Military Space Doctrine

Before examining relevant technology and policy pertaining to the militarization and weaponization of space, it is important to appreciate the political complexity that governs the military use of space. Four dominant schools of thought exist: the sanctuary school, the survivability school, the space control school, and the high ground school.[1]

The sanctuary school asserts that space should not be weaponized at all.[2] Surveillance satellites are important military assets because of their ability to fly without limitation over international territories. They can act as first-strike deterrents for intercontinental ballistic missiles (ICBMs) and other terrestrially launched weapons of mass destruction. Their uninhibited overflight also allows arms treaties to remain effective through verification.[3]

The sanctuary school is partially flawed because it relies very heavily on the cooperation of unfriendly countries. As long as the United States continues to develop, deploy, and rely on satellite technology for military applications, it will be in the interest of unfriendly countries to develop antisatellite (ASAT) capabilities. ASAT capabilities are well within the reach of most states with reasonably advanced technology, and ASAT propagation presents numerous threats to both American space assets and international interests.

The survivability school contends that because satellites are inherently vulnerable, countries should not become reliant on them for military applications.[4] Unfortunately, the Cold War provided a window for the United States and the Soviet Union to become excessively reliant on satellite technology without international interference. As a result, the survivability school holds little merit as a modern doctrine for the use of military space. Presently, for other nations to become strategically on par with the United States on the battlefield, they must decide to rely on a large amount of satellite technology themselves, or develop a functional ASAT capability to cripple American military space assets.

In start contrast to the sanctuary and survivability schools, the space control school asserts that complete military control over the space environment should be pursued.[5] Adherents believe that space is inherently the same as any other military theater.

The high ground school is similar in the way it views the practicality of space as a strategic asset; asserting that because space is the "ultimate high ground", it provides an invaluable opportunity for terrestrial dominance.[6]

It is important to note the way in which these two latter schools prescribe the implementation of weapons systems. Adherents to the sanctuary school and the survivability school conclusively derive that an American implementation of space weapons would be inherently dangerous to international stability. However, both the space control school and the high ground school presume it to be a strategic imperative. Modern United States space policy

[1] Mowthorpe, p. 12.
[2] Ibid.
[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] Ibid., p. 13.

adheres closely to the two more aggressive schools. The reasons for America's departure from cosmic pacifism are worthy of an aggressive examination.

American Militarization of Space

Before the Soviet launch of Sputnik 1 on October 4th, 1957, no American military service had issued a plan or doctrine for the potential use of space as a strategic arena. The lack of objection from the international community over the launch of Sputnik 1 established the precedent that undeterred satellite overflight of national territories was to be internationally condoned.[7] The seeds for Cold War satellite reconnaissance programs were planted.

It should be noted that the militarization of space is distinct from the weaponization of space. The "weaponization of space" refers specifically to the implementation of space-based weapons, while the "militarization of space" refers to the use of reconnaissance and communications satellites to aid terrestrially based forces.[8]

American dependence on military satellites grew immensely during the Cold War, but it was not until 1975 when the Ford administration convened the Slicther Panel that any credence was given to the idea that the militarization of space could be detrimental to long term international stability. The Slichter Panel concluded that military dependence on defenseless satellites was growing.[9]

The Gulf War of 1991 is considered the first "space war" by most military analysts. The Global Positioning System (GPS) allowed for precision navigation in a featureless environment. Joint Direct Attack Munitions, missiles equipped with GPS modules, provided an inexpensive alternative to cruise missiles.[10]

Advanced surveillance systems allowed commanders to see near-instantaneous enemy force placements and movements. Over 60 Western military satellites allowed the deployment of an army of 400,000 to a foreign theater in several weeks.[11] During the most intense parts of Desert Storm, more than 700,000 telephone calls and 152,000 messages were sent every day. 85% were carried by both military and civilian satellites.[12]

The US military relied heavily on commercially available civilian technology when its own equipment became overloaded, indicating the wide availability of advanced military space technology and the ease with which a potential adversary could cripple American space defenses.

Many civilian space technology sources are international corporations, which presents additional problems. EOSAT, a US-based company that operates the Landsat series of surveillance satellites, had to sell imagery information to non-coalition countries during the 1991 Gulf War due to legal reasons.[13]

It is apparent from the nature of military operations during the 1999 conflict in Yugoslavia that American military satellite technology, and by extension its dependence on space assets, advanced further after the 1991 Gulf War. Between 15 and 20 different American and European space systems consisting of over 50 satellites were involved in NATO coordination, intelligence and strike operations. Damage assessments and troop placements at

[7] Ibid., p. 14.
[8] Ibid., p. 3.
[9] Ibid., p. 16.
[10] Ibid., p. 4.
[11] Ibid., p. 166.
[12] Ibid., p. 167.
[13] Ibid., p. 169

night and in all weather conditions were coordinated through 1-3 ft resolution satellite images.[14] NATO satellite data was tied so closely to the timing and placement of strategic operations that the US Air Force Space Command classified satellite orbital data that had previously been public because a skilled Yugoslavian analyst could have used satellite overflight times to predict attacks.[15]

In current operations in Afghanistan and Iraq, the ability of commanders to view video from UAVs (unmanned aerial vehicles), identifying targets to be attacked on the ground in near-real time is due largely to advanced satellite communication.[16] Precision operations against a fugacious enemy are possible only through satellite reconnaissance. Recently, the existence of American photoreconnaissance satellites with near real-time capabilities has been confirmed by US Air Force Space Command.[17]

Satellite dependence, due to its strategic effectiveness, inherently breeds more satellite dependence. The most recent Department of Defense war games have shown that the United States requires a capability to rapidly reconstitute its national security space platforms.[18] American satellite dependence is a crutch that an enemy of moderate technological inferiority could potentially exploit. Many influential policymakers, including Secretary of Defense Donald Rumsfeld, have suggested that America should develop a more substantial ASAT capability. However, an increased ASAT capability would increase America's satellite dependence while at the same time initiating scores of other strategic issues.

American ASAT Development

The Soviet Sputnik program provided the initial rationale for American development of an ASAT capability concurrently with satellite surveillance programs during the Cold War. By November 1957, every branch of the US military had a separate ASAT proposal.[19] However, President Eisenhower understood that the United States was more reliant on satellite reconnaissance than the Soviet Union and did not want to jeopardize American space assets with development that could lead to an anti-satellite arms race.[20] Eisenhower's ASAT policy reflects survivability school arguments and an uncanny amount of foresight.

In the late 1950s, no country had significant space assets by today's standards, yet many of *today's* policymakers and theorists fail to recognize the vulnerability of the American military through its *current* space assets. Given the extent to which the modern United States military is reliant on satellites compared to the military of the 1950s, this reflects an astonishing amount of ignorance.

During the Cold War, American policymakers were forced to make ASAT decisions based on the overt nature of the programs that would implemented as a result. The Soviet Union was not faced with the same dilemma because Soviet society was much more closed than American society. In 1963, the Soviet Union formed the PKO (Protivo Kosmicheskaya

[14] Ibid., p. 203.
[15] Ibid.
[16] Ibid., p. 204.
[17] Ibid., p. 192.
[18] Ibid., p. 193.
[19] Ibid., p. 14.
[20] Ibid., p. 110.

Oborona) for the development of an ASAT capability[21]. Unfortunately, this was likely as a result of President Kennedy's ASAT policy. Believing that a Soviet ASAT threat was on the horizon, the Kennedy administration preemptively authorized the US Army Program 505 in May 1962 to adapt the NIKE-ZEUS ABM (anti-ballistic missile) system into an ASAT role.[22]

The Soviet PKO ASAT program of 1963 is an important example of the type of policy that can potentially breed ASAT proliferation. Its precedent has largely been ignored by the current Bush administration, which blindly clutches to the idea that an American ASAT will act as an ASAT deterrent, and not justification for a hostile state's own ASAT program.

President Kennedy's decision seems even more ludicrous given that an American ASAT capability would not have deterred Soviet ASAT development during the Cold War because the Soviet Union knew that the United States was more dependent on satellite technology.[23] Future administrations, with the notable exception of President Carter's, failed to continue President Eisenhower's anti-ASAT legacy. The Carter administration vigorously pursued an ASAT treaty with the Soviet Union. Carter understood the risks involved with ASAT proliferation and the weaponization of space. His administration's press releases clearly define his position on the issue:

"The United States finds itself under increasing pressure to field an anti-satellite capability of its own in response to Soviet activities in this area. By exercising mutual restraint, the United States and the Soviet Union have an opportunity at this early juncture to stop an unhealthy arms competition in space before the competition develops a momentum of its own."[24]

In 1978, the US State Department believed that the benefits of an anti-ASAT treaty with the Soviet Union would be far greater than the risks of covert Soviet ASAT deployment.[25] Unfortunately, the SALT II treaty on June 18th, 1979 and the subsequent Soviet invasion of Afghanistan pushed the ASAT issue into the background[26] at a critical time: immediately prior to the Reagan presidency.

It is important to assert that heavy American reliance on military satellites is not a serious issue in a conflict against an enemy of *vast* technological inferiority, such as Iraq in the 1991 Gulf War. However, an enemy with modest satellite or ground-based ASAT capabilities could easily destroy American satellites and subsequently cause immense damage to an American military campaign.

The Partial Test Ban Treaty of 1963 prohibits high-altitude nuclear detonations, but nuclear explosions in space could very effectively act as a crude anti-satellite capability. The thermal flash, electromagnetic pulse (EMP), and radiation from a nuclear explosion would destroy vulnerable satellites.[27]

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[21] Ibid., p. 57.
[22] Ibid., p. 113.
[23] Ibid., p. 112.
[24] Ibid., p. 127.
[25] Ibid., p. 128
[26] Ibid., p. 17.
[27] Ibid., p. 223.

The Mid-Infrared Advanced Chemical Laser (MIRACL), originally a United States ABM program, was adapted into a terrestrially based ASAT program in 1997. It has been successfully used to "blind" satellite sensors with a great degree of accuracy, and the technology utilized in its implementation is not outside the reach of most developed countries.[28] After jamming GPS, communications, and commercial satellites, a nation with less satellite reliance could very easily use cheaper terrestrial technologies such as fiber-optic land lines and direct line-of-sight terrestrial relays instead.[29]

The congressionally appointed Commission to Assess United States National Security Space Management and Organization was chaired by Donald Rumsfeld from 1999 to 2000 when he was promoted by President Bush to Secretary of Defense. While chairman of the Space Commission, Rumsfeld asserted that the development and deployment of an ASAT capability was necessary.[30] His rationale was that ASATs will prevent other countries from relying on military satellites too heavily[31], but the implications of Rumsfeld's logic are ludicrous. American space assets are vulnerable and the military relies heavily on them. *Consequently*, an ASAT arms race would be extremely detrimental to American civil and military interests.[32]

Space Junk

One of the most pressing issues with the propagation of ASATs and other space-based weapons is the potential use of satellite orbits as a combat theater.[33] As stated previously, satellites are extremely vulnerable. Methods for making them less vulnerable are very limited due to restricted launch weights.

Dead satellites do not fall from their orbits unless carefully pushed with considerable effort. If a satellite is completely destroyed and fragmented, small fast-moving fragments will spread back and forth between orbits, most likely destroying many other satellites. Space debris lingers indefinitely, except at very low altitudes.[34] As a result, even small firefights in space could be catastrophic. Entire satellite orbits could be lost forever. Considering how heavily the United States depends on satellites for both military and civilian functions, a complete or near-complete loss of satellites would probably affect America more detrimentally than any other nation.

The 1977 United Nations Environmental Modification Treaty prohibits, "widespread long-lasting or severe effects as the means of destruction, damage or injury to any other State Party through the deliberate manipulation of natural processes."[35] Most analysts of the treaty agree that this description would apply to space junk.

Additionally, if damages to another country's spacecraft are caused in orbit and the state responsible for the damage-causing debris has been negligent, liability convention provides for claims against the negligent state.[36]

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[28] Ibid., p. 131.
[29] Ibid., p. 175.
[30] Ibid., p. 198.
[31] Ibid., p. 134.
[32] Grossman, p. 8.
[33] Preston, p.60.
[34] Ibid., p. 83
[35] Ibid.
[36] Ibid.

If America employs space-based weapons or ASATs, even if they are never used and the debris hazard in orbit does not increase, the international community will view the debris risk as an American decision.[37] A RAND analyst wrote that, "Even if the risk is insignificant in actuarial terms, the political consequences may not be."[38] However, with the amount of space-based weapon and ASAT proliferation that could be caused by serious American military ventures into space, the risks hardly seem insignificant, *especially* in actuarial terms.

The Strategic Defense Initiative

Before examining the Reagan administration's Strategic Defense Initiative (SDI), it is important to gain perspective on the state of military spending. After World War II, the United States was reluctant to spend money on military programs with unclear potential; especially space programs. ABM and ASAT systems were of questionable strategic value in the 1950s and 60s, but they clearly had potential as functional weapon systems. Additionally, programs were scrapped when lack of money or practicality became obvious.

Prior to Reagan's presidency, even the most conservative and militaristic administrations showed restraint in spending on military space ventures. As stated previously, President Eisenhower emphasized the use of space for peaceful purposes.[39] President Nixon established a Space Task Force in 1969, and with its help his administration announced that, "the Department of Defense would only be permitted to embark on new space programs when they could show it to be more cost effective to carry out the task in space."[40] The Carter administration developed only space weapons programs that provided incentive for negotiations and anti-ASAT treaties with the Soviet Union.[41]

President Reagan's defense policy marked the first time when the White House, rather than the Pentagon, set ambitious military space plans.[42] In March 1983, Reagan announced his Strategic Defense Initiative. Coupled with the Challenger explosion in January 1986, it led to a revised American space policy that was announced in January 1988. Four basic requirements were specified:

1) deterring, or if necessary, defending against enemy attack;
2) assuring that forces of hostile nations cannot prevent our own use of space;
3) negating, if necessary, hostile space systems; and
4) enhancing operations of United States and Allied forces.[43]

The Defense Acquisition Board's September 1987 review led to the recommendation and subsequent acquisition of select SDI elements including several ground-based and space-based surveillance and tracking systems, ABM systems, and battle management and radar system

[37] Ibid.
[38] Ibid.
[39] Mowthorpe, p. 14.
[40] Ibid., p. 16.
[41] Ibid., p. 126.
[42] Ibid., p. 22
[43] Ibid., p. 18

communications upgrades.[44] In 1990, after several concerns about cost and technological feasibility, an innovative space-based interceptor system known as "Brilliant Pebbles" was developed.[45]

With the SDI, the Reagan administration shifted American military space policy away from the sanctuary school and into the high ground school.[46] Negative effects from the SDI were seen before any of its recommendations were even implemented. In 1983-1984, the Soviet Union combined its opposition to SDI with a campaign to prevent testing and development of ASAT weapons.[47] The ASAT treaty that the Carter administration was never able to get was available, and could have been strategically invaluable to the United States for decades, but the Reagan administration ignored the opportunity. The Soviet Union abandoned their attempt at an ASAT treaty in 1985 because it wanted to maintain an ASAT capability in response to the SDI.[48] Both international stability and American strategic interests were sacrificed.

In 1985-1988, a Democratic majority in Congress was able to successfully limit the power that the Department of Defense had over ASAT and space-based weapons development.[49] The Clinton administration was able to keep military space priorities under control and effectively lower America's space defense profile *with* a Republican Congress. Military space budgets were kept low. The National Space Council was replaced by the National Science and Technology Council and the Deputy Undersecretary of Defense for Space was dissolved.[50]

The current Bush administration, with the help of a Republican majority in Congress, has almost completely reversed President Clinton's reforms. Due to Donald Rumsfeld's position of increased influence, it is likely that many of the organizational changes he suggested while chairman of the Space Commission have been implemented.[51] Rumsfeld's promotion to Secretary of Defense has also added an element of prestige to the recommendations made by the Space Commission. In addition to advancing American ASAT and space-based weapons capabilities, the Space Commission's report recommended that the US Air Force be given responsibility for organizing, training, and equipping US space forces. A separate "Space Corps" should be implemented in 5-10 years with an independent promotion system and funding similar to the former Army Air Corps.[52]

In 1999, the US Space Command's long range plan asserted that, "at present, the notion of weapons in space is not consistent with U.S. National Policy."[53] However, a more recent Space Command report projected that there will be, "weapons in space for use against terrestrial targets within the next 20-30 years. Some driven by perceived threats, some intended as more effective and timely alternatives to terrestrial capabilities."[54] As mentioned previously, the MIRACL laser was used in 1997 to illuminate and "blind" a satellite in a test. The technology

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[44] Ibid., p. 21
[45] Ibid., p. 22
[46] Ibid., p. 31
[47] Ibid., p. 59
[48] Ibid.
[49] Ibid., p. 116.
[50] Ibid., p. 195.
[51] Ibid., p. 206.
[52] Ibid., p. 197.
[53] Ibid., p. 200.
[54] Preston, p. 74.

for space-based weaponized lasers is much further from completion, but the US defense budget request for space-based lasers in 2002 was 110 million dollars.[55]

ABM Systems and Space Weapons

The initiative to develop space-based weapons emerged primarily from the ABM programs of the SDI. Policymakers have long referred to the need for highly effective, versatile defenses from ballistic missiles. ICBMs were a serious threat during the Cold War, but considering the nature of most current American enemies (rogue states, failed states, and terrorist factions), contemporary ABM systems present as more of a threatening precedent than a genuinely effective defensive countermeasure. The increasing obsolescence of the military systems that initiated the development of space-based weapons forces one to ask serious questions about their future strategic utility.

Because the United States was reluctant to spend money on military programs with entirely unclear potential until the Strategic Defense Initiative, they did not fund any ABM programs until it was clear that the Soviet Union was putting money into ballistic missile development.[56] The Anti-Ballistic Missile Treaty (ABM Treaty) of 1972 between the United States and the Soviet Union placed limits on ABM system production. The guiding principal behind the ABM Treaty was the concept of mutually assured destruction (MAD). Neither the United States nor the Soviet Union would be likely to launch ICBMs if reciprocal launches were assured. ABM systems made MAD less likely, threatening international military stability.

Article V of the ABM treaty forbade development, testing, and deployment of all ABM systems and components, unless they were land-based. (Land-based defenses were deemed to be less strategically destabilizing.[57]) The development of missile defense systems has considerable implications for the advancement of space-based weapons. Exoatmospheric hit-to-kill interceptors, space-based lasers, and space-based kinetic kill systems are all weapons that could be used to neutralize targets other than ICBMs, both space-based and terrestrial.[58] The Soviet Galosh ABM system had rudimentary ASAT capabilities.[59]

The Reagan administration was able to develop ABM systems without rescinding the ABM Treaty under the SDI by adopting what would be known as the "broad interpretation" of the ABM Treaty.[60] However, if the United States wanted to seriously pursue space based weapons, the first logical thing to do would be to rescind the ABM Treaty entirely, which the Bush administration did on November 13th, 2001. The ABM Treaty was seen internationally as the primary treaty prohibiting the development of space-based weapons. Its elimination neutralized the most serious diplomatic restrictions blocking the United States from implementing them. Rescinding the ABM Treaty has also potentially allowed the United States to covertly develop space weapons for terrestrial targets under the guise of an ABM program; ABM systems being somewhat more accepted in the international community.[61]

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[55] Mowthorpe, p. 159.
[56] Ibid., p. 13.
[57] Ibid., p. 45.
[58] Ibid., p. 206.
[59] Ibid., p. 127.
[60] Ibid., p. 45.
[61] Preston, p. 20.

The Outer Space Treaty

Although the Bush administration officially rescinded from the ABM Treaty in 2001, the Outer Space Treaty (OST) of 1967 still bars the United States from placing nuclear weapons and other "weapons of mass destruction" in orbit. The Kennedy administration's negotiations of the United Nations General Assembly in 1963 laid the foundation for the President Johnson to negotiate the OST.[62]

Some analysts believe that the OST was a signal that the US government did not believe that space held any military utility, except as a sanctuary for reconnaissance satellites.[63] The OST seems to reflect the sanctuary school of military space use. However, it is clear that President Johnson did understand the offensive military utility of space because of his administration's continued development of the ASAT programs undertaken by President Kennedy.[64]

Although the OST restricts the use of weapons of mass destruction based in space, terrestrially based ICBMs have always been a more cost effective delivery system for nuclear warheads. The most likely current plans for offensive space-based weapons systems do not include space-based nuclear weapons, thus the OST does little to bar current American plans for the weaponization of space.

Space Weapons for Terrestrial Targets

The first types of space-based weapons considered for implementation against terrestrial targets were orbitally based conventional weapons. Because of launching expenses, only small missiles could be cost-effective. With a sufficient number of orbiting platforms, the response time for such a weapon could be as little as 20-30 minutes. However, unlike space-based "kinetic energy weapons," orbitally based conventional weapons are neither more effective nor more cost efficient than conventional weapons delivered by cruise missile or aircraft.[65]

Space-based directed-energy weapons have been thoroughly researched and considered for implementation. A laser's response time is instantaneous, however each object engaged would take a certain amount of time to absorb the energy required for destruction. This could range from anywhere between a matter of seconds for targets above the atmosphere to several minutes for terrestrial targets. A space-based laser would also have to be much more powerful than a comparable Earth-based laser because a laser's effectiveness falls off with the range of the target squared. Weather conditions could also be detrimental to the effectiveness of a laser, thus a low orbit would be necessary, increasing the vulnerability of the platform. The capacity of a single platform would also be limited.[66]

Space-based lasers, if ever implemented, will likely be large and expensive. Development and implementation costs will be somewhat approximate to a next-generation space telescope with a large rocket engine and propellant tanks.[67] Additionally, it is difficult to

[62] Mowthorpe, p. 15.
[63] Ibid., p. 16.
[64] Ibid.
[65] Preston, p. 45.
[66] Preston, p. 28.
[67] Ibid.

imagine that a precision instrument with enormous energy output capabilities would not present unforeseen engineering challenges.

Because of limits on the energy that a space-based laser will be able to focus on terrestrial targets from space, armored targets will not be easily destroyed. However, it is alright for targets to be moving relatively fast. Ideal targets would be aircraft and missiles.[68]

Space-based kinetic energy weapons are the simplest platforms under consideration for implementation. The underlying principal behind the development of space-based kinetic energy weapons is that a heavy object, if "dropped" from space with considerable speed, could be more efficient than a warhead. 1 meter tungsten rods with a 1 cm radius and sphere-capped nose cones would most likely be used. Weighing approximately 100 kg, the rods would additionally benefit from vaporized tungsten's combustible nature.[69]

From low earth orbits, deploy times could range between 10 and 20 minutes. Space-based kinetic energy weapons are best suited for small, heavily armored targets, tall buildings will small footprints, and missile silos. Their effectiveness against wide, low buildings could be limited. The tungsten rods would be capable of penetrating 1.5 meters of hardened steel, 3 meters of clay or stone, or 1 meter of uranium.[70] In the defense industry, they have been periodically referred to as "rods from god."[71]

Strategic Advantages of Space Weapons

Cost is an issue that is presented frequently in arguments for and against the implementation of space-based weapons. Mass-to-target weapons (kinetic energy weapons and orbitally based conventional warheads) do have a transportation cost for orbital implementation. However, it is important to note that the physical effort required to place a weapon in orbit is little more than the effort needed to deliver a short to medium-range ballistic missile.[72] Financial differences can be attributed to the logistical and bureaucratic difficulties of a space launch – difficulties that could theoretically be overcome with political changes and technological advances. The fuel required to place kinetic energy weapons in orbit is approximately fifty times the mass of the weapons. During the 1991 Gulf War, air delivered ordinances required approximately forty times their mass in fuel.[73]

Space platforms would be capable of protecting a wide array of assets in place of a network of ground-based systems to protect individual assets.[74] Additionally, they would be very difficult to defend against. Their combination of high velocities and short delivery times could evade both detection and interception.[75] Kinetic-energy weapons deployed from 500 km could reach ground targets in one minute, leaving little possibility of evasion for fixed targets.[76]

The most recent Department of Defense war games have shown conclusively that the United States lacks a the ability to quickly strike important, time sensitive targets deep inside a

[68] Ibid.
[69] Ibid., p. 42.
[70] Ibid., p. 41.
[71] Mowthorpe, p. 200.
[72] Preston., p. 36.
[73] Ibid., p. 43.
[74] Mowthorpe, p. 25.
[75] Preston, p. 103
[76] Mowthorpe, p. 70.

country.[77] For global and hemispheric reaches, the response time of a space-based weapons platform would probably be a few hours; similar to the response time of a large ICBM.[78] However, launching an ICBM with a conventional warhead could be dangerous because effectively announcing its non-nuclear status prior to delivery would be very difficult. The United States could risk accidentally triggering a full-scale nuclear war. Space weapons would have the global reach of ICBMs without the nuclear implications.[79]

ICBMs also lack the accuracy for tactical strikes with conventional warheads on small targets, such as missile silos and vehicles. The most attractive strategic advantage of space-based weapons is their ability to strike distant targets on short notice without the complexities of a substantial troop deployment into a combat theater.[80] Additionally, space weapons could effectively accomplish strategic attacks traditionally reserved for aircraft strikes when the risk to pilots is too great.[81]

Strategic Disadvantages of Space Weapons

It is very difficult to compare the cost of space-based weapons with that of terrestrial weapons because the expense of sustaining space-based weapons over extended periods of use is substantial. A space-based laser designed to defend against ballistic missiles would consume fuel weighing as much as a small satellite for each missile killed.[82] A report from RAND analysts asserts that space-based weapons, especially laser weapons, are best deployed in concert because multiple platforms reduces urgency and extends the utility of the weapons' contribution.[83] A need for multiple platforms will also obviously increase the cost of the system.

Because of the significant cost of neutralizing a single target with a space-based weapon, space-based weapons could only conceivably be used to destroy targets with significant strategic value,[84] limiting their utility in a full-scale conflict.

The political costs of space weapons could prove to be equally staggering. American allies might feel that a United States acquisition of significant offensive capabilities in space would threaten their vital interests. A feeling of second-tier strategic status as well as the threat of disproportionate roles in future international interventions would lie secondary only to an increase in the vulnerability of their own space assets. As deduced previously, the risk of a significant increase in orbital debris could weaken America's alliances as well.[85] The global reach of space weapons could also be a liability if other nations feel threatened by them and seek protection in international court.[86]

The significant financial and political investment that would be needed to implement a system of orbital weapons platforms could be undercut if an opponent with surveillance capabilities found a weapon and attacked it before the platform could release its missiles or rods.

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[77] Mowthorpe, p. 193.
[78] Preston, p. 43.
[79] Ibid., p. 102.
[80] Ibid., p. 57.
[81] Preston, p. 58.
[82] Ibid., p. 105.
[83] Ibid., p. 37.
[84] Ibid., p. 56.
[85] Ibid., p. 83.
[86] Ibid., p. 101.

[87] Because weapons platforms will follow predictable orbits, it is very likely that they will need to be able to defend themselves.[88] Space weapons *need* to be thought of as static in the same ways that terrestrial weapons are. They are inherently vulnerable against an opponent able to direct a concentrated attack against them.[89]

An American space-based weapons system might politically legitimize a variety of anti-satellite weapons targeted against all United States space capabilities.[90] A system of space weapons could conceivably be protected by a system of decoy satellites. The decoys could even be fitted with heat sources to fool thermal sensors.[91] However, the cost of launching an entire system of decoys could approach the cost of launching the original weapons platforms.

It was previously noted that offensive space weapons could be used as an alternative to aircraft strikes when conditions are too dangerous for pilots. However, guided weapons, cruise missiles, and "stealth" aircraft make this a somewhat redundant function.[92]

According to international legislation and precedent, there is a difference in liability for the use of space-based weapons against a terrestrial target that could make the user liable for damages sustained. This would not apply if the use resulted from a subsequent action that the claimant state had taken.[93] However, the greatest utility of a system of space-weapons is their ability to conduct a non-nuclear "first strike"; subsequent action would often be only political.

It is true that space weapons could be very useful as conventional alternatives to ICBMs because an ICBM launch is inherently dangerous to international stability. However, ICBMs do require less effort to reach a target. It should be possible to avoid nuclear confusion with vehicle characteristics, operational practice, basing, and arms control. Other American weapons systems, including the B-52, B-1, and B-2 airplanes; air-launched cruise missiles; and tomahawk cruise missiles have successfully made the transition from nuclear to conventional warheads without large amounts of international confusion.[94]

A Threat to International Stability

RAND analysts postulate that if one state chooses to develop space-based weapons, it would be rational for all peer states concerned to develop and deploy space-based weapons in order to preserve stable deterrence.[95] It would be both shortsighted and ignorant to presume that no nation in the world qualifies as a peer state of the United States in this context. The worldwide proliferation of space-based weapons could be unfathomably detrimental to international stability. As discussed previously, weapons launched from space-based platforms are very difficult to detect and almost impossible to intercept because of their fast deploy times. When the objective of implementing weapons of mass destruction is to deter other nations that have also implemented weapons of mass destruction, shorter deploy times make stable deterrence more difficult because they threaten the survivability of a potential opponent's

[87] Ibid., p. 41.
[88] Ibid., p. 60.
[89] Ibid., p. 104.
[90] Ibid., p. 82.
[91] Mowthorpe, p. 151.
[92] Preston, p. 59
[93] Ibid., p. 106.
[94] Ibid., p. 49.
[95] Ibid., p. 71.

deterrent.[96] Unlike the case of strategic ICBM launches, the concept of mutually assured destruction is not preserved with space weapons and thus neither is global first strike stability.

If the United States chose to implement orbital weapons platforms, the calculation of first strike stability is particularly difficult to manage in the transition phase between a state of no space weapons and a state of weapons that are functional and in place.[97] It would be strategically advantageous for a potential adversary to announce a "launch-on-warning" or "launch-under-attack" policy tied to the status of American space weapons.[98]

The period of deployment for a system of space weapons poses an additional question: should deployment be covert or transparent? A covert deployment could have very unpleasant consequences because of the inevitably negative international reaction to its unveiling. A transparent deployment could lead to an arms race.[99] Additionally, defending space weapons in the process of deployment could be a serious problem. The first weapons platform components to be launched could encounter space mines. ASAT escorts might be necessary and the components could require external surveillance to guard against possible attack.[100] These separate issues could each propagate scores of other complex problems and international crises.

It would be possible for the United States to join a multinational acquisition of space-based weapons and negotiate constraints that would be beneficial to America. RAND analysts speculate that space-based lasers could be implemented with constrained wavelengths that would keep their effectiveness out of the atmosphere.[101] However, this is a peculiar example because America's greatest strategic weakness is the vulnerability of its satellites.

Other analysts speculate that space-based weapons could be used as an alternative to the ineffective 1991 Gulf War PATRIOT missiles to defend against hostile missile attacks;[102] also an interesting example because it illuminates another important and seemingly obvious issue: technology that does not work is not effective as a deterrent.

During the implementation of a system of space-based weapons, there will most likely be a long period of time in which the system will not be fully functional. Many politicians and defense contractors argue that it would still serve as a deterrent in its dysfunctional state. The Gulf War incident in Dhahran, Saudi Arabia on February 25th, 1991 illustrates that this is not a strategically advantageous policy. 28 American soldiers were killed because they believed that the PATRIOT missile system was an effective defense against an Iraqi Scud that struck their barracks.

The United States could make the decision to acquire space weapons after significant threats are posed to national security. RAND analysts list "Unilaterally acquiring space weapons in advance of a compelling threat," as another possible scenario.[103] The internationally destabilizing effects of space weapons are intense enough *without* an American decision to acquire them for no compelling reason! To do so would be ludicrous from a rational foreign policy standpoint. Additionally, a unilateral decision to obtain space weapons would preclude

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[96] Ibid., p. 102.
[97] Ibid., p. 69.
[98] Ibid., p. 81.
[99] Ibid., p. 81.
[100] Ibid.
[101] Ibid., p. 73.
[102] Mowthorpe, p. 26.
[103] Preston, p. 68.

rational dialogue between nations. An obvious parallel can be seen in the frenzied American reaction to Sputnik in 1957.[104] However, the Defense Security Board recommended to the Department of Defense in 1999 that space weapons serve as a central element of future American national security in advance of specific compelling threats.[105]

A pipe dream for those in support of space weapons seems to be that the probable response of opponent states in the event of an American decision to acquire space weapons would be to, "cede the high ground of space."[106] The notion that countries would not actively seek countermeasures to American space weapons and that an arms race would not ensue seems very unlikely, especially considering the current animosity and feelings of uncertainty directed towards the United States on defense issues.

[104] Ibid., p. 71.
[105] Ibid., p. 74.
[106] Ibid., p. 82.

Current Space Weaponization Ambitions in Russia

Unlike American policymakers who had qualms about the internationally destabilizing effects of space weapons at the beginning of the Cold War, the Soviet Union initially sought to develop strategic offensive weapons systems in space.[107] A Soviet document described the nation's military space doctrine:

> The Soviet Armed forces shall be provided with all resources necessary to attain and maintain military superiority in outer space sufficient both to deny the use of outer space to other states and to assure maximum space-based military support for Soviet offensive and defensive combat operations on land, at sea, in air, and in outer space.[108]

The Soviet Union began ASAT development in 1963 and continued despite multiple cancellations of American ASAT programs.[109] By the late 1970s, the Soviet Union had surpassed the United States by entire stages in the development of space weapons components, most notably with advanced laser systems.[110] In the 1980s after the birth of the American Space Shuttle program, the Soviet Union accused the United States of planning to deploy nuclear missiles aboard the Shuttle. They claimed that they could do the same with the similar Soviet Buran.[111]

Since the end of the Cold War, Russia has still show significant interest in ASAT capabilities largely due to American pursuit of ASAT platforms.[112] Russia continues to maintain an extensive military presence in space. Their launch sites are operational and they are capable of putting satellites in orbit for *far* less money than the United States.[113] Russia's space program has always been much more closely linked with their military than America's.[114] The United States may have reached the moon before the Soviet Union, but the USSR was the clear winner of the military space race.

In the late 1990s, Russia still launched about 15 satellites each year; mostly Cosmos designated intelligence gathering, early warning, and tactical communications satellites. Their launch numbers are down by nearly 80% since the 1980s and early 1990s, but are still significant relative to other countries.[115] Russia's economic crises have not deterred it from its expansion of military space assets. Additionally, Russia continues to subscribe to the "high ground" school of space weapons policy; a position largely solidified by the President Reagan's SDI.[116]

Russian military leaders currently view space as a potential theater for military action. The capability to undergo operations to destroy weapons in flight, operations to prevent deployment of enemy satellites, and operations to seize and hold strategically important areas of near earth space are all prime military objectives. Additionally, the Russian military has shown

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[107] Mowthorpe, p. 57.
[108] Ibid.
[109] Mowthorpe, p. 117.
[110] Ibid., p. 69.
[111] Ibid., p. 70.
[112] Ibid.
[113] Preston, p. 105.
[114] Mowthorpe, p. 66.
[115] Ibid., p. 75.
[116] Ibid., p. 71.

interest in the implementation of space-weapons for strikes against terrestrial targets.[117] Top priorities in Russian military research and development are still strategic space weapons and acquisition of the most advanced space technologies.[118]

Current Space Weaponization Ambitions in China

Space based weapons could most easily destabilize first strike deterrence with nations like China that have smaller nuclear forces.[119] China is a particularly interesting case in regard to its military's space capabilities. Because of advanced technology and overlapping characteristics of military and civilian space programs, the development of simultaneous development of a missile program and a space launch program was possible.[120] As of 1998, the Chinese government was giving its highest priority to the development of an ASAT system. They currently have a ground-based laser similar to the American MIRACL system capable of damaging the sensors of satellites in low earth orbit (LEO).[121] Small orbital ASAT units known as "parasitic" satellites are in development at the Small Satellite Research Institute of the Chinese Academy of Space and Technology. The People's Republic of China is definitely seeking to weaponized space,[122] and the lack of international control over the situation continues to grow due to American refusal to participate in a treaty.

American Resistance to a Space Weapons Treaty

A country capable of developing both spacecraft and ICBMs could most likely develop and successfully implement a space-based kinetic energy weapon.[123] The United States is *not* the only nation in the world with such capabilities. Additionally, space-based weapons are of much greater strategic utility to countries seeking global military power without duplicating American terrestrial force investments.[124] A country such as India, with modern technical capabilities but a limited navy and air force could achieve a comparable military presence to the United States by investing in a network of armed satellites and space-based weapons.[125] A friendly state with extensive American investments and technology could decide to develop space weapons before the United States. If the state had strong political ties to the United States as well (Israel is an obvious example), response options could be limited.[126]

It cannot be reiterated enough that space weapons acquired by a small or developing nation could effectively exploit American military weaknesses. Currently, no immediate compelling threat drives any country to acquire space weapons except to counter the overwhelming strategic advantage of American military forces.[127] It seems that the pursuit of an

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[117] Ibid., p. 176
[118] Ibid., p. 69.
[119] Preston, p. 69.
[120] Mowthorpe, p. 87.
[121] Ibid., p. 101.
[122] Ibid., p. 103.
[123] Ibid., p. 37.
[124] Ibid., p. 40.
[125] Ibid., p. 175.
[126] Preston, p. 72.
[127] Ibid., p. 99.

international space weapons treaty, as opposed to the pursuit of space weapons themselves, would currently be in the best interests of the United States.

Strangely, the United States has a longstanding tradition of vehement opposition to space weapons treaties. In the late 1980s through the 1990s, several European countries attempted to pass international legislation prohibiting the continued weaponization of space on the floor of the United Nations. These were known as the UN PAROS (prevention of an arms race in outer space) talks and they were successfully blocked by American objections. In November 2000 America, Israel, and Micronesia refused to vote for a UN resolution citing the need for steps to prevent the weaponization of space.[128]

Although the United States does not hold any formal ability to veto talks and resolutions prohibiting the proliferation of space weapons, other member states of the United Nations view the pursuit of a space treaty without American support as a pointless endeavor. The United States refuses to support an international treaty preventing the proliferation of space weapons in the face of its own logical interests because Americans, goaded by policymakers and defense lobbyists, continue to irrationally cling to Cold War ideas of militarism.

Recent American government discussions reflecting a consensus about failed-state and terrorist threats having potential access to weapons of mass destruction have been used as justification for the development of space weapons.[129] However, there is currently no such threat that the United States could not gain access to from US-controlled areas! Additionally, it should be considerably more affordable, both financially and politically, to engage these supposedly undeterred threats terrestrially than to develop an extensive space weapons program.[130]

Future Civilian Roles in the American Weaponization of Space

When military satellites were overloaded during the 1991 Gulf War, civilian satellites were leased and pressed into service. The proliferation of ASAT capabilities could have a significantly detrimental effect on American civilian industries if civil space circuits are destroyed either through direct targeting or space debris from a firefight in orbit.[131] However, American space policy makers have no ambitions to exclude civil industries from the development of space weapons.

Recent analysis has shown that any capability to deliver and retrieve large quantities of material to and from space could be adapted to emplace and deliver conventional weapons.[132] If the space tourism market ever creates a viable industry for cost effective space launches and recoveries, the steps to transform a transportation industry into a weapons carrier industry could be trivial. Current United States Space Command plans outline how such a transition might take place![133]

Would giving American commercial markets an increased stake in strategic military operations, especially at such a grand scale, be beneficial to the future of American international responsibility? More highly vulnerable and increasingly important targets would be created and

[128] Mowthorpe, p. 197.
[129] Preston, p. 69.
[130] Ibid.
[131] Mowthorpe, p. 167.
[132] Preston, p. 75.
[133] Ibid., p. 76.

international corporations could be held liable for the collateral damage from military operations. There is only one certainty: the nature of American military operations is at a crucial junction.

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