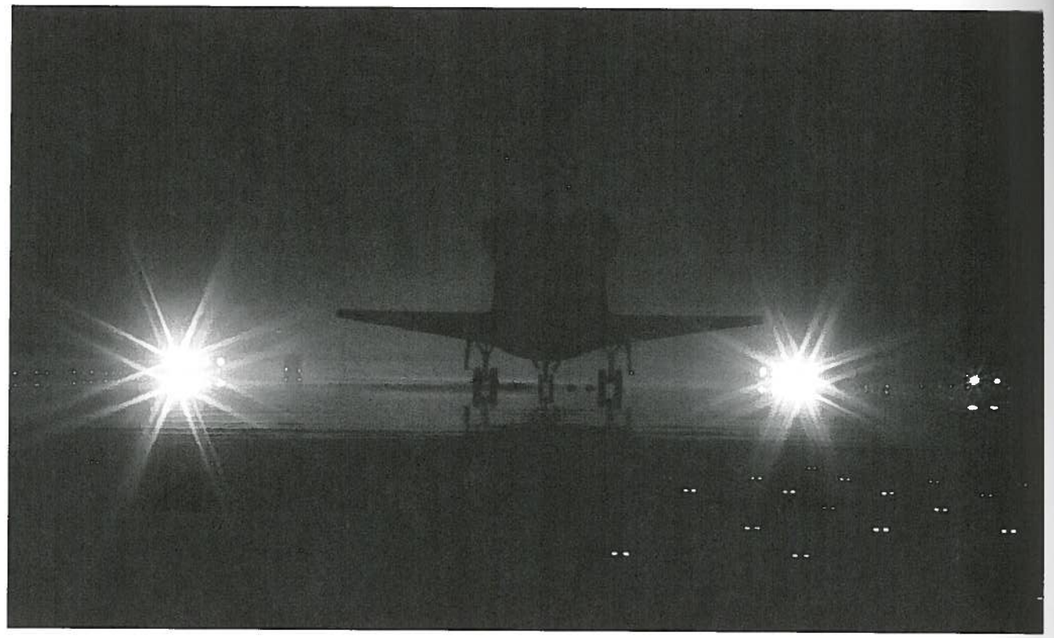

Strengthening Space Security

Advancing US Interests in Outer Space

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Fifty years ago, the Space Age was not yet five years old but the broad outlines of US space interests were visible. The year 1962 saw the first US human orbital flight by John Glenn on a converted Atlas Intercontinental Ballistic Missile (ICBM). Telstar 1 demonstrated the first transatlantic television, telephone, and fax transmissions by an active satellite. The United Kingdom became the third country to operate a satellite with the US launch of Ariel 1. Later that year, both Telstar 1 and Ariel 1 were seriously damaged when the United States detonated a 1.4-megaton nuclear device 250 miles over the Pacific Ocean in what was titled the Starfish Prime test. The Glenn flight and the Starfish Prime test respectively represented the civil and military bookends of US space interests that were to shape international, commercial, and scientific space activities.

Fifty years later, the United States is facing new challenges and opportunities in integrating its civil, commercial, and national security space interests in a dynamic global environment. Space activities today play critical roles in US national security, economic growth, and scientific achievements. The Global Positioning System (GPS) is an integral part of several critical infrastructures and enables functions ranging from survey and construction, to farming, finance, and air traffic management—not to mention supporting US military forces worldwide. The International Space Station represents a unique collaborative partnership between the United States, Europe, Canada, Japan, and Russia. International space cooperation, space commerce, and international space security discussions could be used to reinforce each other in ways that would advance US interests in the sustainability and security of military and civil space activities.

The past five years have seen the emergence of new threats to US space activities, threats that are different from those of the Cold War and which have their own distinct dynamics. Some threats are intentional and others are accidental. In some cases, threats come from a known nation state while in others, it is impossible to attribute responsibility due to a lack of full "space situational awareness" to support intelligence needs.

In 2007, without prior notification, China tested a high altitude anti-satellite weapon (ASAT) against one of its old weather satellites. This test created tens of thousands of pieces of orbital debris and increased the risk of collision and damage to many satellites operating in low Earth orbit, including the International Space Station, for many years. In 2009, there was an accidental collision over the Arctic between a defunct Russian Kosmos communications satellite and an active Iridium communications satellite that added even more orbital debris to low Earth orbit. North Korea, faced with multiple UN sanctions, has continued developing ballistic missile capabilities under the guise of peaceful space launches. Iran continues to jam commercial satellite broadcasts in order to prevent foreign reports of domestic unrest from reaching its population. There have been reports of attempts at unauthorized access to US civil scientific satellites, e.g., Terra and Landsat in 2007 and 2008, but the source of these attempts has not been confirmed. Threats to the sustainability of space activities today come not from a single superpower but from a much more diverse group of actors whose motivations can range from deliberate to ambiguous and even accidental.

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The global space community is a dynamic one with new capabilities and new entrants. Europe is building its own version of GPS, titled "Galileo," and has long been a leading supplier of international commercial launch services with its Ariane family of launch vehicles. China has flown several astronauts, becoming only the third country with independent human access to space. China is constructing a space laboratory and has demonstrated unmanned rendezvous and docking operations in preparation for a fully manned space station in 2020—about the time the International Space Station may be ending its operations. Japan has announced plans to sell radar satellites to Vietnam while South Korea is seeking to sell an optical imaging satellite to the United Arab Emirates. Brazil and China are continuing many years of space cooperation in remote sensing, while India and South Africa are close to concluding their own space cooperation agreement. All of these countries recognize that space capabilities are important for both practical and symbolic reasons and that these capabilities are intrinsically "dual-use" in that civil, security, and commercial applications are based on similar skills and technologies.

Background: US Domestic Space Challenges

US space capabilities today are dramatically superior to what they were fifty years ago. However, in relative terms and compared to the importance of space to US national interests, the trends are worrisome as they represent shortfalls in US space capabilities and disconnects between US policy statements and actions. The second loss of a Space Shuttle, Columbia, in 2003 resulted in the decision to retire the system after completion of the International Space Station. The last Shuttle flight occurred in 2011 and the United States is now reliant on Russia for human access to space. Plans to replace the Shuttle were disrupted by the 2010 decision of the Obama Administration to cancel NASA's Constellation program and shift to reliance on new private providers of crew launch services. While the Bush Administration contemplated a four to five year gap in US human access to space, the current gap may now be more than six years. In addition to the cost of paying Russia for crew transportation, the other Space Station partners are concerned with relying on a single country for access to the International Space Station. Four recent Russian launch failures—a Proton loss in December 2010, Soyuz and Proton-M failures in August 2011, and the Phobos-Grunt Mars mission loss in November 2011—have raised concerns that Russia's traditional strength in reliable launch vehicles may be fading.

In addition to disruptions in US human space flight, the United States was unable to make a long-term financial commitment to Europe for a program of robotic exploration of Mars, despite years of involvement in the planning process. This prompted the European Space Agency to invite Russia to be a full partner in the ExoMars program in October 2011 after discussions with the United States reached an impasse. Budget constraints have similarly prevented domestic production of Plutonium-238 after Russian supplies ran out. This nuclear fuel is critical to providing electrical power to missions traveling beyond Mars and long-term exploration of the planets. There is enough fuel for one more "flagship" mission but that will be the end without new supplies. Finally, budget uncertainty has caused delays in the construction of the next series of weather satellites and the United States may be facing a multiyear gap in meteorological data that will

Photo Courtesy Reuters

result in less accurate near-term weather predictions.

Financial turmoil is not the only source of difficulty for US space operations. The Federal Communications Commission (FCC) has been considering allowing a terrestrial broadband company, LightSquared, to operate in the spectrum adjacent to GPS. This spectrum has been previously allocated to satellite services that were compatible with GPS. Unfortunately, testing has shown that the proposed terrestrial broadband service would create unacceptable interference to many, if not all, GPS-enabled services. The regulatory uncertainty at the FCC has gone on for more than a year and prompted formal expressions of international concern from the European Commission, the Japanese Government, and the International Civil Aeronautics Organization (ICAO) over possible interference to satellite-based positioning and navigation. The international community has been puzzled by the US debate over possible interference to GPS, as the National Space Policy clearly requires the "protection of radionavigation spectrum from disruption and interference."

US National Space Policy and Space Strategy

The current US National Space Policy, a comprehensive document that addresses the full range of US interests in space, was released in June 2010. The policy continues many long-standing principles, such as the right of all nations to engage in the peaceful uses of outer space, recognition of the inherent right of self-defense, and that purposeful interference with space systems is an infringement of a nation's rights. The policy states that the United States "recognizes the need for stability in the space environment" and that it will pursue "bilateral and multilateral transparency and confidence building measures to encourage responsible actions in space."

The policy made some important changes compared to the 2006 National Space Policy, notably with respect to arms control. The 2010 policy does not categorically reject space-related arms control that would constrain US space activities but states that any such agreements would have to be "equitable, effectively verifiable, and enhance the national security of the United States and its allies." This is a traditional policy formulation that was also used during the Reagan Administration. There is nothing in the policy, however, about actively pursuing new international treaties, creating legal norms, or characterizing space as a "global commons" or being part of the "common heritage of all mankind"—ambiguous terms that are advocated in some segments of the international space law and policy communities. Use of these terms by US officials can lead to misperceptions or miscommunications as to US policy and strategic intentions.

The general coherence on the national security and foreign policy side is not matched in the section of the 2010 National Space Policy dealing with civil space exploration. The policy says that the NASA Administrator shall "set far-reaching exploration milestones. By 2025, begin crewed missions beyond the moon, including sending humans to

To the Moon and Beyond

Key Dates of Obama's Plan for NASA (2010)

Date	Goal
2012	2,500 additional jobs in Florida's Kennedy Space Center
2015	Building of a heavy-lift rocket
2020	Extension of the life of the International Space Station (likely beyond 2020)
2025	Manned spaceships for deep-space exploration (manned trip to an asteroid)
2030s	Manned trip to Mars

NASA, 2011

an asteroid." Unlike the carefully crafted text elsewhere in the policy, this section appears to have been directly taken from an April 15, 2010 speech by President Obama at the Kennedy Space Center in Florida. Subsequent technical work has shown that there are few scientifically attractive, technically feasible asteroids that can be reached on this schedule. Even worse, the international space community, which had been shifting attention to the moon in anticipation of that being the next US focus of exploration beyond low Earth orbit, felt blindsided. Countries in Asia, such as Japan, India, China and South Korea, saw the moon as a challenging but feasible destination for robotic exploration and a practical focus for human space exploration. The asteroid mission was, perhaps unintentionally, taken as a sign that the United States was not interested in broad international cooperation but would focus on partnerships with the most capable countries, such as Russia and perhaps Europe. As a result, spacefaring countries are increasingly making their own space exploration plans separate from the United States.

The National Security Space Strategy was released in January 2011 as a report to Congress and is intended to provide direction to the national security space community in planning, programming, acquisition, operations, and analyses. Despite being signed by the Secretary of Defense and the Director of National Intelligence, it places a major emphasis on diplomatic activities as a responsibility of the Department of State—as well as dual-use capabilities that are promoted and regulated by the Departments of Commerce, Transportation, State, and the FCC. The implementation of the strategy says, in part, that (emphasis added):

- "We seek to address congestion by establishing norms, enhancing space situational awareness, and fostering greater transparency and information sharing."
- "We seek to address the contested environment with a multilayered deterrence approach. We will support establishing international norms and transparency and confidence-building measures in space, primarily to promote spaceflight safety but also to dissuade and impose

international costs on aggressive behavior."

The problem with the phrase about establishing norms is that it goes beyond the terms of the National Space Policy. Furthermore, it presupposes there will be some authority by which the norms are established and that the United States will be bound along with other nations. Many harmful activities such as the intentional creation of long-lived orbital debris and intentional satellite jamming are already contrary to international law, notably the Outer Space Treaty and the Constitution of the International Telecommunication Union. Yet there has been little in the way of sanctions save for international complaints. A more useful statement might have been one about promoting compliance with existing international laws and agreements.

Unfortunately, the Defense Department also uses the legally problematic term "global commons" with respect to space in the most recent Quadrennial Defense Review (February 2010). This term applies to the high seas and the air above them, but is not yet accepted internationally or even officially by the United States. Whether intentional or not, use of the terms "norms" and "global commons" sends mixed messages to international audiences about the US view of space, despite stated desires to reduce miscommunication.

Subsequent statements by Defense Department officials expanded on this new concept of "multilayer" deterrence with respect to US space systems. In an April 13, 2011 speech to the 27th National Space Symposium, the Deputy Assistant Secretary of Defense, Greg Schulte, explained that: "The first layer of deterrence is the establishment of norms of responsible behavior, thus separating responsible space-faring countries from those who act otherwise. The second layer of deterrence is the establishment of international coalitions, thus forcing an adversary to contemplate attacking the capabilities of many countries, not just one. The third layer of deterrence is increasing our resilience and capacity to operate in a degraded environment… thus reducing the incentive to attack our space capabilities. The fourth layer of deterrence is a readiness and capability to respond in self-defense, and not necessarily in space, thus further complicating the calculus of a government considering an attack on our space assets." The latter two points are arguably part of traditional deterrence theory in which an opponent is deterred through fear of retaliation or denial of attack objections. The first two points may seem plausible but in practice they can represent a gross oversimplification of possible foreign reactions, including those of our allies. Under threat of attack or denial of crucial space systems, other countries may move toward neutrality in a crisis. In the longer term, they may accelerate the acquisition of independent capabilities rather than be unwillingly "entangled" with the United States.

China and Russia have for many years advocated an international treaty barring space weapons as well as the use or the threat of the use of force against space objects. They have introduced a draft treaty at the UN Conference on Disarmament as part of deliberations on the "prevention of an arms race in outer space." The United States has consistently opposed such a treaty as unnecessary, unverifiable, and not in the interests of the United States and its allies. A major flaw in the draft treaty is the difficulty in defining just what a space weapon is; even if defined, the Chinese-Russian text leaves out ground-based systems such as interceptors and lasers. Consideration of a verifiable agreement, based on behavior, to ban the intentional creation of long-lived orbital debris has not gained much traction due to the impasse over the Chinese-Russian proposal.

Potential International "Space Code of Conduct"

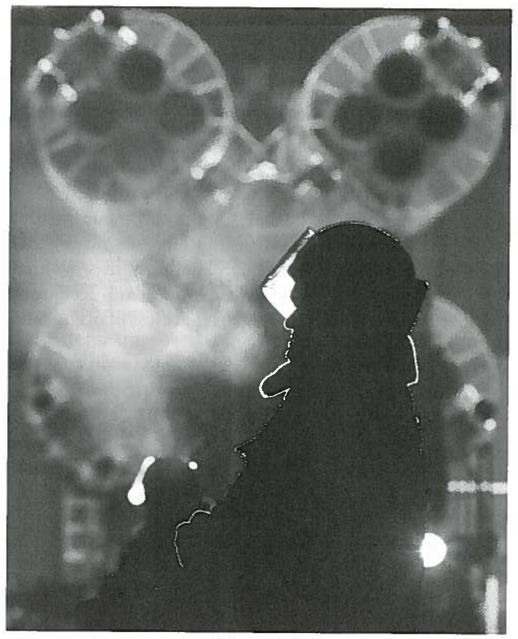
As a pragmatic alternative to the proposed draft treaty, the United States has sought to pursue various "transparency and confidence building measures" that could enhance space security and stability in ways that would be acceptable to both developing and developed spacefaring states. Orbital debris, regardless of origin, and

On April 15, 2010, residents rallied before the visit of US President Barack Obama to the Kennedy Space Center in Cape Canaveral, Florida, where he was to discuss revisions to his space policy proposed earlier.

Photo Courtesy Reuters

radiofrequency interference are hazards to all space operations. Rather than a "top down" negotiation of a treaty among major space powers, the development "bottom up" of technical best practices to mitigate hazards can be a more effective means of engaging a wider range of space actors. This is the approach taken in the development of orbital debris mitigation guidelines over several years in the Scientific and Technical Committee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). The guidelines have helped mitigate the creation of new debris but more needs to be done.

The European Union has proposed a draft "Code of Conduct for Outer Space Activities" that would be a collection of non-legally binding transparency and confidence building measures (TCBMs) for space. A draft code released by the European Union in October 2010 calls for states to "refrain from the intentional destruction of any on-orbit space object or other activities which may



A Russian policeman guards the Soyuz TMA-03M spacecraft ready for transportation to its launch with American and Russian International Space Station crew. 12/19/2011

generate long-lived orbital debris" and for signatories to share information on their space policies and practices. Procedurally, the code is being discussed outside of both COPOUS and the Conference on Disarmament, as the former does not deal with security issues and the latter is deadlocked on other, non-space, security issues. This is a practical approach that avoids being constrained by the existing structures and internal limits of UN organizations.

The United States has expressed overall positive support for the idea of an international code of conduct and the initiative taken by the European Union, but there are a number of sticking points with the current draft. For example, there are phrases calling for "further security guarantees" that are undefined as well as technical ambiguities such as what constitutes "dangerous proximity" for satellite operations. Provisions for an international mechanism to investigate incidents could draw opposition from the major space states, including China and Russia as well as the United States.

Considerable expert-level consultation will be needed before consideration could be given to calling a diplomatic conference for a code of conduct. While the United States and its traditional allies could likely come to an agreement, it is also important to draw in other spacefaring nations outside Europe, Canada, Japan and the United States. The United States and its allies do not have space security concerns with each other as much as they do with the BRICS (Brazil, Russia, India, China and South Africa) - not to mention North Korea and Iran. A space code of conduct will be valuable to the extent it can create a consensus with other spacefaring states around the world. Establishing such a consensus, however, is likely to take longer with countries that do not have a history of close civil space cooperation with the United States.

There will also be skepticism from some in the US Congress toward a code of conduct. In February 2011, a group of 37 Republican Senators sent a letter to Secretary of State Hillary Clinton expressing concerns that US acceptance of a space code of conduct would constrain US space capabilities. They wrote, "We are deeply concerned that the Administration may sign the United States on to a multilateral commitment with a multitude of potential highly damaging implications for sensitive military and intelligence programs (current, planned or otherwise), as well as a tremendous amount of commercial activity." In particular, the Senators were concerned with possible constraints on space basing of missile defense interceptors and anti-satellite weapons as well as the costs of compliance. A code that helps to single out rogue actors and reduces the risk of orbital debris to US space operations might be accepted. A code that tries to go further and limit ballistic missile defenses or which seems to discriminate against the United States will likely be rejected.

A more subtle concern with a space code of conduct is whether it becomes a pretext for avoiding costly improvements in space mission assurance and resilience of critical military functions during conflict. International political agreements are a poor substitute for having actual capabilities to, as the National Space Policy requires, "deter, defend against, and, if necessary, defeat efforts to interfere with or attack US or allied space systems." It is both tempting and dangerous to believe that diplomacy alone can save money in times when total defense spending is under pressure and national security space capabilities may be reduced. Placing a heavy emphasis on norms and coalitions to ensure space security, as expressed in statements about multilayer deterrence and space as a global commons, increases the risk that words might be substituted in place of US capabilities to the detriment of the actual space security.

Photo Courtesy Reuters

Integrating National Interests in Space

Negotiations over possible "rules of the road" in space will not occur in isolation from other aspects of the international environment. From the beginning of the Space Age, space activities have been "tools" of both hard and soft power for participating nations. Hard power is represented by alliances, military capabilities, and economic strength that can compel and pay others to do what we desire. Cultural, diplomatic, and institutional forces are aspects of soft power by which we are able to persuade others to do what we desire. In seeking to advance international security interests in space, the environment for civil and commercial space activities must be considered along with the environment for military and intelligence ones.

The United States undertook the Apollo program in the 1960s to beat the Soviet Union to the moon as part of a global competition for Cold War prestige. The Apollo-Soyuz program symbolized a brief period of détente in the 1970s. The Space Station program was established in the 1980s, in part, to bring the developing space capabilities of Europe and Japan closer to the United States and strengthen anti-Soviet alliances. Russia was invited to join a restructured International Space Station in the 1990s to symbolize a new post-Cold War, post-Soviet relationship with Russia. What might be the geopolitical rationale for the next steps in human space exploration?

> "Deterrence in space is no different from deterrence on the land, seas or in the air: the focus is on understanding the thinking of an opponent."

It is well recognized that many of today's most important geopolitical challenges and opportunities lie in Asia. States under UN sanction, for example, Iran and North Korea, are seeking to develop ICBM capabilities under the guise of space launch programs. China, India, and South Korea are demonstrating increasingly sophisticated space capabilities that serve both civil and military needs. Examples of these capabilities include satellite communications, environmental monitoring, space-based navigation and scientific research. Unlike Europe, there are no established frameworks for peaceful space cooperation across Asia. In fact, the region can be characterized as containing several "hostile dyads" such as India-China, North Korea-South Korea, and China and its neighbors around the South China Sea. At the same time, Asian space agencies have shown a common interest in lunar missions as the logical next step beyond low Earth orbit. Such missions are seen as ambitious but achievable and thus more practical than missions to Mars and more distant locations. A program of peaceful, multilateral exploration of the moon would be a symbolic and practical means of creating a framework for peaceful space cooperation in concert with dual-use discussions of space TCBMs.

While seeking realistic approaches to civil space cooperation with increasingly capable states in Asia, the United States should also take a realistic approach to international space security and deterrence. Deterrence in space is no different from deterrence on the land, seas or in the air: the focus is on understanding the thinking of an opponent. Ensuring adequate military capabilities requires understanding how space systems fit into joint and combined arms campaigns, as well as understanding the views and values of potential adversaries. This in turn may well suggest steps toward greater international cooperation with friends and allies. TCBMs and codes of conduct can be helpful in reducing the chances of accidental conflict and in providing cues to unusual activities. They cannot be seen as a substitute for the military capabilities necessary to deter potential adversaries.

Organizing a broad international approach to space exploration and space security will not be easy—not the least because of errors and confusion in recent US space policy statements, strategies, and programs. US global influence has been diminished by removal of the moon as a focus for near-term human space exploration efforts, a failure to cooperate with Europe on the next stage of robotic missions to Mars, some simplistic assumptions regarding deterrence in the National Security Space Strategy, and limitations in space object tracking and notification capabilities that would reduce the risk from orbital debris for all space users. This cannot help but affect perceptions of US leadership by other spacefaring nations, in particular China. The effective integration of national security and civil space interests in support of US foreign policy objectives would benefit from amending these recent mistakes. Doing so would in turn enable opportunities for creating strategic advantages for the United States and its allies. Space activities do not fit within a single policy domain, department, or agency, but it is the very fact that they engage so many aspects of a nation's policymaking that make them so beneficial to the nation. In shaping the international environment for space activities, hard and soft power can complement each other to build a more secure, stable, and prosperous world in which our values are taken beyond the Earth. ■