

COMMENTARY

Space Power Beyond Challenge:

The Wrong Direction for the United States

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Space systems are a crucial and necessary element to contemporary American warfare tactics. However, the militarization of space should not give way to the weaponization of space (that is, the development of weapons capable of attacking targets in space or targets on earth from space). Despite much rhetoric on the vulnerability of American space infrastructure and the presumed inevitability of space as a future battleground, weaponizing space would prove technologically, economically, and strategically impractical, especially when compared to existing or alternative security measures. Furthermore, American weaponization of space would bolster resentment toward the U.S. in the rest of the world and could incite an international space arms race. As the world's dominant military and space power, the United States should take the leading role in maintaining space for peaceful purposes, as stated in the Outer Space Treaty of 1967.

“America has, and intends to keep, military strengths beyond challenge...”
- George W. Bush¹

The ability to operate in space has given the United States the advantage of the “high ground” in contemporary warfare. This is evidenced by the quick successes in Operation Desert Storm in 1991, and more recently in Operations Enduring Freedom in 2001 and Iraqi Freedom in 2003. Never before has full-scale conflict

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relied so heavily, and so effectively, on space-based communication, observation, navigation, and weapons guidance systems. Images from reconnaissance satellites provided intelligence for coordinating maneuvers, telecommunications satellites relayed commands across oceans and continents, and global positioning system (GPS) satellites accurately directed both troops and munitions to their destinations.²

Yet satellite-based cameras and the global positioning system are not functionally different from the telescope and sextant of an earlier era of warfare. Furthermore, though these tools are integral components of modern weapons systems, they differ from similar civilian applications only in the quality of detail, and not by much. Still, the Pentagon has access to outer space in the same way as any other government organization or private company could openly do. By using space for the purposes of information collection and transmission and operating military hardware in orbit the United States has already militarized space. However, the militarization of space is very different from the *weaponization* of space. Whereas the former is about supporting Earth-bound military activities, the latter is about using weapons in space. Weapons technologies do not yet exist to attack targets in space or to attack targets from space. It is very important that this line not be crossed and space remains weapon free.

Increasing the accuracy of conventional weapons through supporting satellite technology, such as the Joint Direct Attack Munition (JDAM) guidance package for bombs, is a categorically different endeavor from developing anti-satellite (ASAT) weapons or orbiting weapons platforms that can attack earthly enemies or defend against ballistic missiles. Some believe that without such systems the United States – including its property in orbit – is vulnerable to hostile forces. It is, first of all, unlikely that any space-based weapons system will be feasible within foreseeable time horizons due to constraints of cost and expected levels of technological capability. But regardless of how well, or even if these systems may function, a decision by the United States to develop or deploy them would incite a strong negative response in the international community and provide the impetus for other space-faring nations to develop and deploy space weapons systems of their own, thereby increasing the United States' vulnerability to attack.

Crossing the weaponization threshold by using arms in space is wholly unnecessary for national security at this time. Such a policy would be neither technologically feasible nor cost-effective, and might very well spawn a destabilizing arms race for the twenty-first century, inciting old rivalries and creating new ones. For now, let us limit the military use of space for assisting Earth-bound conflict. Let us reiterate the sentiment behind the 1967 Outer Space Treaty signed at the United Nations by many countries, including the US, and that aims at maintaining space as a peaceful environment. Let us also continue to promote civil space science and technology endeavors that can and do yield a myriad of social and economic benefits. In its extraterrestrial activities, the United States should occupy the moral “high ground”

and refrain from pursuing military space power beyond challenge.

Space Pearl Harbor

The Bush Administration is of a different ideology. It has opted the United States out of the Anti-Ballistic Missile Treaty (ABM) in favor of the development of a defense system which would include space-based missile interceptors. The administration's military budget for fiscal year 2004 includes \$14 million for a "space test-bed" for space weapons.³ This trend has its origins with Secretary of Defense Donald Rumsfeld, who previously served as chairman of the Commission to Assess United States National Security Space Management. In January of 2001 the commission released a report indicating that the United States' wide use of space systems, both military and commercial, makes it relatively dependent on them and that these systems could be attractive targets to hostile forces. The report continues by defining the space as "a medium in which highly valuable applications are being developed and around which highly lucrative economic endeavors are being built."⁴ It is stressed that United States is vulnerable to what it calls a "Space Pearl Harbor." The Rumsfeld Commission recommends that "the U.S. Government should vigorously pursue the capabilities called for in the National Space Policy to ensure that the President will have the option to deploy weapons in space to deter threats to and, if necessary, defend against attacks on U.S. interests."⁵

Employing the image of Pearl Harbor is clearly a fear-mongering tactic. Moreover, such an analogy presents at least a couple of major flaws. First, those events were the result of an increasing militarization of the pacific region by two powerful nations, Japan and the United States. In contrast, today there is no existing dominant power in space. International law dedicates space as a communal area to be used for peaceful purposes, and no country would feel threatened by U.S. activity there, that is, unless that activity was of a provocative, potentially offensive military nature.⁶ The second problem with the analogy is that the disaster at Pearl Harbor did not result from a lack of ability to defend against such an attack, but rather from cracks in intelligence gathering and analysis.⁷ Preventing a space Pearl Harbor or another 9/11 will be a matter of discovering the possibility of an attack rather than defending from it, and thus dependent on intelligence gathering, analysis and human decision-making rather than on available weaponry.

Vulnerability in Space

The development of weapons to destroy or damage space targets is a major component of space weaponization. Some believe that the United States must be able to defend against enemies who might plan to use such weapons. The Rumsfeld Commission repeatedly notes in its report how U.S. interests in space are vulnerable – an example of wording particularly effective when directed at the American psyche. Being vulnerable would imply that a threat exists, but who could pose such a threat?

The qualifying factor for any potential space enemy is the ability to launch a rocket into space, a very money- and technology-intensive endeavor. There are only a limited number of nations that have launch capabilities. None we would consider enemies or “rouge states.” Moreover, space launches are extremely costly, ranging from \$4,000 to \$10,000 per pound. This makes access to space difficult even for nations with large economies and next to impossible for non-space-faring nations and terrorist groups. It would be much easier and cost effective for hostile forces to attack the ground station components of satellite systems, or use subtler means to disrupt communications by jamming transmissions or hacking into computer systems. In fact, this is exactly the tactic that the Iraqi military used during the most recent war; they employed at least six high-powered GPS-jamming devices to disorient satellite-guided weapons. These devices cost only \$40,000 each and have an effective range over several miles.⁸

As for institutionalizing non-proliferation in space, most nations in the world have called for a ban on all types of space-based weapons through United Nations resolutions. The U.S. on the other hand —along with only two other nations, Israel and Micronesia— has opposed even discussing such legislation.⁹ Even more ironic, the United States is the only nation openly developing ASAT weapons through the Army’s Kinetic Energy Anti-Satellite program.¹⁰

Whereas an attack on US satellites has been pointed out as the most urgent challenge to confront in space, it must be considered that anti-satellite (ASAT) technology is highly sophisticated, expensive to develop and deploy. A typically hypothesized hostile ASAT scenario involves the detonation of a nuclear bomb in orbit. This would send out a powerful electromagnetic pulse, disabling all electronics on satellites not sufficiently hardened or blocked by the Earth itself and much the electronics on the Earth’s surface immediately below.¹¹ Such a scenario assumes an enemy that has access to both nuclear weapons and launch capabilities. There would be no reason for a Russia, a China, or any other nation to knock out any of our communication satellites in a Pearl Harbor-like surprise attack, except as the first step of a full-scale war. However if this were the case, it would be very difficult to maintain the element of surprise with today’s advanced, satellite-enabled reconnaissance techniques. Preparations for war take time, and unusual troop movements and naval maneuvers would be very visible a long time in advance of any attack.

The reality is that there is no credible United States vulnerability to ASAT attack from either cold war or war-on-terror enemies. If there were a real threat posed to United States interests in space, then the first place that concern would materialize would be in the commercial sector, the source of the highly lucrative economic endeavors that Mr. Rumsfeld feels are at risk. Yet there is no such concern from that side. Richard DalBello, President of the Satellite Industry Association, is skeptical about current trends in the United States military to weaponize space. DalBello says that the military’s plan for space weaponization is principally one of

self-interest, seeing as the easiest satellites to target would be those in Low Earth Orbit (LEO), where most Defense Department assets are concentrated.¹² He also thinks that there is general agreement within the satellite industry that the risk of attack has been overstated. According to DalBello, “physics imposes heavy burdens on potential attackers” due to the technology, materials and launch costs previously discussed. He also notes the large problem of debris. If there is an exchange of weapons fire in space and objects are blown apart, the debris will not “sink” like a shipwreck at sea. Rather, fragments will continue to orbit the Earth in unpredictable ways and at high velocities, indiscriminately endangering all other satellites along their trajectories.

Force Applications From Space

Apart from protecting U.S. interests in space, a central theme of space power beyond challenge would be protecting terrestrial U.S. interests from space. This would mean the placement of weapons systems in orbit for use in attacking targets on Earth. The advantages of space-based weapons is that they can be deployed anywhere in the world within a few hours and would be nearly impossible to defend against because of their incredible speed. Possible uses of so-called force applications include bombing tasks normally assigned to airplanes, or more likely the incorporation into a ballistic missile defense system. It is doubtful that either would be effective.

One popular option for force applications from space would be the de-orbiting of inert, metal rods that would rain down on targets with great speed and energy. Though these projectiles would have no explosives, their sheer velocity of four to six kilometers per second would impart energy to the target equivalent to a conventional explosive. However, the cost of developing the technology for such a platform, launching it and regularly exploding the ammunition, as well as operation and maintenance costs make it doubtful that the efficacy versus expense of such a system would justify its use over traditional air power.

More impressive than kinetic energy weapons are direct energy weapons (DEWs), which could transmit destructive force to their targets instantaneously. The DEW with the most potential for development, and to which the most research has been committed so far, is the laser. Air Force Colonel William N. McCasland, program director for the Space-Based Laser, has said that possible missions could include ASAT and radio jamming functions, shooting down high altitude aircraft and cruise missiles, as well as “denying access to space” of hostile forces.¹³ This last option makes it attractive for purposes of ballistic missile defense, but in reality it would not be practical.

Destroying an ICBM with a laser requires focusing the beam on the same spot on the missile’s surface when it is in its boost phase. The beam must stay within a few feet for a few seconds while the relative velocities between the orbiting laser and its target are thousands of miles per hour. To focus properly and generate the

power necessary to burn through the missile casing, the lasing chamber alone would have to be 25-50 meters in length and 10-14 meters in diameter. Such a colossal machine could not be launched in one piece by the Space Shuttle. Rather, it would have to be constructed in orbit like the International Space Station, at great expense of money and time and certainly without the option of sharing the burden with international partners. This is significant not only for cost, construction, and deployment concerns, but for tactical considerations as well. The large size would make retargeting times unacceptably slow.¹⁴

The expense of a space-based laser system would be astronomical and it would provide little or no protection. An example of the great logistical difficulties and expense involved are the chemical fuel requirements for these satellites. Bearing in mind that launch costs range from \$4,000 to \$10,000 per pound of payload, it could cost over a billion dollars for each satellite *simply to transport the fuel into orbit*.¹⁵ This figure does not take into account the costs for research and development, engineering, materials, or manufacturing of the system components here on Earth. Nor does it consider launch, in-orbit construction and maintenance costs of such large and complicated hardware. In contrast, the countermeasure technology would be significantly cheaper – covering the missile in a reflective coating, for example, or spinning the missile while in flight so that the laser does not focus on the same spot.¹⁶

Proponents of ballistic missile defense say that a space-based DEWs would be complemented by ground-based interceptor missiles and that the integrated system would be effective as a whole. While ground-based missile defense is not in the purview of this paper, it should be noted that it runs into exactly the same problem: very cheap countermeasures. The great technical difficulty of both ground- and space-based missile defense systems and the lack of interest, on behalf of proponents, as to whether they are feasible could mean that we would not know if they truly worked properly unless a missile attack actually occurred. The effect of a ballistic missile defense system would be that billions, if not trillions, of dollars would be spent to gain us no further safety than we already have.

Space for Peaceful Purposes

The surest way for the United States to guarantee national security and protect its assets in space is to act proactively through intelligence efforts and take steps to maintain space for peaceful purposes. Initiatives to place weapons platforms in space would run contrary to this goal and could only serve to provide the impetus for other space-faring nations to undertake space weaponization programs of their own. The United States is so proficient in space technology that no other nation would consider space warfare unless the United States first established it as a legitimate arena for combat.

One question remains, who would be the enemies defending against America

should it embark on a quest for unchallenged space power? China certainly tops the list. A Cato Institute brief had this to say on the matter: “To be sure, not deploying weapons in space is no guarantee that potentially hostile nations (such as China) will not develop and deploy ASATs. However, it is virtually certain that deploying U.S. weapons in space will lead to the development and deployment of ASATs to counter such weapons.”¹⁷

If the United States starts down this road, it would be foolish not to expect China as well as other countries to try to do the same. India is definitely capable of competing in the area of space technology, and if China does it India may feel the need to defend itself. If India goes, Pakistan will have to follow. Funds in all of these countries will be further redirected from where they are most critically needed just to ensure national security through mutual deterrence. Far from promoting a peaceful environment in space, the United States’ orbiting of weapons would likely trigger a space arms race resulting in increased global instability.

Unfortunately, the United States is within its rights as a sovereign nation to do so. The Outer Space Treaty of 1967, to which the United States is a signatory, already bans weapons of mass destruction anywhere in space, including on celestial bodies, and prohibits the establishment of military bases, the conducting of military maneuvers and the testing of any type of weapons on the moon or any other celestial body.¹⁸ It does not, however, explicitly ban all weapons from space. The international consensus that space, the moon and other celestial bodies should be used for “peaceful” purposes is somewhat ambiguous. Where many nations believe this to mean non-military, the United States consistently interprets this as non-aggressive. Indeed, the Rumsfeld Commission was careful to point out that this definition of peaceful “comports with customary international law allowing for routine military activities in outer space, as it does on the high seas and in international airspace.”¹⁹

Yet weapons, by their very nature, risk being provocative even when labeled as “non-aggressive.” It is natural to expect that nations that could respond to any American initiative of space weaponization, such as China, would do so. By developing space weapons the United States would not only risk similar actions by other nations, but could also be considered in violation of international law. Although ambiguous as for prohibiting weapons, the Outer Space Treaty clearly commits nations to be legally responsible for any damage done to any other nation’s property in space, allowing any attack on orbiting hardware to be resolved within the jurisdiction of international law, and ultimately on terrestrial battlegrounds if necessary.²⁰ Legal structures already exist to deter against aggressive behavior in space. The United States should not act in such a way to cite precedent for other nations to ignore established international law, or indeed provoke them to do so out of their own national security interests.

Should one want to use space technology to increase the security of the nation, there are plenty of realistic options which do not cross into the realm of

weaponization. Improvements to GPS could make its signal less susceptible to enemy jamming and increased resolution on spy-satellites would yield better intelligence. Practical space applications also exist beyond the purview of the military. Mother Nature can cause extreme economic and human loss, and unlike terrorists or rogue nations we can be certain that she will always strike again. Orbiting earth observation systems can do much to prevent or mitigate the consequences of natural disasters. Advancements in meteorological satellite technology would, for instance, provide better tracking of tropical storms, saving lives and monetary costs of unnecessary evacuation.

High technology space systems already exist to maintain peace and security, and they yield tangible results with relatively little expenditure. The problem with ASAT capabilities and orbiting weapons platforms is not that they bear the stigma of science fiction. Rather, it is that further investment in such systems would be extremely costly and would have very uncertain benefits, especially when compared to the guaranteed public welfare improvements from civilian space technology. Furthermore, civilian space programs lend themselves towards international cooperation and improved global relations, especially in the realm of earth observation and disaster management. Space weaponization would have exactly the opposite effect.

Conclusion

Under the Bush administration, the United States is heading toward a position of military power beyond challenge including the weaponization of space. Yet there is no imminent challenge in space and movement in this direction takes us further from efforts of arms reduction on the Earth. The need for military protection of American assets in space simply does not exist and space-based defenses would be economically, strategically and technologically ineffective. The placement of weapons in space would only waste money, create an international space arms race and increase the risk of armed conflict in or from space. The Outer Space Treaty already holds nations liable for damage to another nation's property in space. That legislation, the possibility of international legal action, and the deterrent effect of earth-bound military force as a last resort should be enough to contend with any such actions. American weaponization of space would be contrary to the spirit of peace embodied in the Outer Space Treaty and could set the precedent for its further distortion. Furthermore, it would be at the expense of practical space applications that could have significant economic and social benefits.

Ironically, the same sense of national pride that moves some Americans to desire space power "beyond challenge" initiated the era of space travel. Perhaps that is why total control of space is so hard for Americans to let go. In the long term, though, traversing space and landing a man on the moon was less of an American accomplishment than a human one, and though it was the product of competition, the space race symbolized a triumph of peace over war. Inscribed on a plaque on the

Apollo 11 lunar lander are the words “we came in peace for all mankind.” I have confidence that generations from now visitors to that historic site in the Sea of Tranquility will care more about the immortal words written on that plaque than the colors on the flag that was planted next to it.

NOTES

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² Stephen Biddle, “Afghanistan and the Future of Warfare”, *Foreign Affairs* Vol. 82, no.2 (March-April 2003).

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⁴ U.S. Congress, *Report of the Commission to Assess United States National Security Space Management and Organization*, (Washington, D.C: U.S. Congress, 2001), 11.

⁵ *Ibid.*, 12.

⁶ United Nations Office for Outer Space Affairs, “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,” 22 January 1977. Available at: <http://www.oosa.unvienna.org/treat/ost/outersptxt.htm>; 12 January 2003.

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⁸ Frank Vizard, “Safeguarding GPS,” *Scientific American*, 14 April 2003. Available at: <http://www.sciam.com/article.cfm?SID=mail&articleID=00079DD3-DAA0-1E96-8EA5809EC5880000>; 10 June 2003.

⁹ Theresa Hitchens, “Weapons in space: Silver Bullet or Russian Roulette? The policy Implications of U.S. Pursuit of Space-Based Weapons,” 18 April 2002. Available at: [http://www.gwu.edu/~spi/spaceforum/BMDandSpaceWeaponizationHitchensPaper\[1\].pdf](http://www.gwu.edu/~spi/spaceforum/BMDandSpaceWeaponizationHitchensPaper[1].pdf); 18 January 2003.

¹⁰ *Ibid.*, 5.

¹¹ George W. Ullrich, Defense Special Weapons Agency, “Threats Posed by Electromagnetic Pulse to U.S. Military Systems and Civilian Infrastructure,” Statement to House Military Research and Development Subcommittee, 16 July 1997.

¹² Richard DalBello, President of the Satellite Industry Association, Personal communication with author.

¹³ Hitchens, 7.

¹⁴ William L. Spacy, “Does the United States need space based weapons?”, 12 September 1999. Available at: https://research.au.af.mil/Papers/special_collection/CAD-PAP/spacy.pdf?pdf_button=Adobe+Acrobat+4.0+document; 15 January 2003.

¹⁵ *Ibid.*, 14.

¹⁶ *Ibid.*, 12.

¹⁷ Hitchens, 12.

¹⁸ Stephen Gorove, “Article IV of the 1967 Outer Space Treaty and Some Alternatives for Further Arms Control,” in Nandasiri Jasentuliyana, ed., *Maintaining Outer Space for Peace-*

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¹⁹ U.S. Congress, 17.

²⁰ *Ibid.*