The Next Frontier

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Space is vital to America's future. The United States has a strong interest in securing the peaceful uses of space in support of its economic, political, and defense needs. It likewise requires unfettered access to space as an indispensable part of its national security. As such, the U.S. has a vested interest in formulating a modern strategy that is able, in the words of the 2001 Rumsfeld Space Commission, to "deter and defend against hostile acts directed at U.S. space assets and against the uses of space hostile to U.S. interests."[1] Yet, even though it is now well into its second term, the Bush administration has yet to set forth such a national strategy.

What are the future goals of the United States in space? How does space relate to overall American national security? And what space policies are necessary in order to assure national security, international stability, and economic benefit? Answers to all of these questions are essential to American prosperity—and, indeed, to its global status—in the Twenty-First Century.

Why space matters

The stakes are enormous. The United States already relies on space commercially and militarily more than any other nation, and that dependency will only grow in the years ahead, as global telecommunications networks and other technologies for civilian and defense purposes increase in use and in sophistication. Because the United States is more dependent than any other nation on

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space, the threat to and from space is greatest to the United States. U.S. space systems have numerous vulnerabilities, including strikes that could be mounted against ground stations, launch systems, or orbiting satellites. The implications would be potentially catastrophic, both in today's world and in the years to come.

In today's world, an adversary need not match the United States technologically in order to inflict catastrophic damage. The United States is already vulnerable to such attacks in space and on the Earth, and threats will only grow in the years ahead.

One such danger is an electromagnetic pulse (EMP). As the 2004 EMP Commission outlined in its authoritative study, a single nuclear warhead exploded at a high altitude above the United States (between 40–400 km) would generate an electromagnetic pulse sufficient to disable both space-based assets such as satellites and ground-based critical infrastructure, including telecommunications, energy, food supplies, hospitals, and financial institutions, among others.[2] Space systems similarly would be vulnerable to EMP effects from one or more nuclear detonations. Satellites in low-Earth orbit would be especially at risk from the collateral radiation effects resulting from an EMP attack. These satellites are vitally important to such governmental services as weather forecasting and communications, emergency response services, and military operations. Recovery from such an attack would be protracted, painful, and perhaps even impossible.

EMP, as well as similar efforts to disrupt the United States by attacking it in or from space, falls within the overall category of asymmetric warfare. In today's world, an adversary need not match the United States technologically in order to inflict catastrophic damage. The United States is already vulnerable to such attacks in space and on the Earth, and threats will only grow in the years ahead as we proceed with military transformation designed to take account of new technologies based on "net-centric" warfare. Such assets help to identify targets on the ground, just as space provides the navigational systems for military forces and civilian vehicles, including the cars that we drive equipped with GPS. Without space-based capabilities, the United States will be unable to deploy advanced military forces based on unprecedented levels of accuracy, flexibility, lethality, and mobility.

It has been repeatedly asserted that those who seek to defeat the United States in the future will attempt to attack at our points of vulnerability, not where we are strongest. Because the United States depends increasingly on space, its space-based capabilities as well as associated earth-bound technological infrastructures constitute attractive targets to existing and potential enemies. Those who seek to weaken the United States will develop their own space capabilities while discouraging the United States from maximizing its own potential in space, or by a combination of such strategies.

What is remarkable is the extent to which there presently exists a disconnect in U.S. strategy between emerging threats and the level of national commitment to space. Equally striking is the political oppo-

sition evident in many quarters to the full utilization of space by the United States. Such opposition includes those who seek to prevent the United Sates from dominating space, together with those who believe that, by an act of such abnegation, the United States can dissuade others from developing their own space programs. The results are paradoxical; the United States is being criticized for its alleged interest in "weaponizing" space at a time when the administration appears to have distanced itself from the basic recommendations set forth by the bipartisan Rumsfeld Space Commission.

Such arguments skirt a vital point: to the extent that capabilities, however rudimentary, currently exist to attack space systems, space already is becoming weaponized. Moreover, such capabilities are not likely to be eliminated by international treaties or by unilateral U.S. decisions to forgo certain types of weapons.

Changing course

In its January 2001 report, the Rumsfeld Space Commission spelled out in great detail the basic elements of a U.S. national space strategy. These include the development of space systems to hasten U.S. military transformation; the use of space to collect intelligence; shaping the legal and regulatory environment in ways that accord with U.S. national security interests and contribute to commercial competitiveness; and governmental and commercial investment to ensure that the United States has the most advanced space technologies. Among its basic findings is the assertion that, if the United States is to be successful in such a space strategy, leadership by the President and senior officials will be necessary: "Only the President has the authority, first, to set forth the national space policy, and then to provide the guidance and direction to senior officials that together are needed to ensure that the United States remains the world's leading space-faring nation."[3] Last but not least, the Commission called for efforts to develop a trained cadre of military personnel and civilians within the U.S. government to assure that the United States retains a dominant position in space.

One can only speculate as to the reasons why the Bush administration's commitment to space has so far fallen far short of this standard. Conceivably, the tragic events of September 11th distracted attention from space to the more immediate issues of fighting a global war against al-Qaeda and its affiliates—although the prospect that WMD will be acquired by states committed to our destruction or by terrorist groups prepared to use them only adds to the importance of space as a national security priority. Another plausible explanation is that the administration did not heed the admonition that space could become a national priority only if it had strong and continuing endorsement at the highest levels of leadership. Indeed, the White House has increasingly ceded day-to-day control over space technology and policy to career civil servants and bureaucrats.[4]

Fortunately, Washington still has the opportunity to reverse this drift. Conceptually, it should begin by acknowledging that space is already militarized. This process began in 1944, when, during World War II, the first German V-2 ballistic missile traversed the edge of space after launch toward its target in southern England. It continued with the launch by the Soviet Union of its first Sputnik in October 1957. Today, the militarization of space has become commonplace, insofar as a growing number of

nations have deployed assets such as satellites for commercial and military communications and reconnaissance.

The same holds true for weaponization. Historical evidence does not support the proposition that, by abstention, the United States will discourage others from space weaponization. China, for example, apparently views the development of "counterspace" technologies—that is, space-based weapons—as inevitable because they constitute an essential military capability. In its 2005 report to Congress, the Pentagon outlined that Beijing is developing a number of anti-satellite systems (ASATs) that it plans eventually to deploy. China also has a demonstrated space-launch capability, having placed 10 satellites in orbit in 2004, with a similar schedule through 2006 and an additional 100 satellites by 2020, the year in which Beijing also hopes to have a full space station operational.[5]

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Reversing that trend requires using space for essentially two missions. The first is space control, including the protection of U.S. and allied space assets and, if necessary, possessing the means to attack enemy assets and the capability to deny our enemies access to space. In other words, space control capabilities may be offensive or defensive, designed either to deny an adversary access to space or the use of its space-based assets, or to provide the U.S. with the ability to defend its own space-based assets. The United States will need both types of capabilities.

The second revolves around space dominance. The importance of space to our national security and well-being dictates that if the United States is to remain a superpower, it must continue to dominate the high frontier of space. A space strategy would therefore need to include a range of capabilities designed to provide assured access to space, situational awareness in space, earth surveillance, global command, control, and communications, defense in space, homeland defense and power projection in, from, and through space. The goal of the United States should be to develop and deploy weapons that can operate in space, not only to defend assets deployed in space, but also to augment our terrestrial military forces. A national space strategy would also include space-based missile defenses capable of providing a global capability to destroy missiles in all phases of flight.

Looking forward

Given these demanding objectives, a space strategy for the United States would need to contain several essential components:

- *Space-based weapons systems to defend U.S. space-based assets and to support ground-based military operations.* This includes the use of space for missile defense and for strikes against targets in

the air or on the ground. A truly global missile defense to protect the United States and its forces that are deployed overseas, as well as allies and coalition partners, with capabilities that can track, intercept, and destroy missiles and warheads is necessarily space-based. It could be built with kinetic energy weapons, and subsequently could include high-energy lasers. A decade-and-a-half ago, the United States had already developed a robust, capable space-based kinetic energy interceptor known as *Brilliant Pebbles*. But the Clinton administration's decision in the early 1990s to abandon missile defense deployments prohibited by the ABM Treaty led to the demise of *Brilliant Pebbles*.[6] That technology could now be revived and modernized. Without the ABM Treaty and its prohibition on space-based missile defense, the United States can and should be building a missile defense architecture that includes space-based kinetic-energy interceptors as a key layer.

- *Strengthening our ability to collect intelligence about the capabilities and intentions of U.S. adversaries*. This includes an examination of the types of information that can best be collected from space, and the kinds of technologies that we will need to develop and deploy in space for this purpose. The Rumsfeld Space Commission noted that certain commercially available imagery from remote sensing companies can be adapted to meet official collection needs and should therefore be incorporated into the overall space intelligence architecture.

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- *Shaping the space legal and regulatory environment*. Specifically, this means that the United States should participate as actively as possible in developing space regimes that accord with U.S. needs, including the right to defend its interests in and from space. Some other states pursue their interests by seeking international agreements designed to restrict access and thus to counter U.S. advantages in space. Where such agreements serve U.S. interests, they should be supported. Especially with the end of the ABM Treaty, however, the United States should oppose efforts to develop new regulations that are designed to limit our ability to deploy a space-based missile defense.

- *Maintaining technological leadership*. By necessity, this will require renewed emphasis on scientific and engineering skills in space-related fields. The existing workforce is passing from the scene, and will not be replaced in the absence of market incentives in the form of challenging career opportunities. A national commit-

ment to space, backed by necessary levels of sustained funding, would translate into the job market as well as academic specialties.

U.S. space hegemony would create tremendous dividends, both for ourselves and for our allies. Under American oversight, space, specifically low earth orbit, would become an arena for prosperity, open to economic and scientific development by foreign nations.

Indeed, the absence of a national space strategy is evident in the broader trends taking place in science and technology education. A decreasing percentage of Americans are pursuing degrees in science and engineering disciplines and fields. In its report on *Science and Engineering Indicators 2004*, the National Science Board of the National Science Foundation noted "a troubling decline in the number of U.S. citizens who are training to become scientists and engineers."[7] Moreover, foreign expertise is fast outpacing U.S. know-how. Foreign students now account for nearly half of the graduate students enrolled in computer sciences and engineering programs in the U.S. And, while the U.S. educational focus on science and technology has atrophied, the opposite is taking place abroad; between 1991 and 2001, science and engineering Ph.D.s in China and South Korea rose by 535 percent and 150 percent respectively.[8] Both for missile defense and for space more generally, the United States will need to make major new investments in science and technology education in the years ahead.

Likewise, if the United States is to remain dominant in space, new defense-industrial approaches are necessary. The aerospace sector's share of total national research and development investment has declined precipitously—from about 26 percent in 1987 to less than 4 percent in 2001.[9] Compounding this decline, U.S. companies are investing more heavily in efforts to win modernization contracts based on existing technologies, rather than investing in "leap ahead" technologies that would dramatically transform our space program. A concerted focus on technological innovation is needed to assure that the U.S. space industry can continue to produce systems that are at least one generation ahead of its international competitors.

Learning to love American space power

Because space control is vital to the United States, and because American space assets must be protected, Washington should not shrink from developing the means necessary to ensure space dominance. Specifically, this means developing and deploying capabilities designed to protect U.S. space-based systems and the use of space as part of a layered missile defense for the United States.

It often has been asserted by critics that our goal should be to prevent an arms race in space. Yet, it is highly doubtful that the United States, by abstaining from the military uses of space, can actually prevent such an

arms race. In fact, the opposite is likely to happen. Nature abhors a vacuum, and a strategic vacuum in space will naturally be filled by others.

U.S. space hegemony, on the other hand, would create tremendous dividends, both for ourselves and for our allies. Under American oversight, space, specifically low earth orbit, would become an arena for prosperity, open to economic and scientific development by foreign nations. In other words, just as great powers historically have asserted control over spatial domains such as the oceans in order to protect their national interest in peaceful passage, the United States should provide leadership in formulating and enforcing rules for space operations.

Whenever possible, the United States should work with other states that share our interests in developing and enforcing law and shaping the regulatory environment in space, while simultaneously extending the frontiers of knowledge and security into space. Such a goal, however, cannot become a reality until and unless the United States acknowledges the primacy of space in the broad context of its national security interests.

1. *Report of the Commission to Assess United States National Security Space Management and Organization*, January 11, 2001, vii (http://www.defenselink.mil/pubs/space20010111.pdf).
2. *Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack*, Volume 1: Executive Report, 2004, 4-7 (http://www.globalsecurity.org/wmd/library/congress/2004_r/04-07-22emp.pdf).
3. *Report of the Commission to Assess United States National Security Space Management and Organization*, ix.
4. See, for example, "Space as a Vital National Interest," George C. Marshall Institute *Policy Outlook*, August 2005, 4 (http://www.marshall.org/pdf/materials/315.pdf).
5. Office of the Secretary of Defense, *ANNUAL REPORT TO CONGRESS: The Military Power of the People's Republic of China 2005* (July 2005), 36 (http://www.defenselink.mil/news/Jul2005/d20050719china.pdf).
6. For a detailed history of *Brilliant Pebbles*, see Donald R. Baucom, "The Rise and Fall of Brilliant Pebbles," *Journal of Social, Political and Economic Studies* 29, no. 2 (September 2004), 145-190.
7. National Science Board, *Science and Engineering Indicators 2004* (Arlington, VA: National Science Foundation, 2004) (http://www.nsf.gov/statistics/seind04).
8. Norman R. Augustine and Burton Richter, "Our Ph.D. Deficit," *Wall Street Journal*, May 4, 2005; See also Sharon Begley, "Slim Pickings: Behind 'Shortage' of Engineers: Employers Grow More Choosy," *Wall Street Journal*, November 16, 2005.
9. Extrapolated from *Aerospace Facts and Figures 2003/2004* (Washington, DC: Aerospace Industries Association, 2004), 104 (http://www.aia-aerospace.org/stats/facts_figures/ff_03_04/FF03P104.PDF).