance the security of U.S. assets in space, then space control strategists ought to be their strongest supporters.

Let us grant that, given a choice between obscurity and clarity, it is better from a strategic standpoint if U.S. space assets are viewed as clearly legitimate. Additionally, let us stipulate that arms control's "NTM" euphemism includes spy satellites and other technical collection assets. Using the NTM language of the ABM Treaty as a baseline, real world cases still permit the following fundamental generalizations:

- These provisions' stated purpose was to provide "assurance of compliance with the provisions of *this Treaty,*" not to sanction NTM's observation of *non*compliance, or of activities not explicitly addressed in the treaty.
- Interference with NTM was prohibited, but only when NTM was "providing assurance of compliance with the provisions of this Treaty."
- The only *deliberate concealment* prohibited was that which would "impede verification of compliance with the provisions of this Treaty."
- The provisions never specified what NTM encompassed, indicated how the parties could distinguish between use of NTM for verification and other intelligence activities, or addressed what could be done *legally* if the offended party determined that activities were not NTM verification.

Before these provisions were agreed to in 1972, of course, there were far fewer grounds on which to call space based collection assets legal. Indeed, when the U-2 was shot down over Soviet territory in 1960, the first U.S. reaction was to publicly deny that it was a spy plane, and Soviet proof to the contrary was a major diplomatic embarrassment. Still, for arms control proponents to say that these agreements legalized space based intelligence

[27] Article XII, Treaty Between The United States Of America And The Union Of Soviet Socialist Republics On The Limitation Of Anti-Ballistic Missile Systems (ABM Treaty), Signed at Moscow 26 May 1972, Ratification advised by U.S. Senate 3 August 1972, Ratified by U.S. President 30 September 1972. Identical language used in Article V, Interim Agreement between the United States of America and the Union of Soviet Socialist Republics on Certain Measures with Respect to the Limitation of Strategic Offensive Arms – an Executive Agreement signed in Moscow 26 May 1972.

collection – even as it related strictly to arms control – was overstated and self-promotional. To illustrate, consider the case histories of two relatively insignificant real world U.S. compliance issues of the mid-1970s:[28]

- In 1974, the United States observed a substantial increase in the concealment of Soviet strategic weapons programs. Though presumably foreclosed by SALT I's non-concealment provisions, a charge of violation would have required proof that "these measures prevented *verification of compliance with agreed provisions*." Rather than facing that obstacle, U.S. policy makers dropped the issue altogether noting that "there no longer appeared to be an expanding pattern of concealment activities associated with strategic weapons programs."
- In 1975, the United States analyzed Soviet actions alleged to have "blinded" U.S. reconnaissance satellites – a practice seemingly foreclosed by SALT I's noninterference provisions. This too was deemed compliant on grounds that U.S. monitoring capability *related to the agreement's provisions* "had not been affected by these events."

Beyond the questionable security afforded U.S. space assets by arms control measures, the treaties that refer to NTM are bilateral ones between the United States and USSR. At least a dozen states, many of whom are openly hostile to U.S. interests, are now capable of accessing outer space. In this context it is worth recalling that the *multilateral* Comprehensive Test Ban Treaty (CTBT) – for which U.S. Senate advice and consent was denied in 1999 – relied not on *national* technical means but on an *internationally* controlled seismic network. Indeed, a number of states, led by China, resisted provisions that would sanction national intelligence sources.[29] As China's representative put it:

> On the issue of national technical means (NTM), China had consistently opposed in the past two years and more the concept of allowing NTMs to play a role in the CTBT verification regime, particularly in triggering of on-site inspections.[30]

Eventually, in what it described as "a major concession," China would grant allowance for "purely technical NTMs to play a supplementary role." Thus, inspection requests could appeal to NTM only if they specified "all data upon which the request is based" thereby exposing sources and methods of collection. Even then, the political decision to act on such a request would rely exclusively on international data.

The fact that space assets have been in common use by a variety of states for four decades probably earns

[28]U.S. Department of State, Bureau of Public Affairs; July 1979; *Special Report No.55*; *Compliance with SALT I Agreements*. Emphases added.

[29]The question at hand was whether NTM could be used to trigger complex provisions related to on-site inspections (OSI) of suspect activities. A demand for inspection (which would be tightly managed by the suspected state) required 31 votes on the 50-member CTBT Executive Committee. Paragraphs 5, Section A, of Article IV of the CTBT specifies a monitoring regime consisting of international seismic stations, consultations, on-site inspections (OSI), and confidence-building measures. But Paragraph 6 allows that "no State Party *shall be precluded from*" using NTM. The Administration's Article-by-Article Analysis acknowledges that "During the negotiations, some states argued that NTM should not be an authorized method for verifying Treaty compliance…" but that paragraph 37 of Section D of Article IV allows OSI requests based on NTM. Paragraph 37 of Section D of Article IV allows use of NTM in OSI requests, which must contain "information pursuant to Part II, paragraph 41 of the Protocol." Paragraph 41 of the Protocol, Part II, provides that OSI requests must include geographical and vertical coordinates of the location of the event, boundaries of the area to be inspected, . . . the time of the event that triggered the request, and all data upon which the request is based.

[30]Statement by H. E. Mr. Sha Zukang, Ambassador of the People's Republic of China for Disarmament Affairs, Head of the Chinese Delegation to the Conference on Disarmament, at the Plenary Meeting of the CD, 1 August 1996. Transcript from PRC Permanent Mission at Geneva.

them more legal stature than they can acquire through formal law. But in the final analysis, with or without law, the assets we call "NTM" are operated by intelligence services for clandestine espionage purposes. Their effectiveness is enhanced not by the genuineness of the other side's approval, but by the other side's ignorance of when and how they are operating. Most states will do all they can to disallow espionage intrusions at times and places of a curious observer's choosing. Decisions of whether or not to negate such intrusions may be affected by extant international standards, but, as shown, those standards are conditional. The same qualifiers that limit well-intended noninterference and non-concealment provisions will apply, at the offended state's discretion, to choices of whether to negate any intelligence collection activities it regards as offensive.

Clearly then, arms control's NTM provisions apply not to overhead technical collection in general, but to its narrowly limited use in support of specific arms control provisions, and primarily in a bilateral context. In other words, arms control has advanced the interests of – at most – arms control. Proponents are thereby equipped to defend a treaty's verifiability on grounds that intelligence garnered therefrom will be "admissible." But the record demonstrates that how behaviors are categorized, what standards of evidence will apply, and the nature of proof itself are all political issues. Thus, even to the extent that it relates to arms control, NTM legalization contributes little or nothing to U.S. freedom of action in outer space.

beyond arms control's limited *positive* contributions to U.S. freedom of action in outer space, several of its provisions simply foreclose U.S. strategic options

Beyond arms control's limited *positive* contributions to U.S. freedom of action in outer space, several of its provisions simply foreclose U.S. strategic options. Some – like the Outer Space Treaty's prohibition of weapons of mass destruction on orbit – impede no strategic options of immediate interest to the United States. Others – like the ABM Treaty's prohibition of U.S. territorial defense, or "a base for such a defense" against ballistic missiles – have been of more immediate concern.[31] Although the treaty permitted limited ABM testing, the United States explicitly agreed in 1972 *"not to develop, test, or deploy ABM systems or components which are …space-based…."*[32] That provision outlawed specific, vitally important U.S. options for the strategic exploitation of outer space. In the real world, a broader *extra-legal* ABM Treaty regime featured a plethora of self-imposed political restrictions that limited U.S. freedom of action far beyond the treaty's explicit terms.

One example of a self-imposed constraint on U.S. space exploitation involves the "broad interpretation" debate over the ABM Treaty's testing restrictions. The issue first arose in 1985 when the Defense Department realized that for all of its restrictions on research and development the treaty had left open the door to testing space-based ballistic missile defense (BMD) components that employed "other physical principles."[33] At DOD's request, State Department Legal Affairs Advisor Abraham Soafer had analyzed the treaty language, intent, and negotiating record, and ruled that such latitude had been left in the treaty – at Soviet insistence despite U.S. efforts to restrict future technologies.[34] Had the Soviets exercised these

[31] Article 1, ABM Treaty.

[32] Article V, ABM Treaty. Emphasis added

[33] Refers to the ABM Treaty's Agreed Statement D: "In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III of the Treaty, the Parties agree that in the event ABM systems based on *other physical principles* and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with Article XIII and agreement in accordance with Article XIV of the Treaty." Emphasis added.

[34] The initial study was conducted by former New York assistant district attorney Philip Kunsberg at the request of Undersecretary of Defense Fred Iklé and Assistant

rights themselves, in other words, the U.S. compliance adjudication machinery would almost certainly have ruled it permissible. After National Security Advisor Robert McFarlane aired this interpretation in a televised news interview on 6 October 1985,[35] news reports described a contentious high-level interagency conflict over the issue.

> While legal experts in the State, Defense and Justice Departments had accepted the Pentagon interpretation even before McFarlane spoke, U.S. diplomats and [North Atlantic Treaty Organization] NATO allies were appalled. They protested that the Administration position, coming only weeks before next month's Geneva summit meeting between Reagan and Soviet Leader Mikhail Gorbachev, would doom any chance for negotiating an arms-control agreement. [Secretary of State George] Shultz suggested to the White House that if McFarlane were making policy for so sensitive a matter on television, then Reagan would seem to have no need for a Secretary of State. Reagan convened a White House meeting… described by Administration sources as "acrimonious."[36]

Despite his own legal advisor's counsel, Shultz publicly challenged McFarlane's reading on three grounds having nothing to do with treaty provisions.[37] First was "the outrageous way this matter had been handled procedurally, which amounted to a usurpation of presidential authority." Second was Shultz' view that it "was not the traditional position of the United States or the position of our allies; …and it was certainly at odds with the current Soviet view." While one might question the relevance of these arguments, they were political judgments well within the purview of a Secretary of State. The third premise of Shultz' opposition, however, was factually incorrect. Shultz believed that because Reagan's Strategic Defense Initiative (SDI) "was a *research* program… we could address the questions that we needed to answer *within* the confines of the ABM Treaty." In truth, the "broad interpretation" would have vastly expanded the United States right to test space-based technologies most in need of testing. But Shultz convinced himself that adherence to the traditional "narrow" interpretation "would give us the best of both worlds."

> We would be able to *research* the key questions of strategic defense. We would also have *something to fall back on and to bargain with* by "clarifying" the treaty. So all this flurry of concern could be made to be useful to us.[38]

Since SDI space components did not require testing by this State Department logic, the unarguably legal U.S. right to do so could be traded for the State Department's more immediate diplomatic interests. Speaking to a NATO audience one week after

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Secretary of Defense Richard Perle. There was no doubt, according to Kunsberg's report, that the U.S. had sought a tight ban on "exotic" future ABM systems except those in fixed land-based mode, but that the Soviets had consistently rejected the broad ban advocated by the United States. See Don Oberdorfer, "ABM Reinterpretation: A Quick Study," *Washington Post*, 22 October 1985, A-1.

[35]Interview with National Security Advisor Robert C. McFarlane, *Meet the Press*, NBC-TV, 6 October 1985.

[36]"Resolving a Star Wars Skirmish," *Time*, 28 October 1985.

[37]George P. Shultz, *Turmoil and Triumph; My Years as Secretary of State* (New York: Charles Scribner's Sons, 1993), pp. 580-1.

[38]Ibid. p. 581. Emphasis added. The same misunderstanding may have motivated Shultz to welcome, weeks later, a Soviet trial balloon offering offensive reductions in exchange for U.S. agreement not to exercise Treaty withdrawal rights for ten years. "In my view, continued observance by the United States of the ABM Treaty while offensive reductions took place would work to our advantage: the *prospect* of SDI would keep the reductions coming, and SDI would still be moving along." Congress had required Reagan and Weinberger to certify that the SDI program would be conducted in compliance with the ABM Treaty. The notion that Shultz interpreted this *political* assurance as a literal statement of programmatic adequacy, whereby the Treaty was less than a showstopper for SDI's development program is, frankly, shocking.

McFarlane's comments, Shultz would eagerly claim victory in this bureaucratic battle:

> It is our view, based on a careful analysis of the treaty text and the negotiating record, that *a broader interpretation of our authority is fully justified*. This is, however, *a moot point*; our SDI research program has been structured and, as the President has reaffirmed last Friday, will continue to be conducted in accordance with a restrictive interpretation of the treaty's obligations. Furthermore, any SDI deployment would be the subject of consultations with our allies and to [sic] discussion and negotiation, as appropriate, with the Soviets in accordance with the terms of the ABM Treaty.[39]

Shultz had apparently convinced the President to adopt space-testing restrictions that were dictated, if at all, by his reading of the "spirit" of the ABM Treaty. In so doing, he unburdened the Soviets of their greatest concern about the SDI program – U.S. pursuit of advanced space based technologies. He had also added consultation with allies and negotiation with the Soviets to the preconditions of a U.S. deployment decision, demanding nothing in return.

Despite the conviction throughout the executive branch that such latitude was legally in place, the United States would never test a BMD component under the broad interpretation of the treaty. A political argument, intensified by internal bureaucratic discord, had been resolved by extra-legal criteria. Instead of expanding U.S. space exploitation rights, McFarlane's ploy had so offended Shultz that it further *restrained* U.S. strategic latitude. Meanwhile, in the Defense and Space Talks (DST), where the two sides deliberated such matters from 1985 to 1992, the Soviets would seek not just to ban research, development, and testing of "space strike arms," but also to confine all other R&D to "the laboratory" – which would proscribe the testing of even *ground based* ABM components.

Soviet insistence that these restrictions must precede a START agreement would outlive Ronald Reagan's Presidency. Congress would then codify these political restrictions in the Missile Defense Act (MDA) of 1991 which foreclosed a space layer of ballistic missile defense, required Soviet approval of essential non-space components, constrained deployable technologies, discouraged R&D funding for technologies that could not be legally deployed, and unilaterally exorcised SDI's global implications.

President Reagan had vetoed 1989 legislation precisely because Congress had refused to authorize his space interceptor program. But in September 1991 President Bush signaled the end of SDI's space component by signing the 1991 MDA into law. As soon as Bush agreed to the START Treaty on these grounds the Soviets vacated all discussion of treaty revisions. Two years later Congress was informed:

> It is the position of the Clinton Administration that the "narrow" or "traditional" interpretation of the ABM Treaty is the *correct* interpretation and, therefore, that the ABM Treaty prohibits the development, testing, and deployment of sea-based, air-based, space-based, or mobile land based ABM systems and components without regard to technology utilized.[40]

To further clarify its position the Clinton Administration renamed the *Strategic* Defense Initiative Organization (SDIO) as the Ballistic Missile Defense Organization (BMDO). While crediting SDI for helping to end the Cold War, Secretary of Defense Les Aspin proclaimed "the end

[39]Shultz, "Arms Control, Strategic Stability, and Global Security," Address before the North Atlantic Assembly, San Francisco, 14 October 1985, Department of State *Bulletin*, December 1985, pp. 20-25. Emphasis added. Shultz' citation of remarks by the President served as the public record of Reagan's judgment.

[40]White House Press Release, 13 July 1993. Emphasis added.

of the SDI decade."[41] In 1996 Clinton would veto funding for the military space plane, the kinetic anti-satellite (ASAT) program, and the Clementine II asteroid probe, which simulated interception of ballistic missiles in space.[42] In 1997, he signed agreements extending ABM Treaty restrictions on *strategic* space exploitation to a prohibition on "interceptors capable of intercepting *theater* missiles from air or space.[43]

In short, although space technology and U.S. arms control policy have shared an intimate relationship since both came of age in the 1960s, the benefits of that relationship have gone exclusively in the direction of arms control. That substantive agreements could be negotiated at all was attributable to satellites' contributions to threat measurement. That such agreements could be called verifiable was attributable to space assets' monitoring precision. But beyond failure to promote the security of satellites, arms control has imposed binding legal and political restrictions on U.S. space options with debilitating strategic implications. The question to be answered is whether that outcome could be reversed by diligent application of diplomacy to the twenty-first century strategic requirement for U.S. space control.

The Political Framework for Space Control

Wars and their component battles are won by those who control the environment within which they are fought. This is not a novel concept. Battle zone control includes the governance of access and egress by people, supplies, and equipment. Allied ground forces could seize and hold territory in Iraq and Afghanistan because the United States controlled the air above them and the sea around them. Air and sea control are preconditions of terrestrial control, which settles conflicts. From an operational military standpoint "control" of outer space is no more or less essential than control of other dimensions of the battlespace environment.

This is offered not as a primer on the operational art, but as a starting point for discussion of space control in its proper context. The lay public understands control as it relates to terrestrial, atmospheric, and maritime lines of communication, but is less familiar with the extension of these principles to outer space. Exotic *images* associated with space control, however illusory, are not lost on its detractors. It does not mean ownership, sovereignty, occupation, expropriation, perpetual domination, flags planted, governance transferred, or access permanently denied. It simply recognizes that the United States can permit neither the uncontested vulnerability of its own space assets nor the multiplied effectiveness of an enemy that uses commercial space services or employs its own satellites on orbit.

It is nontrivial in this regard that all of the bureaucratic arguments over atmospheric, maritime, and terrestrial control are long settled. For the Navy this occurred in the 19th century. Thousands of American merchant ships had been attacked before the Navy's West India Squadron was equipped to crush piracy in the Caribbean Sea and the Gulf of Mexico. It took George Washington two full terms to get Congress to fund six-ships to protect U.S. commerce from the Algerine Corsairs. For the Air Force it was twelve decades later when the extension of military capability to the air required a public lobbying campaign for which General Billy Mitchell was court-martialed. Because the bureaucratic bloodletting over means of control in these realms is over, strategists need only establish the functional identity of space control with air, sea, and land control.

Because political consensus on controversial topics is measured in bipartisan terms, it is useful to note that in 1996 the Clinton White House assigned DOD responsibility for "deterring, warning, and if necessary, defending against enemy attack; assuring

[41]Donald R. Baucom, Historian, BMDO, "Ballistic Missile Defense: A Brief History," 1997.

[42]Peter L. Hays, James M. Smith, Alan R. Van Tassel, and Guy M. Walsh, "Spacepower for a New Millennium: Examining U.S. Capabilities and Policies," in Hays et al., eds., *Spacepower for a New Millennium: Space and U.S. National Security* (New York: McGraw-Hill, 2000), p. 27.

[43]Testimony of David J. Smith, Committee on Foreign Relations, U.S. Senate, 13 May 1999.

that hostile forces cannot prevent our own use of space; [and] countering, if necessary, space systems and services used for hostile purposes.[44] A few years later Clinton's Secretary of Defense implemented this guidance in a Space Policy Directive that should resolve once and for all that space is a medium in which the United States must prepare itself for the conduct of military activity.

> It is DOD policy that space capabilities shall be operated and employed to: assure access to and use of space; deter and, if necessary, defend against hostile actions; ensure that hostile forces cannot prevent United States use of space; ensure the United States' ability to conduct military and intelligence space and space-related activities; enhance the operational effectiveness of U.S., allied, and friendly forces; and counter, when directed, space systems and services used for hostile purposes.[45]

This language clearly stopped short of Ronald Reagan's 1988 policy directing DOD to "develop and deploy a robust and comprehensive ASAT capability with initial operational capability at the earliest possible date."[46] But for Presidents Clinton and Reagan to agree even in *principle* shows how far we have come toward a national consensus on space control.

Because it imposed far more restrictions than its original proponents ever imagined, the U.S. decision of December 2001 to withdraw from the ABM Treaty under its Article XV provisions removed an enormous obstacle to a responsible space strategy. Besides its legal, political, and self-imposed restrictions on space control, the treaty's outright prohibition of defense against attacking missiles added psychological and intellectual obstacles. As the debate over missile defense intensified in the 1980s and 1990s it became increasingly partisan with anything remotely related to military use of space caught in the crossfire. As illustrated by the State Department's handling of the broad interpretation, for example, the United States imposed strategically significant restrictions on itself based on how the Soviet Union *might* react to policy choices that were unquestionably legal in treaty terms. In that case Secretary George Shultz objected *publicly* to a policy option on grounds that it had not previously been the traditional one. Similarly, Congress prohibited ASAT testing, and President Clinton vetoed an experimental rendezvous with a meteor because both involved target engagement scenarios that *emulated* interception of attacking Soviet missiles.

the sea offers a particularly apt analogy to the outer space argument

It was one thing for the United States to comply with the *spirit* of the treaty while the Soviets were routinely exceeding its *letter*. But the seemingly infinite elasticity of what was included in its spirit went beyond good faith by consigning ourselves to a wholly different regime. By its remarkably uncontroversial withdrawal notification of 2001 the United States unburdened itself of all such impediments to the strategic control of outer space.

The Way Forward on Space Control

With the bureaucratic and policy foundation in place for a U.S. space control regime, sea control provides an actual *blueprint* for the remainder of space control's political-military edifice. The sea – over which United States control is a joint product of diplomacy and naval operational supremacy – offers a particularly apt analogy to the outer space argument. Oceans, like space, are seen as the common province of nations – a realm in which safe passage and access to resources are fundamental international rights. Just as a ballistic missile might traverse outer space in a crisis, vehicles bearing weapons of mass destruction are routinely on patrol

[44] Fact Sheet, National Space Policy, The White House, National Science and Technology Council, 19 September 1996.

[45] Department of Defense Directive 3100.10, 9 July 1999, Subject: Space Policy.

[46] White House Fact Sheet, "Presidential Directive on National Space Policy," 11 February 1988.

throughout the high seas. But the stationing of such weapons is banned from the ocean's floor just as it is from Earth orbit. No nation can claim jurisdiction over either realm but lawless behavior is condemned in both.

Abhorrent activities like slave trading, drug smuggling, and piracy on the high seas are international crimes, and JCS rules of engagement reflect a U.S. commitment to their enforcement. The Navy's readiness to carry out protection and denial responsibilities is both cause and effect of these laws' integrity. This capability has hardly brought an end to crime on the high seas, but it has tamed it enough for commerce, resource access, and marine environmental security to be counted among the basic entitlements of nations. United States leadership has spawned a clear set of collectively accepted international norms for sailors and vessels operating in international and territorial waters. The U.S. Navy has worked in tandem with the State Department to see that sensible operational principles are facilitated rather than impeded as these codes are crafted and refined. The resultant regime defines conditions under which force may and may not be employed under the flags of law-abiding nations. Seafarers who comply with these standards are entitled not just to legal protection, but also to physical protection from vessels positioned to offer assistance in a crisis.

This is how diplomacy and military preparedness can work together rather than against each other to advance vital national interests. New and updated JCS rules of engagement never leave the drafting stage until their compatibility with the standing body of international law can be demonstrated. Working together in support of U.S. sea control, these policies of diplomacy and military preparedness secure vital national interests while advancing rather than inhibiting the rights of weaker seafaring nations. Arms control's international rules and procedures thereby protect, focus, and magnify the effectiveness of a U.S. military mission, while military preparedness strengthens the effectiveness of law. In combination, they advance a vital national security objective with unparalleled competence.

It would not be necessary to extend this analogy to the requirement for space control if space were the exclusive domain of law-abiding states. But consider the implications of a hermetic, impoverished, diplomatically isolated North Korea developing a three-stage launch vehicle. The United States would surely have shared launch services as readily as it assisted North Korea's commercial nuclear power program – not out of altruism or to inhibit anyone's access to space, but out of *self*-interest to inhibit its *hostile* exploitation. North Korea's leaders would have known this but chose instead to invest in autonomous means. In strategic terms this was altogether logical and predictable. What potential adversary could possibly ignore the enormity of U.S. reliance on outer space assets that are as vulnerable and at least as vital as her 18th century merchant ships?

Calls by the U.S. National Command Authority for military readiness "to *counter, when directed, space systems and services used for hostile purposes*" serve notice that no potential adversary can lightly ignore. They call for investment in the means to protect U.S. space assets while holding those of other states at risk, and for legal strategies that go beyond weapons reductions and constraints. In short, they establish criteria against which both policies should be measured, toward which both should orient their creative energies, and in the service of which the whole must exceed the sum of its parts.

As with sea control, much of the legal infrastructure that would underpin space control is already in place. The 1967 Outer Space Treaty[47] assigns the same legal status to "outer space, including the moon and other celestial bodies," that maritime law assigns to the high seas. This means that the Moon, like the oceans, is immune from ownership or sovereignty claims, and that any nation can go

[47]Article I of the Outer Space Treaty: "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."

there. How would that prevent, say, a techno-terrorist organization from positioning itself on the lunar surface? In legal terms, the answer is that the Outer Space Treaty requires "non-governmental entities in outer space" to be authorized and supervised "by the appropriate State Party to the Treaty."

This provision has deep roots in maritime legal tradition. Standing sea law affords "free transit" on the high seas only to vessels flying the flag of a recognized authority. The flag tells port authorities, warships, and other vessels which state's laws will prosecute illegal behavior. It accepts the common province principle, but rejects the proposition that anarchy must therefore reign supreme. It reflects a shared preference that states or other legitimate entities enforce their own laws on their own citizens. Although the law is international, violators are subject to the penalties and protections inherent in the legal codes of the authority behind their flag. By exclusion, violators acting independently relinquish entitlement to such protection. An American taken into custody from an unflagged vessel within another state's territorial waters, for example, may or may not be afforded the presumption of innocence by the offended state's courts.

Unflagged vessels can be hailed, boarded, or seized by those equipped and authorized to do so. Vessels bearing the flags of more than one authority are not entitled to the protection of the state behind *any* of their flags. Falsely flagged vessels can be boarded with impunity from a warship of the "true" flag nation. Maritime law thereby achieves one of U.S. diplomacy's fundamental objectives – protection of the innocent – by facilitating one of the Navy's fundamental objectives – exposure of the non-innocent. By proscribing illegitimate military action, the law *licenses* legitimate military action. Arms control, in other words, points the way to rules of engagement. Navies cannot act with impunity on the high seas, but neither can criminals. Legitimately flagged ships engaged in illegal behavior are treated as diplomatic rather than military problems. Falsely or unflagged vessels are treated as military rather than diplomatic problems.

This, of course, is the point at which sea law takes a course that space law is not presently equipped to follow. Violators of space law could be subjected to a variety of enforcement, protection, and penalty systems, including the seizure, imprisonment, impoundment, or punishment of their earthbound elements, and comparable penalties upon returning to Earth. If that system of sanctions is adequate, there is no need for military force *in* space to challenge nefarious actions in progress. But the same could be said of maritime law enforcement, by which logic there would be no need for coast guards and navies. The latter point – as experts on drug smuggling, kidnapping, weapons proliferation, money laundering, immigration, piracy, and slave trading are quick to point out – is absurd. Indeed, the answer to these rhetorical questions is not only obvious from a U.S. standpoint, but widely agreed throughout the international community. Just as the United States welcomed the Royal Navy's advancement of nineteenth century British security interests in the Atlantic, law-abiding nations today seldom object to a U.S. naval presence in their regional waters.

What if an unflagged vessel anchored a few hundred kilometers from a U.S. coastline were readying itself to fire crude short-range ballistic or cruise missiles? Apart from a sovereign nation's entitlement to protect itself do we feel safer knowing that the perpetrator could be punished upon return to port? Or are we heartened to know that that the Navy and Coast Guard are trained to hail such a vessel and confirm its intentions *before* it acts? One difficulty with this analogy, of course, is that international standards on the high seas were codified *after* navies became commonplace national instruments. Modern navies, in turn, arose *after* maritime crimes and national security threats became intolerable. In comparison, there have been few direct assaults on national space assets, and the power to prevent or negate such assaults is held by a mere handful of states. And yet, the emergence of international space law is well underway.

Table 1 lists four such instruments to which the United States is party, illustrating the paucity of U.S. enforcement options in comparison with the maritime equivalent of each. In each case the United States has both the means and the explicit authority to enforce international law as it relates to the sea, but neither the means nor the explicit authority to enforce the same provision in space. In the case of each law of outer space, such capability would contribute to U.S. space control in the same measure to which analogous capability contributes to U.S. sea control. And in each case the integrity of the relevant law would be enhanced as a *result* of sanctions implied or exercised by the fact of United States enforcement power.

Table 1 illustrates a less obvious point as well. Laws of the sea, established *after* national naval power became commonplace, were put in place – in part – to limit the exercise of arbitrary authority by powerful navies. As such, they served an arms control function – leveling a playing field under no one's jurisdiction. The fact that laws of outer space are being put in place *in advance* of routine military force deployments suggests their enactment regardless of whether they are accompanied by in-place enforcement authority. It is not a question of *whether or not* such laws will emerge, but who will write them, who will enforce them, and in whose interest. And at the risk of stating the obvious, it is also a question of what nonexistent means of space control will be foreclosed in the meantime. It is always easier to foreclose future weapons than to eliminate those in being. And, indeed, Table 1 hardly exhausts the list of emerging space legal principles to which the United States is already party. Additional examples include:

- **The Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space**
  Sets forth the basic components of international space law.[48]
- **Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting**
  Taking into consideration that such use has international political, economic, social, and cultural implications, provides that a state which intends to establish such a broadcasting service notify receiving states and should establish such a service only on the basis of agreements with those states.[49]
- **The Principle Relating to Remote Sensing of the Earth from Space**
  States that such activities are to be conducted for the benefit of all countries, with respect for the sovereignty of all states and people over their own natural resources and for the rights and interests of other states.[50]
- **The Principles Relevant to the Use of Nuclear Power Sources in Outer Space**
  Recognizes that nuclear power sources are essential for some missions, but should be designed so as to minimize public exposure to radiation in the case of accident.[51]
- **The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries**
  Purpose as stated.[52]

Each instrument of outer space law listed above and in Table 1 was initiated in the United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS). That body was created in the 1950s at United States urging to highlight the peaceful nature of its space program. In recent years, however, UNCOPUOS deliberations have adopted a discernible logic, grammar, and vocabulary pattern.[53] Prominent among its recurring themes is

[48]Precursor to the Outer Space Treaty adopted by the UNGA in 1963.

[49]Adopted in 1982 as UNGA Resolution 37/92.
[50]Adopted in 1986 as UNGA Resolution 41/65.
[51]Adopted in 1992 as UNGA Resolution 47/68.
[52]Adopted in 1996 as UNGA Resolution 51/122.
[53]Examples that follow are drawn from statements by national representatives to the UNCPUOS UNISPACE III Conference, Vienna, Austria, 20 July 1999.

the belief that "peaceful use" of outer space begins with its "demilitarization" – a term of art that brooks no distinction between reconnaissance, meteorology, communications, warning, navigation, ASAT, or battlefield command and control missions. Military use of space, by this logic, is simply anathema to good order. Since properly structured regulatory regimes would presumably be self-enforcing, new weapon concepts quickly acquire rogue status.

TABLE 1 – A Comparison of U.S. Enforcement Protocols for International Sea vs. Space Law					
UN Space Law		**Parties**[54]	**International Sea Law Equivalent**[55]	**U.S. Law Enforcement Mechanisms**	
				At Sea[56]	**Space**
1967	**Outer Space Treaty**[57]	122 States including United States	Promotes a legal order to facilitate global communication and promote peaceful use of the seas based on the needs of all mankind – particularly those of developing countries, whether coastal or land-locked.	The "objective territorial principle" recognizes the right of a nation to apply its laws to acts committed beyond its territory which have their effect in that nation's territory. Extra-territorial drug laws and "hovering vehicles" are legally reached under this principle.	?
1968	**Rescue Agreement**[58]	110 States including United States	Vessels must assist distressed persons, provide warnings, safe harbor, innocent passage, and respect to sovereign property	Doctrines of collective and individual self-defense and protection of nationals authorize U.S. forces to protect U.S. flag vessels, property, and persons from violent/unlawful acts.	?
1972	**Liability Convention**[59]	105 States including United States	States must investigate injuries, loss of life, or damage to another state's property on the high seas caused by a ship flying its flag. Ships unjustifiably stopped outside territorial limits must be compensated.	Except as noted (re liability of warships), "nothing in this [LOS] Convention affects the immunities of warships… operated for non-commercial purposes."	?
1975	**Registration Convention**[60]	43 States including United States	States will fix the conditions for the grant of its nationality…for the registration of ships in its territory, and for the right to fly its flag. Ships have the nationality of the state whose flag they are entitled to fly. There must exist a genuine link between the state and the ship. Every state shall issue to ships to which it has granted the right to any its flag documents to that effect	If a ship on the high seas is reasonably suspected of involvement in slave trade, unauthorized broadcasting, piracy, or false flagging, a warship that encounters it may board and verify its flag rights. A warning shot is a signal – usually to warn an offending vessel to stop or maneuver in a particular manner or risk the employment of disabling fire or more severe measures.	?

[54] United Nations Treaties; Status of International Agreements Relating to Activities in Outer Space; States that have signed or ratified as of February 1999.

[55] 1958 Geneva Convention on the High Seas; 1974 London Convention on Safety of Life at Sea; 1982 Law of the Seas; Customary International Law.

[56] The U.S. Naval Commander's Handbook on the Law of Naval Operations; NWP1-14M; FMFM 1-10; COMDTPUB P5800.

[57] Outer Space Treaty.

[58] Agreement of the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. Provides for aiding crews of spacecraft in accident or emergency landing; establishes a procedure for returning to a launching authority space objects found beyond its territorial limits.

[59] Convention on International Liability for Damage Caused by Space Objects. Establishes launching state's liability for damage caused by its space objects on the Earth's surface, to aircraft in flight, and to space objects of other states or persons.

[60] Convention on Registration of Objects Launched into Outer Space. Launching state must maintain registry of space objects and furnish specified data to UN.

Some proponents of this agenda, including the current UN Secretary General, believe the growth of space commerce warrants to a new UN mission of "preventive diplomacy," which would extend the UN's role in peacemaking and peacekeeping to arms race prevention and missile warning. A French proposal would equip new UN agencies with satellites, ground stations, and data processing facilities for Earth observation, launch notifications, transparency of military operations, and arms control monitoring. A Chinese Resolution would create a standard format for the acquisition, processing, and handling of remote sensing data in support of developing countries, demilitarize outer space, and equip the UN to manage atmospheric reentry of nuclear power sources. [61] Iran would ban the transmission through space of TV signals that broadcast values contrary to the religious and ethical values of other sovereign states.

Some of these proposals build on the social benefits of third world access to existing assets in space for economic and social development. Others appeal to the commercial benefits of protocols that regularize access to space. Whether on humanitarian, social, or risk management grounds, however, each also promotes restrictions that would intentionally or unintentionally inhibit U.S. space control. Americans tend to regard "the law" as an evenhanded, dispassionately enforced instrument of justice. Although that is hardly its status in places like North Korea and Iran, egalitarian UN principles entitle each member state to an objective hearing on the merits of its case. None of these countries shares the United States sense of urgency for freedom "to conduct military and intelligence space and space-related activities …and [to] counter, when directed, space systems and services used for hostile purposes."

Although it is the hidden agenda behind many of these proposals, some are more blatant than others in opposing U.S. space control. Russia, for example, has employed standard UNCOPUOS language to float a ban on *creation* of "space vehicles capable of destroying missile attack warning space systems."[62] By focusing on warning assets that everyone considers sacrosanct, this provision would assign rogue status to a hypothetical class of ASAT weapons designed to place them at risk. Since arms control's verification and confidence building rules cannot tolerate fine distinctions between a weapon's peaceful or hostile purpose, and since "creation" could only be defined by "observable" testing and development practices, a ban on early warning ASATs would effectively ban *all* ASATs. Ironically, this would include the very *anti-ASAT* weapons required for the Russian proposal's enforcement, but that would only matter if early warning satellites were the real object of its concern. Instead, having assigned rogue status to a repugnant class of ASAT weapons, Russia has positioned itself to champion physical limits on space control.

In fact, attacks on legitimate sovereign space assets, let alone on early warning satellites, are already acts of war. Some such attacks, *especially* against early warning satellites, would themselves warn of impending terrestrial aggression. To add that these attacks also violate a UNGA Resolution would be redundant at best. In the final analysis, of course, neither existing space laws nor the one proposed by Russia would enshroud satellites of any kind in a blanket of security. Nor, for that matter, would U.S. space control ever permanently eliminate all anxiety on the matter. Neither the United States nor the international community, after all, can finally control all behavior even under well-established political-military regimes governing the high seas.

[61] UNGA Resolution 51/122, "International Cooperation and Use of Outer Space for the Benefit and in the Interest of All States."

[62] Interview comments by Colonel General Vladimir Yakolev, Supreme Commander of Russia's Strategic Missile Forces, January 1999, FBIS, Interfax.

But if unsanctioned norms were its only regulator, the law of the sea would be the law of the jungle – a continuous struggle among conflicting interests regulated only by the balance of power.

It may or may not be true that such anarchy exists in outer space today, but how are violators of international space norms deterred, defeated, or punished? If peaceful space use cannot be secured, how can its military abuse be controlled? What distinguishes offensive activities from defensive activities? How does a right to attack no one differ from a right to attack everyone? How are violators denied the benefits of their actions before it is too late?

Nor can it be denied that there are nations who would feign outrage over United States exercise of its space control responsibilities. But since power is made manifest primarily by its use, the same is true of any unexercised sovereign entitlement. What if the United States had never yet deployed carrier battle groups to show force in a tense region? Some governments will be threatened, jealous, or righteously indignant, but most would *expect* the world's most economically, militarily, and technologically advanced power to structure and enforce rules of the road according to its interests. Those whose ideals comport with ours, no matter how "shocked" they claim to be in public, will welcome it as a commonplace exercise of leadership. There are states throughout the world that would prefer it not be so, but the fact is that the United States operates the world's only global blue water navy, and that it serves all law-abiding nations by enforcing collectively held standards. To reject such a space regime while welcoming analogous laws of the sea would be an inconsistency few of them could long sustain.

If the United States concurs with sentiments expressed in UNCOPUOS circles, a passive approach to its proceedings will advance U.S. interests.[63] If not, questions arise that are worthy of thought while capabilities and procedures for space control are being deliberated. What space asset identifiers might be equivalent to the flagging of vessels at sea? How might legitimate "identify yourself" inquiries be authenticated? How would distinctions between military and civilian spacecraft be affirmed? What recognized standards would signal *intrusions* that violate established rules? What venue might structure a strategically sound international space regime?

Contrary to American ideals, legislation is not necessarily a neutral expression of universally held values and more often reflects trade-offs among conflicting interests. Societal ordering schemes are only purchased by the expenditure of *some* individual liberties – and vice versa. Thus, two fundamental truths are clear regarding the law of outer space. The first is that such laws *will* be made; the second is that they will serve *someone's* interests. It is not clear what further limitations on its freedom of action in space the United States should accept in order to promote an expanded legal regime that might better serve its national interests. What is more clear and immediate is that the international community, heavily influenced by anti-American interests, is presently deliberating norms that cannot be enforced and would undermine central U.S. interests if they were. If space strategists choose not to engage that challenge – by staying "above it" or denying its existence – the rules will be made by others. And unless we equip ourselves with routinely demonstrated means of enforcement, those rules will be *enforced* by others.

Given United States' reliance on the military and commercial products of space, the countless ways by which these can be negated, and the ease with which they can be employed for hostile purposes, space control is as challenging as it is essential. Military organizations are familiar with such challenges, but the solution to this one will require

[63] It is worth noting in this regard, that the U.S. representative to the 1999 CPUOS convention took the course of least resistance by stressing aspects of past and current U.S. space policy that are fully compatible with the organization's agenda. See Statement by Ambassador John B. Ritch, "Global Cooperation In The Exploration Of Space: Fusing The UN Idea And Mankind's Greatest Adventure," UNISPACE III Conference, Vienna, Austria, 20 July 1999.

more than shoulders to the wheel and noses to the grindstone. It is a no-nonsense national security dilemma, whose commercial, economic, and diplomatic dimensions are at least as relevant as its military content. However clear it may be that military and diplomatic instruments of national power must be focused toward a common strategic end, U.S. policy has treated them in *either-or* terms for fifty years. The naval analogy offers the best, perhaps only, exception to this pattern. Now, because arms control will either enable or disable space control, space control strategists must learn to see beyond this tradition and take steps to create enforceable twenty-first century space law.

REGIONAL SPACE POLICY UPDATES

UNITED STATES POLICY UPDATE
JAMES VEDDA

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This first installment of the Journal's U.S. space policy update will recap significant developments since the beginning of the George W. Bush administration. The formal mechanism chosen by the administration to deal with policy issues is the Policy Coordinating Committee (PCC) system, composed of high-level officials from throughout the executive branch. This system was established by National Security Presidential Directive (NSPD)-1, dated 13 February 2001, which set up 6 regional and 11 topic area PCCs, none of which addressed space issues.

NSPD-1 gave the National Security Advisor authority to set up additional PCCs as appropriate. A Space PCC (along with three others) was added in April 2001. The enabling documentation and lines of authority make it clear that the PCCs were set up to address national security issues, only incidentally touching on other areas like civil and commercial space. Although it is represented in the Space PCC, NASA is not one of its most powerful players.

The PCC system bears a striking resemblance to the Senior Interagency Groups (SIGs) of the Reagan administration, which were not considered an effective mechanism for managing civil space issues. SIG (Space) was disliked by Congress for its lack of transparency, apparent disinterest in outside input, and perceived goal of centralizing the nation's space policy-making in the White House. It operated in an environment that promoted interagency turf battles dominated by the top officials of the national security community. The current Space PCC is viewed by some in a similar light.

What follows is a timeline of key space policy events that have occurred since the beginning of the Bush administration.

February 2001: In an act reminiscent of the early months of the Clinton administration, the White House directed NASA to make drastic changes in the International Space Station (ISS) program to curb cost overruns. The ISS would lose a habitation module, a crew return vehicle, and the ability to accommodate long-term crews of more than three people. Such changes directly affect agreements signed in 1998 with international partners.

March 2001: NASA announced cancellation of the X-33 and X-34 experimental launcher programs. (The Air Force's decision in August 2001 not to participate in X-33 ended hopes of reviving the project.) Both programs were experiencing technical and cost problems before the arrival of the Bush administration, so their termination was not completely unexpected. But the decision meant abandoning two high-profile efforts involving a combined NASA investment of over $1.1 billion.

May 2001: NASA awarded its first round of technology development and study contracts under the Space Launch Initiative (SLI), amounting to $767 million. Like the terminated X-vehicle programs, SLI also predated the Bush administration. Moving ahead with these contract awards indicated that the administration was placing its confidence in SLI to provide NASA's next generation of space access. Later, in

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Center for Space and Defense Studies
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November 2002, NASA refocused SLI on development of an Orbital Space Plane.

November 2001: The White House announced the nomination of Sean O'Keefe as NASA Administrator. The Bush administration's long delay in appointing a new administrator, and its choice of a deputy director of the Office of Management and Budget (OMB) with no previous space experience, sparked speculation over what this meant for the space agency. Analysts saw this belated attention as an indication of NASA's low priority in the president's agenda. The choice of Sean O'Keefe prompted some observers to see his mandate as little more than damage control, primarily for the troubled ISS program.

February 2002: The president's budget request for fiscal year 2003 included funding for a major new NASA initiative in nuclear power and propulsion.

April 2002: NASA ordered the termination of work on the X-38 emergency return vehicle prototype. Space station partners, particularly the Europeans, expressed their displeasure at the apparent breach of agreement and the lack of prior consultation.

June 2002: NSPD-15, "National Space Policy Review," initiated a series of interagency reviews that lead to the formulation of new policies as noted below.

February 2003: The loss of space shuttle *Columbia* and its crew forced the nearly completed draft of a new space transportation policy back to the drawing board. The report of the Columbia Accident Investigation Board, released in August 2003, included tough criticism of NASA's organizational culture, assigning it part of the blame for the accident.

NSPD-27 directed U.S. government agencies to rely on U.S. commercial remote sensing

April 2003: The space policy review produced its first results with NSPD-27, "U.S. Commercial Remote Sensing Policy," which superseded the Clinton administration's Presidential Decision Directive-23. While continuing the existing policy of encouraging U.S. industry while protecting national security, NSPD-27 also directed U.S. government agencies to "rely to the maximum practical extent on U.S commercial remote sensing space capabilities for filling imagery and geospatial needs for military, intelligence, foreign policy, homeland security, and civil users." The National Geospatial-Intelligence Agency (NGA) was already beginning to implement this policy, having awarded the first of its ClearView contracts to DigitalGlobe and Space Imaging in January 2003.

September 2003: DigitalGlobe won the first award in NGA's NextView program, which put the imagery agency in the business of providing direct support to the next generation of U.S. commercial remote sensing satellites.

January 2004: In a high-profile speech at NASA Headquarters, President Bush set a new course for the space agency by reviving a 50-year-old vision that set the nation's sights on the Moon, Mars, and beyond – after returning the shuttle to flight status and completing the space station. NSPD-31, "U.S. Space Exploration Policy," called for retirement of the shuttle (which was later set for 2010) and development of new space transportation capabilities that would support human missions to the Moon starting between 2015 and 2020. Meanwhile, U.S. research on the space station would be refocused to support space exploration goals. Also, in the same week as the space exploration announcement, NASA Administrator Sean O'Keefe revealed plans to discontinue servicing of the Hubble Space Telescope other than preparing it for a safe de-orbit – a decision that generated a firestorm of criticism.

December 2004: Two more space policies were released within days of each other. NSPD-39, "U.S. Space-Based Positioning, Navigation, and Timing Policy," reinforced existing policy on sustaining operation of the Global Positioning System (GPS) and improving capabilities for denial of service to hostile users. The policy recognized GPS as critical infrastructure for homeland security purposes. NSPD-40, "U.S. Space Transportation Policy," continued the pursuit of assured access to space, technology development, and a healthy U.S. commercial launch industry, and also called for demonstration of "operationally responsive" access to space. Decisions on the future of the Evolved Expendable Launch Vehicle (EELV) program were deferred until 2010.

April 2005: Mike Griffin took over as NASA Administrator, a move that elicited strong approval from around the community, including the Congress. He pledged to revisit Sean O'Keefe's unpopular decision to terminate servicing of the Hubble Space Telescope. A month later, he sent Congress a revised spending plan that, among other things, cut funding for his predecessor's nuclear power and propulsion program.

July 2005: The Bush administration requested that the Congress grant relief from the Iran Non-Proliferation Act of 2000 to permit NASA to purchase the services of Russian Soyuz and Progress vehicles to sustain the space station while the shuttle is grounded. In response, Congress amended the Act (through Public Law 109-112) in November 2005.

September 2005: Just five months after taking office, NASA Administrator Griffin unveiled the transportation architecture that would be used for the return to the Moon. As expected since mid-summer, the architecture was substantially derived from space shuttle components.

February 2006: The President's proposed FY07 budget for NASA disappointed many in the community due to its limited overall growth and its substantial cutbacks previously proposed funding for space science, Earth science, and aeronautics over the next few years.

The Bush administration worked on a new National Space Policy from the beginning of 2004 through mid-2006. As this issue was going to press (October 2006) that policy was released and it replaced the 1996 National Space Policy of the Clinton administration (PDD-49). For the next issue of *Space and Defense*, this section will focus on analyzing the new policy.

Russian Space Policy Update
William P. Barry, D. Phil.

Russian Federation Space Policy: Back to the Future?

With the collapse of the Soviet Union in 1992, the Russian Federation found itself the inheritor of much of the Soviet space program. However, this "new"country also had a new leadership that had little interest in a space effort that was viewed as tainted by its close association with the leadership of the Communist Party and its management through the Soviet defense industry bureaucracy. In addition, the extraordinary budgets and priorities assigned to resources designated for space efforts were a luxury that Russia could now little afford. In the face of these enormous challenges, the Russian Space Agency was created and Mr. Yuri Koptev was appointed to lead it. Such an organization devoted to civil space was a new concept, although many of the Russian Space Agency's officials, like Mr. Koptev, had previously served in the coyly named Ministry of General Machinebuilding – the ballistic missile and space ministry of the Soviet government. For the remainder of the 1990s Russian space policy was largely ignored at the highest political levels and left to survive on meager (and frequently undelivered) fiscal rations, while Mr. Koptev

courted foreign assistance and struggled to build a space agency in the Western mold.

Considering the circumstances Mr. Koptev was remarkably successful. In the late 1990s, Russia retained its reputation as a "space power" (as tarnished as that reputation may have been) largely through the central role it came to play in the International Space Station (ISS). The Russian government had also created (in September 1999) an organization parallel in title to NASA by handing Mr. Koptev control over the Russian aviation industry and creating the Russian Aviation and Space Agency (Rosaviakosmos). (The aviation industry in the Soviet Union had always been managed as a separate Ministry. One of the interesting contrasts of the Cold War is the fact that the Soviet space program effectively grew out of the artillery industry, while in the U.S. the space program had its primary roots in the aviation industry). However, the commitments to the ISS were consuming Rosaviakosmos. As the substantial hardware reserves from the Soviet era were depleted, and as contractual payments from NASA were slashed after the passage of the Iran Nonproliferation Act of 2000, Russia's ISS commitments grew to consume 48 percent of the Rosaviakosmos budget in 2001. The simple fact that the Russian space program survived the break up of the Soviet Union and eight years of the Yeltsin Administration is a testament to the robustness of Russian space hardware, the dedication of its workers (often in the face of little or no pay), the adroitness of its leadership in adapting to new circumstances, and some good fortune in finding international partners. Yet, as the new century dawned Mr. Koptev's amazing balancing act was becoming increasingly difficult to sustain.

President Putin referred to the space program as an engine to drive growth in high technology

Political change came just in time for the Russian space program. After Vladimir Putin became President of the Russian Federation in 2000, his government began to face the financial gap between its space aspirations and the budget bottom line. In 2000 Russia allocated a paltry $166 million for the Federal Space Budget (aviation was still funded under a separate budget line, and this figure is not believed to include military space spending or other special space programs that are funded separately (e.g., the GLONASS satellite navigation system). Yet, in 2002, the Russian Federal Space budget began a dramatic increase; rising by over fifty percent from the 2001 figure. Much of the increase was applied to non-ISS spending (which doubled from $95 million in 2001 to $190 million in 2002). This budget growth trend has continued over the last five years, with dramatic growth in the overall budget, but larger part of the increases being allocated to non-ISS programs. In fact, in the last three years the Federal Space Budget has more than tripled (2003 budget: $263 million; 2006 budget: $793 million). Economic stability and the influx of tremendous oil wealth have allowed such increases in spending, but in comparison to aspirations Russian funding levels remain very low. Russia's spending on space amounts to less than five percent of the NASA budget and Russia now ranks fifth in international spending levels on space (behind the United States, the European Space Agency, Japan, and China – just recently having moved ahead of India).

While the financial turn-around began in 2002, structural and personnel changes took another two years. As part of President Putin's sweeping reorganization of the Russian government in the run-up to the spring of 2004 Presidential election, Rosaviakosmos was broken into its more traditional constituent parts. Responsibility for space was vested in the Federal Space Agency (Roskosmos) and aviation responsibilities were assigned to a separate organization. Mr. Koptev, the only leader the space agency had known, was

replaced by the then-Commander of Russian Military Space Forces, Colonel-General Anatolii Perminov. Retiring from military service, Mr. Perminov made his presence felt immediately throughout the Russian space program with a series of visits to Roskosmos facilities and contractors. At Roskosmos headquarters, he overhauled the leadership team, bringing in a number of people with whom he had worked in the military. Two years on, the continuing pace of change and increased energy is still evident at Roskosmos.

The changes at Roskosmos reflected a significant shift in Russian leadership attitudes toward space. President Putin had begun to take a positive public position on space in the year prior the shakeup at Roskosmos by referring to the space program as an engine that could drive growth in the high-technology sector. Yet, his more assertive attitude toward space became much more apparent after the appointment of Mr. Perminov in March 2004. In a first for a Russian President, Mr. Putin visited Roskosmos Headquarters to make a speech and present awards marking Cosmonautics Day, 12 April 2004. During his speech President Putin noted that:

> Thanks to space research we joined the community of developed countries and established a firm foothold there. It was this sphere of activity precisely that allowed our country to achieve leading positions in a range of hi-tech fields. Moreover, since the very beginning of the space age we were aware of our special historic mission….[space should] become an arena for peaceful cooperation, based on trust, sober calculation and a clear-cut understanding of all national interests.

President Putin's support of the Russian space program is not simply a return to Soviet attitudes or a matter of nostalgia for the Soviet era. On a purely practical level, the space program is one of Russia's few world-class inheritances from the Soviet Union. The current Russian political leadership recognizes that Sputnik and the space program were key factors that allowed the USSR to establish itself as a superpower. Although the tone may be somewhat reminiscent of the Soviet era, President Putin's accentuation of Russian space accomplishments over the last two years has not been focused on proving the superiority of his political system, as much as it has been on signaling the continued relevance of Russian power in the world. This is evident in the increased, and less cynical, Russian domestic press coverage of the space program and by the rise in the use of space cooperation as a foreign policy tool. For example, during the May 2003 visit of President Putin to Malaysia, it was announced that Russia would fly a Malaysian in space as part of a $900 million deal to sell 18 Russian Su-30 fighter jets. Since the appointment of Mr. Perminov as head of Roskosmos in early 2004, the visibility of the Russian space program at the diplomatic level and the pace of Roskosmos international activity has further accelerated.

In another telling sign of leadership interest, space was one of fifteen long-term national "targeted programs" created for key economic development fields in 2005. The "Federal Space Program 2006-2015" was approved by the Russian Government in late 2005. It outlines the space goals for Russia over the next ten years and authorizes the expenditure of some $8 billion dollars. Russian press reports indicate that the Roskosmos budget is expected to continue its upward climb until it reaches approximately $1 billion per year (expected in approximately 2010). While the Federal Space Program represents a significant increase in political and financial recognition for Roskosmos, it falls far below the aspirations that Mr. Perminov suggested when the Program was first publicly discussed in the summer of 2005. Like many other Russian government agencies, Roskosmos had evidently hoped for a significant slice of

Russia's new oil wealth. Although the increases in planned spending over the next ten years are significant, Mr. Perminov himself has publicly acknowledged that the approved funding levels will be barely adequate to meet the rather limited goals of the Federal Space Program. (Interestingly, those goals have been publicly touted for their attention to services to Russian citizens, including the replacement and upgrade of long-neglected communication satellites, meteorological satellites, and remote sensing satellites. The Program has very limited space science and exploration objectives, and evidently does not authorize a human spaceflight program beyond participation in the ISS.) In fact, Russian government projections indicate that achieving the objectives of the Federal Space Program 2006-2015 will likely cost approximately $12.5 billion. Thus, success of the Program will hinge on attracting a planned $4.5 billion in revenues from the sale of space goods and services to international customers over the next ten years. A lackluster launch services market and the growth of launch vehicle competitors will force Roskosmos to be very creative and aggressive if it hopes to supplement its 10-year budget by nearly fifty percent through what Russia refers to as "off-budget" sources.

The last two years have been a time of significant change for Russian space policy, as the country has become more nationalistic and more capable of funding its own space programs. Political expectations have increased and Russian space efforts once again enjoy pride of place in demonstrating national capabilities. Yet, although funding increases have been generous by Russian standards, there remains a significant gap between funding needs and allocations. Success appears to continue to rely on obtaining funds from outside the country, while simultaneously acting in a way that might tend discourage significant "outside" investment. This suggests that Russian space policy is now an interesting hybrid of Soviet style attitudes and objectives and post-Soviet approaches to funding. Whether this hybrid approach will be successful remains to be seen.

European Space Policy Update
Richard Buenneke

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Four decades after the first autonomous European satellite launch, Europe found itself at a crossroads regarding the course of its security space programs. Facing continued struggles to develop dedicated military satellites at the national level, Europe considered a strategy based on dual-use technology and past successes in civilian launch and satellite programs. This approach centered on a series of "great projects" for navigation, global monitoring, and space situational awareness.

Despite early predictions by European military space enthusiasts, a range of political, strategic, and economic factors slowed the progress of these flagship programs. By the mid-2000s, Europe's ability to deploy capabilities that would approach those of the United States appeared doubtful. At the same time, advances in satellite technology could give Europe the ability to develop capabilities that could either create new challenges for the Western alliance or contribute to collective security.

National Programs

Among European nations, France continued to devote the most attention and resources – approximately $800 million per year – to dedicated military programs. Evoking the policies of former President Charles de Gaulle, France launched the first of a new generation of Hélios reconnaissance satellites in December 2004. Looking to new mission areas, France's

General Armaments Directorate also demonstrated a "swarm" of Essaim electronic intelligence microsatellites. As a result, France had the bulk of non-communications system in orbit by the middle of the decade (see table below)

Comparison of U.S. and European Material Capabilities in Space*

	United States	Europe
Optical imagery	3 satellites	2 satellites (Hélios)
Radar imagery	3 satellites	0
Military meteorology	5 satellites	0
Signals intelligence	15 satellites	2 demonstrators (Essaim)
Early warning	7 satellites	0
Space surveillance	1 demonstrator	0
Satellite navigation	30 satellites	0
Telecommunications	31 satellites	12 satellites (including 2 NATO)
Data relay and secondary missions	14 satellites	1 civil demonstrator (Artemis)

*Situation as of 1 May 2005

Source: French Ministry of Defense, cited in French National Assembly, Commission on National Defense and Armed Forces, "Défense: Équipement des forces; Espace, communications, dissuasion," *Le projet de loi des finances pour 2006, Vol. IX, No. 2540.*

At the same time, budget constraints prevented France from developing an imaging radar system. To increase its access to all-weather intelligence, France and Germany agreed to a "pooled system" that permitted joint use of the electro-optic Hélios satellites and the German SAR-Lupe radar satellites by 2009. France also partnered with Italy on the Optical and Radar Federated Earth Observation (ORFEO) program. When fully operational later in the decade, his program will network the French Pleiades optical and the radar payloads of Italy's Constellation of small Satellites for Mediterranean basin Observation (COSMO-SkyMed).

The dual-use character of ORFEO was repeated in a number of other national and European programs. At the national level, the German space agency began work on TerraSAR-X (scheduled for launch in late 2006) and the British Ministry of Defense launched in 2005 a TopSat minisatellite imaging demonstration.

Budget constraints also led several European governments to leverage commercial technology and financing for their Military Satellite Communications (MilSatCom) networks. On projects such as the United Kingdom's (UK) Skynet 5 or Spain's XTAR, defense ministries would agree to serve as anchor tenants for privately financed satellites. While France, Italy and Germany opted for more traditional government-owned approaches for their Milsatcom systems, these countries also explicitly linked their purchases to national industrial policies.

The emphasis on industrial policy sometimes complicated efforts to enhance interoperability among national European systems. The closest integration occurred in MILSATCOM, where a team of UK, France and Italy was selected to provide capacity for NATO. Coordination was less evident in reconnaissance satellite programs, where systems remained truly "national" with only minimal integration between ground segments.

European Policy

To fashion a grander design for military space, leading European military planners and aerospace executives sought to ensure space helped create an "ever closer union" of European nations. They argued that space technologies could play an

important role in supporting peacekeeping, humanitarian relief and homeland security functions as well as "out-of-area" military operations. Enthusiasm for this approach was greatest among the technocracy of France, where President Jacques Chirac hailed France's role as the "motive force" for ensuring that Europe did not become a "vassal" to an American space hegemon.

By contrast, the UK remained skeptical of any space project that sought to bolster European Union military capabilities at the expense of the Atlantic alliance. German officials also questioned calls by industry experts to double Europe's military space budget, noting financial constraints.

European leaders argued that space technologies could play an important role in peacekeeping, humanitarian relief, and "out-of-area" operations

The focal point for this policy debate became Galileo, a joint program of the European Union (EU) and European Space Agency to develop an autonomous navigation satellite system. Galileo's civilian positioning, navigation, and timing capabilities were relatively non-controversial and seen by many experts as a valuable augmentation to the U.S. Global Positioning System. However, European plans for a dual-use "public regulated service" on Galileo raised more concerns about potential competition with GPS.

The controversy over Galileo reached its peak in December 2001, when U.S. Deputy Defense Secretary Paul Wolfowitz wrote to EU defense ministers expressing concerns about potential interference of Galileo's security signals with GPS military bands. Although this specific technical issue was resolved in a US-EU agreement signed in June 2004, the controversy also highlighted a growing divergence of views between the United States and EU regarding the role of space in supporting "security" missions and European reliance on American-run "global utilities."

As the decade progressed, concerns about a potential transatlantic rivalry in space abated as overall relations between the United States and Continental Europe improved and the EU Constitution was rejected in French and Dutch referendums. By early 2006, delays and cost overruns in the first phase of the Galileo program – combined with continuing controversies over China's role as a minority partner in the program – cooled the ardor of many European governments for large, dual-use projects.

By 2006, general pressures on government spending also suggested that a second space "flagship," the Global Monitoring for Environment and Security program, would be stretched out to fit tighter budgets. Although the EU Commission still sought to expand its role in space, these efforts were reoriented away from comprehensive European Space Policy and towards a more incremental "road map" that emphasizes interoperability and tighter integration into terrestrial homeland security missions.

The renewed interest in integrated capabilities also may create opportunities for a more Atlanticist approach to military space. One promising candidate for such integration could be Space Situational Awareness, where European space surveillance sensors and satellite monitoring capabilities could be integrated with U.S. military space networks to improve allied commanders' understanding of friendly as well as potentially hostile space activities. Transatlantic ties also could be strengthened through cooperation between the U.S. and UK on operationally responsive microsatellites derived from the TopSat demonstration.

Perhaps more significantly, European nations expressed a growing interest in measures for protecting their space infrastructures. These efforts – which include support for Russian and Chinese diplomatic initiatives for multilateral "transparency and confidence building measures" – challenge many of the Cold War Assumptions of U.S. policy for sharing space surveillance data. The result may be the creation of a "two-way street" for information sharing, thus extending the Security guarantees of the North Atlantic Treaty into outer space.

CHINA AND ASIA SPACE POLICY UPDATE JOHN D. WOLF

John D. Wolf is a Senior Intelligence Analyst with the L3 Corporation

You can't believe everything you hear about the Chinese space program. I worked in Beijing in the late 1990s, and there I encountered a man named Mr. Li. Mr. Li spoke good English, appeared well educated, and claimed to have been in the Chinese Air Force. He would sometimes talk with me about the Chinese space program, particularly about the Chinese space launch facility in Tibet where they were preparing for a mission to the Moon some time before the end of 1999. The purpose of the mission, he said, was to crack open the Moon to allow the Earth to pass through it and enter the next century. The story pretty much went downhill from there. Eventually I had to break off my relationship with Mr. Li, explaining that his version of reality and mine were too far apart.

The real Chinese space program has recently entered a new and exciting phase: manned spaceflight. The Chinese successfully put astronauts in Earth orbit in 2003 and 2005. This makes them only the third country in the world to develop this level of space technology. These launches have sparked tremendous popular enthusiasm and pride in China for their space accomplishments, and they look forward to greater achievements. Unfortunately, anyone searching for reliable information on the future of the Chinese manned space program will likely be frustrated by the lack of credible information.

The only published space policy document was done in 2000, long before the first manned mission. It contained few concrete details. Since then, while there is plenty of speculation in the popular press, real government information on the manned space program has largely been limited to brief statements, little more than sound bites, by government or space industry officials. The Chinese are not very free with information in some areas, and since the space program is viewed as connected with their military, it is a sensitive topic. Such public statements as have been made can be woven together into an outline of sorts on China's plans. The question remains, however, how closely this outline matches China's actual intentions.

China could prove either a competitor or a partner with the United States in developing manned space capabilities. It is therefore important to know, as best we can, what China's policy is for manned spaceflight. The starting point for such knowledge should be what Chinese officials have said their program consists of. Then, later, as they progress in their activities, we can get a sense of the reliability of this data by comparing words and actions.

Initial Policy Statement: The 2000 White Paper

The closest that the Chinese have come to a public space policy is the State Council publication of "China's Space Activities: a White Paper," in November 2000. This was a first-ever public government outline of their space

programs and enumerated the following development targets:

- The short-term development targets (for the next decade) are:
  - To build up an earth observation system [including] meteorological satellites, resource satellites, oceanic satellites and disaster monitoring satellites.
  - To set up an independently operated satellite broadcasting and tele-communications system [with] geo-stationary telecom satellites and TV live broadcasting satellites.
  - To establish an independent satellite navigation and positioning system.
- The long-term development targets (for the next 20 years or more) [include]:
  - To establish a multi-function and multi-orbit space infrastructure composed of various satellite systems and set up a satellite ground application system.
  - To establish China's own manned spaceflight system and carry out manned spaceflight scientific research and technological experiments on a certain scale.
  - To upgrade the overall level and capacity of China's launch vehicles.
  - To realize manned spaceflight and establish an initially complete R and D testing system for manned space projects.
  - To establish a coordinated and complete national satellite remote-sensing application system.
  - To develop space science and explore outer space by developing a scientific research and technological experiment satellite group of the next generation, [and] carrying out pre-study for outer space exploration centering on the exploration of the moon."[1]

[1]The Information Office of the State Council, China's Space Activities, a White Paper, 22 November 2000, emphasis added.

In sum, the Chinese published ambitious space goals including manned spaceflight, manned space experimentation, and lunar exploration. Discussions about the final goal have been somewhat ambiguous and controversial but later sources have clarified that the manned space program includes manned lunar missions. The formal adoption of these programs was made public by Luan Enjie, Administrator of the China National Space Agency (CNSA), in a 2001 report indicating that *space science, deep space exploration and manned space flight* were part of China's development targets for the Tenth Five-Year Plan (2001-2005).[2]

the Chinese published ambitious space goals

Since that time, there has been no comprehensive government statement of policy for China's space programs. The CNSA website currently has a link called "Space Policy," but clicking there will lead the reader to a copy of the 2000 White Paper. Those interested in China space policy today are generally left to piece together statements by government or space program officials, most of which reveal little more than one or two nuggets at a time.

From these statements a sort of policy can be assembled, or at least an outline of the declared space program can be seen. What follows is a summary of what has been said from 2003 into 2006 by officials in the program or other government spokesmen. Although fragmented, the collection of such statements expands on this initial outline and provides a basis for tracking the development of manned spaceflight technology. In the near term, the focus of such statements has been on plans for the next missions in the Shenzhou (Divine Vessel)

[2]Luan Enjie, Administrator of CNSA, "Policy and Prospects for the Development of China's Space Technology," *Aerospace China*, Winter 2001, emphasis added.

program that has included the two manned missions to date.

Future Shenzhou Missions

During the months leading up to and especially after the successful flight of Shenzhou 6 in October 2005, Chinese space officials apparently felt more confident in making predictions for the future of this program. Yang Yiwei, China's first astronaut was quoted by *People's Daily* in August 2005 as saying that Shenzhou 7 would fly in 2007 and include a space walk. He also said that Shenzhou 8 would leave a cabin in space for later docking activity by Shenzhou 9, but he gave no timetable for these missions.[1] The Director of the Manned Space Engineering Office, Tang Xianming, gave a statement in October 2005 that said a spacewalk would in fact occur in 2007 and that manned docking would take place in 2009-2012.[2]

By early 2006, however, the planned launch date for the Shenzhou 7 mission had been pushed back to 2008. The new Director of the Manned Space Engineering Office, Wang Zhougui, announced the change and that "the space walking astronauts will walk in the [Chinese-made] space suit and do some space experiments. Our initial plans are to have 1 or 2 astronauts walk in space for about half an hour."[3] This shift was confirmed a week later by Huang Chunping, chief consultant for China's manned launch vehicle system, in a *Xinhua* interview. "There is nothing wrong," said Huang, "We just need more time to prepare for the mission."[4]

Also by early 2006, the space-dock mission was being connected to the Shenzhou 8 flight. Wang Zhougui was again the source of this. He was quoted by *China Daily* as saying that "Shenzhou 8, with the mission of a space dock, will be launched around 2009 to 2011." It was not clear from his remarks what equipment from which missions would be part of the space dock operation. He said only that "space docks refer to those between two space flights or between a space flight and a space capsule."[5]

Space Lab

Beyond the Shenzhou program itself, Chinese officials have revealed an interest in two manned orbiting systems. Remarks on these systems go back at least to the enthusiastic days after the Shenzhou 5 launch, when Zhang Qingwei, Deputy Commander of China's manned space program, said China "would strive for breakthroughs in space rendezvous and docking technology for launching *a space lab and eventually a manned space station*."[6] Details on what China means by a space lab have been few. In early 2006, however, a presentation to the National People's Congress on the space program stated that the construction of a "sky lab" was part of the Five-Year Plan for 2006-2010 submitted to the Congress for approval.[7]

Chinese Manned Space Station

As mentioned above, Zhang Qingwei referred in 2003 to the plan for a Chinese space station. Such a craft would "enable China to carry out large-scale scientific experiments and applications in space," said Zhang, as part of the manned space program originally laid down in 1992. He further stated that such space-based infrastructure as the space lab and station would

[1] *People's Daily* Online, 12 August 2005.
[2] *Xinhua, People's Daily* Online, 17 October 2005.
[3] *China Daily*: Spacewalk Mission Set for 2008: Official, 24 February 2006, FBIS CPP20060224074023.
[4] Beijing *Xinhua*, "China to Delay Launch of Shenzhou-7 Spacecraft to 2008," 4 March 2006, FBIS CPP20060304054017.
[5] *China Daily*, "Spacewalk Mission Set for 2008: Official," 24 February 2006, FBIS CPP20060224074023.
[6] Xinhua News Agency, 16 October 2003, emphasis added, China to Develop Space Lab, Space Station.
[7] *Xinhua, People's Daily* Online, 7 March 2006, China's Space Program Seeks New Breakthroughs in Five Years.

serve as a platform for deep space probes.[8] The inclusion of a space station in the manned space program was confirmed in late 2003 by the deputy director of CNSA.

In 2003, the Chinese were saying that a space station would take "about 15 years" to complete. Wang Yongzhi, described by Xinhua as chief designer of China's manned space program since 1992, made this statement in a speech to a group of high school students.[9] Huang Chunping of the launch vehicle program said in February 2004 that China would have a space station by 2015.[10]

Again, with practically no expansion on details of the program, Chinese space officials in late 2005 and early 2006 were still stating that a space station was in the plan. Zhang Qingwei was saying no more than that China would "eventually" launch a manned space station to carry out large-scale experiments.[11] Wang Zhougui included a Chinese space station in his February 2006 review of the manned space program, but he likewise gave no indication of when they might launch such a station.[12] Hu Shixiang, described as "a former senior commander" in China's manned space program, stated in March 2006 that the space station was in the 11th Five Year Plan submitted (with the sky lab) to the National People's Congress.[13]

Unmanned Lunar Probes

Chinese officials have repeatedly stated that travel to the Moon is part of their space program. While most of the discussion of near-term missions has been about unmanned probes, several public statements have pointed to manned lunar missions in the future as well.

Following the first successful Shenzhou mission, press reports were predicting lunar missions. In 2003, Qinghua University and the State Robot Research Center were reportedly already working on the manufacture of lunar landing vehicles.[14] Late that same year, Zhang Qingwei was quoted by *Xinhua* as saying China was to "launch its first Moon probing satellite in the next three to five years."[15] In November 2004, Hu Hao, described as "Director of the Lunar Exploration Engineering Center," presented an outline of the lunar program in a conference. He said the program was divided into three stages: orbiting the Moon in 2007, an unmanned landing on the Moon carrying a "Moon rover" by 2012, and the use of lunar vehicles on the Moon to collect samples of lunar soil from then to 2017. (Other statements by space program officials clarified that this third stage involved the return of samples to Earth.[16]) Hu stated that the first craft in China's lunar exploration program, the Chang'e-1 satellite, would be sent to orbit the Moon in 2007 from the Xichang Satellite Launch Center.[17]

As of 2005, this same three-stage program was still being described as well as the steps underway to bring it about. The Lunar Exploration Engineering Center was opened in August in Beijing, with the opening ceremony

[8]Xinhua News Agency, 16 October 2003, China to Develop Space Lab, Space Station

[9]Hong Kong *Hsiang Kang Shang Pao*, "China's Lunar Probe, Aerospace Development Programs," 18 October 2003, FBIS CPP20031213000078.

[10]Hong Kong *Wen Wei Po*, "China To Set Up Space Laboratory Before 2009 and Space Station Before 2015," 30 March 2004, CPP20040410000026.

[11]*Xinhua, People's Daily* Online, 13 October 2005.

[12]*China Daily*, "Spacewalk Mission Set for 2008: Official," 24 February 2006, FBIS CPP20060224074023.

[13]*Xinhua, People's Daily* Online, 7 March 2006, China's Space Program Seeks New Breakthroughs in Five Years

[14]Shanghai *Jiefang Ribao*, "China's Lunar Probe, Aerospace Development Programs," 17 October 2003, FBIS CPP20031213000078.

[15]Xinhua News Agency, 1 November 2003, China to Launch Moon Probiing Satellite in 3 to 5 Years.

[16]*People's Daily* Online, 22 November 2004.

[17]*People's Daily* Online, November 08, 2004.

presided over by Zhang Yunchuan, minister in charge of the Commission of Science, Technology and Industry for National Defense (COSTIND), which has authority over the lunar program.[18] A spokesman for the China Aerospace Science and Technology Group (CAST) said in October that his company was involved in the research and development for the Chang'e-1 lunar probe.[19] By January 2006, COSTIND had listed the manned space program and the lunar probe program as two of its five major tasks for the 2006-2010 timeframe.[20]

Manned Lunar Missions

Several reasons have been given by the Chinese for lunar missions, to include exploration and exploitation of resources on the Moon, the further development of spaceflight technology, and prestige: "stimulating national spirit and cementing national cohesion." An article in *PLA Daily* in April 2004 further stated that "China will complete the unmanned moon exploration in about 20 years and then launch and fulfill a manned moon landing."[21] Luan Enjie repeated in 2005 that the lunar probe missions were designed to "provide data for manned lunar missions and for choosing a site for a lunar base."[22]

Will the Chinese be able to execute the plan in anything like the timelines described?

The timing of China's planned mission to the Moon remains vague. Ouyang Ziyuan, an academician of the China Academy of Sciences and chief scientist of the Moon-probe program, claimed in November 2005 that "China will make a manned moon landing at a proper time, around 2017," He further claimed that a goal of such missions would be to report on the presence of "Helium-3."[23] At about the same time, Hu Shixiang was saying that he thought a Chinese manned lunar landing would occur "in about 10 to 15 years."[24] The latest comment by Luan Enjie of CNSA, in December 2005, sounded like a plea for patience. "Sending a man to the Moon? It would be a one-way ticket if we do it now, given [that] the thrust of our rockets at present is not strong enough."[25]

The Chinese Program: How Serious?

To sum up, Chinese government and space program officials have collectively described a manned spaceflight program that includes space walks by 2008, space docking attempts by 2011, a space lab in orbit by perhaps 2012, a Chinese space station in orbit by perhaps 2015, and a manned mission to the Moon by around 2017. There have been remarks on other programs – a mission to Mars, Chinese "space tourist" launches – but these seem far off, speculative, and not part of a real program.

Two questions arise about the declared elements of the program as we understand it. First, does this outline reflect the actual Chinese plan? Second, is the plan real in the sense that the Chinese will be able to execute it in anything like the timeframes described? An additional question might be: how do we make reasonable judgments on the first two questions?

In the first case, it may not be possible to know if the outline above is the real plan until we have access to the real plan. It is possible that the

[18] *Xinhua, People's Daily* Online, 23 August 2005.
[19] *Xinhua, People's Daily* Online, 17 October 2005.
[20] *Xinhua, People's Daily* Online, 6 January 2006.
[21] *PLA Daily*, in *People's Daily* Online, 9 April 2004.
[22] *China Daily*, in *People's Daily* Online, 16 August 2005.
[23] *China Daily*/agencies, in *People's Daily* Online, 5 November 2005.
[24] *Reuters/China Daily*, in *People's Daily* Online, 28 November 2005.
[25] *China Daily*, in *People's Daily* Online, "Chinese Man on the Moon Far Off," 30 December 2005.

Chinese will update their White Paper and make the program contents and timetable more explicit. Short of that, a careful watch on future public statements can give a sense of consistency or fluidity in the declared program. Major fluctuations in timing or contents, as they appear in future statements, may suggest that the public plan and the real plan are quite distant from one another. Of course, tracking actual spaceflight activity will eventually tell us if these declarations were made in good faith. It will likely be a matter of some years before we can compare this outline with actual progress. In the near term, the launch of a lunar probe and the accomplishment of a Shenzhou space walk by 2008, as declared, would argue that declarations to date have been about the real plan.

In the second case, the question of whether this is an executable plan, access to the technologies being developed and knowledge of the resources available and allocated to this plan could help determine if they can achieve the stated goals. The Chinese are more likely to be open about the first of these. There is already a certain level of openness in scientific journals' coverage of research for space programs in general. Since the manned program carries such prestige, they are likely to trumpet the achievements made in technologies that contribute to this program. The manned program is also more public and less sensitive than some other space programs such as reconnaissance, geopositioning, and military communications satellites.

Following the money is more challenging because, as with their military budget, the Chinese are anything but open and seem to calculate expenditures in very different ways from the West. There have been a few general statements on space budgets for the manned programs, such as the claim in 2004 that U.S. $2.18 Billion had been spent on the manned space program in the preceding 11 years.[26] Beyond such sweeping statements, little detail is available. We are left to guess whether Chinese spending is sufficient to achieve stated goals in the times given publicly.

Looking at the program in the larger sense, we can see that the Chinese are at a point when the technologies needed for manned spaceflight are now available to them and they believe achievements in manned space exploration are within their grasp and important to national pride. They are serious in that they have set goals for themselves in space and are working toward them. Manned space missions play a prominent role in their plan. Their accomplishment of the set goals of a Chang'e lunar probe and Shenzhou space walk/space docking missions should tell us whether they are serious enough to make the plan happen.

[26] *People's Daily* Online, "China to Launch Space Station in 15 Years," 18 May 2004.