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## Introduction

Full spectrum dominance depends on the inherent strengths of modern space power-speed, global range, stealth, flexibility, precision, lethality, global theater situational awareness and strategic perspective.
-Air Force White Paper, Global Engagement: A Vision for the 21st Century Air Force[1]

Arguably, one of the most significant global security policy debates of the 21st century is whether the United States and more specifically the Bush Administration should develop and deploy space-based weaponry. The age of space is upon us. But how convinced is the rest of America, the West and potential adversaries of the legitimate need to do so? For almost half a century, the world's space powers have abstained from deploying such weapons as basic unwritten policy. To date, the military has been limited to surveillance, navigation and communications satellites. In June 2001, Former Air Force Chief of Staff, General Michael Ryan was quoted as saying, "Eventually we're going to have to have the capability to take things out in orbit."[2]


His argument is based on the premise that historically, wherever commerce has gone so does US national interest and, subsequently, the requirement to protect that interest. This rationale for the deployment of offensive space weaponry should elicit much debate, especially as our military is reduced in size. Policymakers and institutions of higher learning need to address this issue before the "Final Frontier" becomes a battlefield. To neglect the topic and let the militarization of space happen out of apathy will be to relinquish any input over a decision, which could potentially destroy the planet.

The technological revolution of the late twentieth century has provided the US military an incredible conventional offensive force and altered forever the way war can and will be waged. In March 2002, Paul Teets, Undersecretary of the Air Force and Director of the National Reconnaissance Office, as well as the Pentagon's lead procurement officer for space programs, stated, "I believe that weapons will go into space. It's a question of time. And we need to be at the

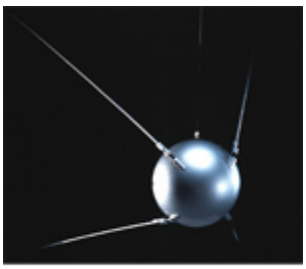
forefront of that."[3] Teets has a significant baseline to work from to effectuate this concept. The advent of precision- guided munitions has provided war fighters, for example, with ordnance accuracies measured as Circular Errors of Probability (CEPs) on the order of a few feet.


Newer weapons including laser guided bombs, Global Positioning System (GPS) guided munitions, and Tomahawk missiles have given military forces an immense capability that will assist in the defeat of any known enemy and, if used correctly, with minimum collateral damage and civilian casualties. Yet, this certainly is just the beginning of the revolution. The trend will be toward even more precise and lethal weapons systems, often unmanned or minimally manned, and able to respond within seconds to attack targets anywhere on earth. On this basis, space seems to offer significant advantages in future warfare, and, currently, the US government is actively pursuing research on spaced based laser and kinetic weapons.

This paper will seek to provide some perspective on the necessity of such pursuits and the possible consequences of rushing in without thinking. The discussion will describe the types of offensive space-based weapons most likely to be developed and deployed in the early 21st Century as well as the potential impact on US military force structure, roles and missions, and doctrine. Clearly, the military has accepted that conflict in space is now inevitable and is preparing for it. The stabilizing or destabilizing impact on the world security environment, from an academic perspective, will also be addressed.

**Historical Developments**

Arguably, the militarization of space commenced with the launch of the Soviet Union's Sputnik satellite in 1957. In the early stages of the Cold War, both sides began competing in space to conquer and use space for the benefit of military forces. President Dwight Eisenhower's response to Sputnik was rather muted especially in relation to the public outcry over the event.



Sputnik 1. Science Museum, London / Science & Society Picture Library

He personally believed that the public's concern was unwarranted; failing thus to act quickly to equal the Soviet Union's effort, he ensured America's second place position in space for the near term.[4] More recently, the Clinton Administration's philosophy of a restrained approach has been replaced with the Bush Administration's unquestioning acceptance of exploitation of space for military purposes.

The separation of military and civilian space programs became codified in July 1958 with the passage of the National Aeronautics and Space Act, which formally created the National Aeronautics and Space Administration (NASA). The US effort was focused toward peaceful scientific and commercial applications. Later, when President John F. Kennedy decided to engage in the race to place a man on the moon, the effort assumed a priority position and the military quickly recognized they were losing potential funding.

Military efforts in space did exist and were supported and characterized as "peaceful" missions. The advent of reconnaissance satellites brought one of those peaceful missions to the forefront following the downing of a U-2 spy plane over the Soviet Union in May 1960. Officially, US space policy evolved from the advocacy of the non-military use of space to one of non-aggressive use of space.[5]

In order to legally continue the programs, the US began to seek confirming international agreements. The idea was not new and incorporated Eisenhower's "Open Skies" initiative. The former Soviet Union rejected the entire concept to allow free over flights of each other's country to verify the location and numbers of nuclear weapons.[6]

Even though the major powers were not in agreement, they continued to experiment but not deploy. Gradually both the Soviet Union and the US expanded military space programs but still restrained themselves from actively using technology capable of shooting down satellites from the ground, sea or air. Nonetheless, trepidation about Soviet threats to place nuclear weapons in orbit led Eisenhower to propose a ban on nuclear weapons in space as early as September 1960. The Soviets agreed, which led to a bilateral agreement to ban nuclear weapons testing from outer space. Specifically, the 1967 Outer Space Treaty prohibits the placing of weapons of mass destruction in outer space or on celestial bodies; including the moon.

Additionally, the 1972 Treaty on the Limitation of Anti-Ballistic Missile (ABM) systems banned either side form interfering with the other's spy satellites. Both of these important documents continue to have considerable influence on the current debate because both the 1967 Outer Space Treaty and the ABM Treaty served to reinforce the self-restraint on the deployment of military space weaponry that Eisenhower advanced. The end of the first Cold War precipitated a reevaluation of current policy.

In the 1990's, National Security Council (NSC) Directive 5520, dated 26 May 1995, recommended separating the US space effort from ongoing military programs to develop Intercontinental Ballistic Missiles (ICBMs). This directive worked to disengage the military from satellite development programs and diverted monies to ICBM programs. Six years later in April 2001, prior to 9/11, the Transformation Study Report, drafted for the Office of the Secretary of

Defense reasoned that, " Space capabilities are inherently global, unaffected by territorial boundaries or jurisdictional limitations; they provide direct access to all regions, and with our advanced technologies, give us a highly asymmetrical advantage over any potential adversary.[7]

The 2001 Quadrennial Defense Review (QDR) made clear that a key objective for the military in the 21st Century is not only to exploit space for military purposes but to make sure that the US maintains full spectrum dominance in space. Right after 9/11, Defense Secretary Donald A. Rumsfeld created a Policy coordinating committee for Space within the National Security Council, recognizing that the US is extremely dependent on space and arguably the dependency on communication and navigation networks needed to be protected. The Administration continues to formulate and implement its offensive spaced base-based weapons initiatives without much scrutiny.

**Treaties and the Law of Space**

Emotions run high throughout diplomatic and political circles when the space treaties mentioned-above are debated. As is frequently the case, the difficulties arise in how world governments interpret the terminology contained in them. The exact wording of Article IV (1) of the 1967 Outer Space (hereinafter referred to as the 1967 Treaty), is:

States party to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kind of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any manner.[8]

The article goes on to state that; "the moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes." Unfortunately, the inadequacy of the wording has caused heated debate in military, political, and scientific communities. "Peaceful purposes" apparently only applies to the "moon and other celestial bodies," not to earth orbit or "outer space" as used in the treaty. The placing of weapons of mass destruction in orbit is clearly prohibited; yet, the definition of a weapon of mass destruction is not as specifically defined. It is assumed any nuclear, chemical or biological would meet the criteria.

The 1972 ABM Treaty is also susceptible to varying interpretations depending on perspective. The debate began in 1983 after President Reagan's decision to start Strategic Defense Initiative (SDI) research and development. Article V (1) in the ABM Treaty states:

Each Party undertakes not to develop, test, or deploy ABM systems or components, which are sea-based, air-based, or mobile land-based.[9]

Although deployment of a space-based missile defense system is in clear violation of Article V, Reagan hoped that by offering to share technology with the former Soviet Union, he could obtain an agreement to mutually nullify the treaty. Additionally, the ABM Treaty does not prevent research and development efforts as long as components are not tested. [10] How to exactly define "testing" is open to elucidation. On top of that, subcomponents can legally be tested compounding the definitional disputes as well as making definitions of what constitutes a component and what constitutes a sub-component a key area of disagreement.[11] Nevertheless, since the end of the Cold War, the US has renewed development and testing of anti-ballistic missile systems. These efforts include improvements in space-borne systems among three services: the Navy's upper tier as well as airborne and surface-based systems; the Air Force's Laser and Theater Anti-Air Defense System (THAAD); the Navy's lower tier and the Army's Patriot.

Additional interpretations of the 1967 Treaty apply to the area of anti-satellite weapons applications as evidenced by the fact that the former Soviet Union developed an anti-satellite weapons system as early as 1968. This satellite interceptor program caused little unrest in the US primarily because testing had ceased in 1971, ostensibly as a result of easing tensions between the two countries. [12] Technically, anti-satellite weapons can be ground-based; thus, not space weapons, avoiding treaty disagreements. However, the technologies being developed today for anti-satellite weaponry can be applied to satellites in an offensive space control mode. Therefore, anti-satellite weapons may hasten the space-based deployment of offensive earth-attack weapons through dual usage of common technologies.

**Geopolitical, Military and Diplomatic Factors**

Today's military is increasingly dependent on reliable, and secure sets of space systems. The information revolution has reached into space. Ways to deny, disrupt, or alter information provided to the enemy is particularly sought after by the competent battlefield commander. Military policymakers, however, have so far been reluctant to risk interruption of commercially generated information flow. The increasing reliance by modern forces on precision-guided weapons relying on commercial GPS systems has created unusual dependence of a military on a business.

Considering the current global situation, it is fair game to debate whether US space based assets are really at risk. Some have foretold of a "Space Pearl Harbor" but this seems a bit disingenuous. The Soviet Union had a working anti-satellite weapons system in the early 1970's and given adequate funding, modern Russia would be capable of building another more up-to date system. Our European allies could likely build and deploy an ASAT system but have also resisted spending the money to build one. Other countries with space potential include Brazil, China, India, and Iran. [13] To date, the perceived threat has not matched the enthusiasm to commit to the effort.

The US has no active ASAT program but since 9/11 is more actively pursing the matter. The system would likely be ground-based initially and deployed sometime in the early decades of the 21st century. This system could be a precursor to an offensive weapon that would possess the capability to attack and destroy ground targets. This continuing activity begs the additional question of whether space should be weaponized and whether Congress is poised to fund the programs. Wary of the changes in the former Soviet states and the threat of global terrorism, it seems that they are willing. Congress realizes that the US military cannot be caught unprepared again in defense of the Homeland. Consequently, funding for research and development of technologies easily adapted to space warfare continues, despite reservations about weapons in space.

The US does not have a monopoly on the use of space but does dominant it. The number of nations able to realistically challenge the US in space is limited. The Russian space program is still operates at an advanced level even though somewhat stagnant due to economic difficulties. China certainly has the potential to be a major space power in the 21st century. Other countries have launch facilities and technological prowess to pursue interests in space. How these space capable countries would react or be capable of significantly reacting to further US space superiority remains to be seen. Regardless, US strategists need to consider the possibilities. Should such a threat materialize, the US monopoly in space warfare would be eliminated, much as the atomic bomb monopoly was lost when the Soviet Union developed an atomic bomb. At least some analysts believe that strategy would cover aspects of space control, missile defense and force application from space.

The financial costs could be prohibitive. Nonetheless, the Air Force alone is expected to invest $185 million in the areas of surveillance ad prevention during fiscal year 2003. More specifically, one official was quoted as saying, "Air Force Space Command is developing a concept of operations for space control and has launched a "red force" namely the 527th Space Aggressor Squadron to pinpoint vulnerabilities in US systems.[14] The military is progressing with plans to militarize and weaponize space on a steady, quiet basis even if not full steam ahead. Therefore, US policymakers must seriously consider the effect of US unilateral violation of current international space treaties. The US is the most powerful nation on earth and clearly capable of space superiority. The real question is whether or not it is worth it politically, diplomatically and economically to take such steps.

**Space Weapons**

By 2025 it is very likely that space will be to the air as air to the cavalry today.
-Air Force 2025: America's Vigilant Edge

In general, technological innovations in air and space will maintain a revolutionary pace well into the 21st century. The technical pathway of what can

be accomplished given enough resources and political will versus what should be accomplished is a process constantly in transition. Technical difficulties that seemed almost insurmountable a decade ago are being conquered today somewhat routinely and on a regular basis. Plans to move out into space have been on the drawing boards for years. Paralleling advancements in the general area of air and space are developmental plans regarding space based offensive weapons.

**Satellite Systems Developments**

Two technological impediments to space offensive weapons deployment serve as the greatest challenge to date. They fall into two categories: space launch technologies and high power generation systems. Space launch systems are very expensive and limit the size of the space cargo able to be transported. Lift in the US is particularly expensive, hence commercial satellite provider's usage of Baikenour in Kazakhstan and other launch facilities in China. Power requirements to operate satellites tactically, i.e., to move them from low orbits to high, necessitate enormous amounts of energy. High power generation systems are needed to fire and maintain weapons that use high-energy lasers, thereby avoiding frequent and costly re-fuelling.

Considerable interest has developed in devices to decrease the size of future space platforms and ease the space lift requirements. These tiny devices, called microelectromechanical systems (MEMS), numbering many thousand to a standard computer microchip, will be able to sense heat, light, motion and sound and can be used in a number of space applications including control of reflective mirror surfaces in space-based laser systems.[15] In discussing power generation systems, one cannot overlook the potential use of nuclear power in space, especially for long-term power requirements. Power beaming technologies, transmitting power through ground-based lasers to satellites, may be technologically feasible and would be more politically appealing.[16] They would also represent a tempting target.

Each weapon system that is developed and deployed will require a complete "system of systems" architecture approach for the design.[17] Each weapon will be associated with its interconnected surveillance, acquisition, tracking and battle damage assessment system for a complete stand-alone capability.[18] These constellations of satellites will be less susceptible to attack because a single attack will not disable the entire system.[19] Several of these constellations, in low earth orbit, can provide global, full-time coverage. Two basic types of weapons systems are being touted as the most realistically achievable: high-powered lasers and kinetic weapons.

**Lasers**

High-powered chemical lasers have been developed and tested for years, initially for missile defense systems. Over time, these weapons have undergone significant

improvements in optics, power generation, beam control, miniaturization, and other key factors.[20] In the next thirty years, a prototype system could be developed that will allow global engagement of targets in minutes or seconds anywhere in the world.

Chemical oxygen-iodine lasers (COILs) have been produced that also have weapons applications. The US Air Force will use this type of laser in the Airborne Laser (ABL) system. This system, designed for ballistic missile defense, will soon reach operational capability. The disadvantages of the ABL, the requirement to be airborne in the area of operations during expected attack by ballistic missile, is precisely what makes a space-based laser a desirable achievement. A space-based laser system would provide constant coverage if enough constellations were deployed.

The power density (fluence) or the energy density (irradiance) achieved on target as measured in kilojoules per square centimeter or in watts per centimeter determines the lethality of the weapon. The power radiated by the laser and the size of the spot on the target affects this density. The smaller the spot size with a given quantity of energy irradiating the target, the greater the lethality of the weapon. Against satellite targets, lower amounts of energy would be required due to the short time of irradiation and the lack of atmospheric interference. Typical irradiance levels required for surface targets range from 100 to 10,000 watts/cm2; for satellites, 1 to 10 watts/cm2 is sufficient to achieve target kill.[21]

Effective focusing of the laser's beam is a primary consideration in weapons design. Because the same amount of energy is contained in the beam, a larger spot size equates to lesser irradiance and thus less lethality. To improve the beam focusing, various technologies will have to be developed such as large lightweight optics, adaptive optics using MEMS, or arrays of solid-state diode lasers.[22] All of these improvements are currently being funded and researched.

Chemical lasers will likely later be supplanted by solid-state diode pumped lasers (SSDPLs). Power levels of these new types of lasers have been attained in the kilowatt range. Advances in production will lower the cost of these lasers and will lead to megawatt scale high-energy lasers of a compact nature for use in space-based applications. There are no apparent technical limitations on power level for these lasers. Current developments indicate the potential of arrays of diode lasers becoming the weapons of choice for space applications.[23]

Lasers are not, however, all weather systems. Clouds, rain, and atmospheric effects can scatter the laser's beam and require an increased power output to compensate. Large optics are also required; the size is dependent upon the frequency of the laser output and the range to the target. For the frequencies of laser systems currently under development, a 20-meter diameter optical system will be required for a satellite in low earth orbit.[24]

Lasers are extremely flexible weapons in that the amount of lethality can be controlled by the duration of the pulse and the power of irradiation. Thus, at high power levels and long duration (several seconds), burn through and target destruction can be achieved. At lower power levels, electronic degradation, melting, infrared sensor blinding, and target designations for laser-guided weapons can be produced. Flammable materials will catch fire under fairly low irradiation levels making targets such as gasoline refineries tempting.

Several methods provide defense against the efforts of lasers. Covering targets with a reflective or ablative fire resistant coating will lessen the heat buildup on surfaces. Protective coatings on missile launch sites, radar and electronic equipment may forestall laser attacks. Another potential countermeasure takes advantage of the fact that lasers will not penetrate through layers of earth, making hardened and buried targets safe.

Moving targets are not safe, especially if the acquisition and targeting systems are interconnected with the weapon in real time. Lasers can destroy targets in seconds from activation making even supersonic aircraft vulnerable. Lasing of fuel tanks or external weapons will explode the aircraft.

High-powered lasers have already proven effective in providing cruise missile defense and downing ballistic missiles in boost phase. Once high power generation technology advances are made and miniaturization techniques are employed easing the space lift burden, space laser weapons should be readily available for production and deployment.

**Kinetic Weapons**

Kinetic weapons are missiles or other types of projectiles launched from space-based platforms and either guided by GPS or laser designator. They destroy the target by attaining hypersonic speeds and shattering it with an enormous force. This type of weapon has the projected capability of destroying targets buried hundreds of feet underground.[25] Again, space based kinetic weapons would provide yet another tempting target for an adversary.

Kinetic weapons have the potential to be extremely accurate with GPS terminal guidance, similar to current day precision guided munitions but without explosives. They have great destructive potential due to the speeds that they obtain. Single targets or multiple targets can be attacked depending on the type of projectile employed.[26] Unlike lasers, they will be all-weather weapons, capable of being launched from satellites and striking targets anywhere on earth in a matter of minutes.

Kinetic weapons will not require the power generation equipment that high-powered lasers will. This gives them a distinct advantage. Interconnectivity with surveillance, acquisition, and targeting satellites in a system architecture will, like

laser, create a potent weapon system. The distributive nature of the constellation approach to satellite weaponry will allow less susceptibility to anti-satellite attacks. Other stealthy approaches to manufacture will also aid in defense.

The main problem with kinetic weapons is the fact that they generate lots of heat upon reentry. This can seriously degrade the electronic GPS receiver for terminal guidance. The use of a laser beam to lead the projectile through the atmosphere, creating a bow wave to partially shield it is one potential cure.[27] Defense against kinetic weapons is nearly impossible once the weapon has been launched. Anti-satellite weapons to eliminate the satellite before it launches or disruption of GPS service appear to be the only defensive measures to prevent kinetic attack. Of course, neither of these have the capability to prevent a preemptive strike making them rather vulnerable.[28]

The technology to allow kinetic strikes is available today. Thus, in the future, advancement in technology will allow even greater accuracies and destructive power. This technology has some very appealing attributes for future space weaponry.

**Strategy and Doctrine**

Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after they occur.
-Guilio Douhet

Military commanders are expected to limit the loss of troops and equipment in modern warfare. Precision guided munitions and stealth technologies provide an invaluable tool in such an effort. Historically, weapons like the Tomahawk missile have helped eliminate the need for aviators to attack through enemy air defenses, reducing exposure to hostile fire and protecting the pilot and jet. By all estimates, war in the future will be even more technologically oriented with little direct confrontation.

Commanders, isolated from the danger of the battlefield, will employ unmanned systems to execute surveillance, target and destroy the enemy. Offensive space weapons will improve the commander's ability to protect and defend with less loss. Space weapons will also have a true global reach. This will clearly impact peacetime military roles and combat planning. US national security strategy needs to be specific in the appropriate application of such systems should they ever be deployed. Assuming that the decision to deploy offensive spaced based weapons is a foregone conclusion, military strategy and doctrine must be adapted accordingly.

**Doctrine in Peacetime**

The primary peacetime manifesto for these weapons will be deterrence. The potential destructiveness will at first be questionable, but will no doubt give US adversaries reason to ponder nonetheless. Unfortunately, out of sheer mistrust they are likely to pursue efforts to combat a perceived threat, whatever allegedly positive US intentions for use of the weapons might be.

Additionally, since these weapons will be susceptible to anti-satellite technology, it will be tempting for the US to preemptively strike anti-satellite production facilities and launch sites of any adversary. The collateral damage from these weapons may also be so small as to favor these preemptive strikes because negative international reaction will be at a minimum as long as damage is contained and personnel casualties are low. This is quite different from the previous philosophy of avoidance of military action in peacetime unless directly attacked.[29] Of course, the goal of avoiding preemption has already been circumvented by military action in Iraq.

Deployment of offensive satellite systems, especially in peacetime, will automatically generate international reaction. Nations who have rivalries with the US, whether economic or military, will find it necessary to try to develop countermeasures and defensive systems. In some cases, countermeasures are currently on the drawing board but limited because steps areexpensive to design and build. The US monopoly on the deployment of these weapons would likely be temporary at best. The primary threat to the US domination of space, anti-satellite weapons, would have to be frequently monitored and upgrades would constantly be needed.

Once deployed, the presence of space weapons may not have a great deterrent effect. To date, the quantity of destructive power is not available to seriously disable aggressive actions before they start. The mere presence of lethal equipment has not historically impeded an aggressor's actions and there's no reason to believe an unseen weapon in space would have any effect, particular one without major potential for total devastation.

**Doctrine in War**

Wartime use of space weapons will be multi-faceted and immediate. As part of a strategic campaign against an enemy nation, space weapons will be able to attack anywhere within seconds. This will make nearly any military or civilian target that has not previously been protected subject to destruction. Specific targets might include intelligence headquarters, electric power grids, communication nodes, leadership, command bunkers, dams, roads, bridges, buried ammunition bunkers, and energy facilities, but anything would be vulnerable. The pinpoint precision and impact within seconds sends a strong psychological signal to an enemy.[30] Consequently, with such destructive ability comes the responsibility to act and plan conscientiously.

Tactical targets can be attacked directly from space. Due to the quick reaction and speed of laser weapons, tanks, aircraft, armored vehicles, missiles, helicopters, and ships, nearly any surface-based military target can be engaged and destroyed. Ships at sea will no longer be immune from attack in any part of the ocean. Eventually, nations will need to control space in order to control the sea, air or the land.

Such envious capability will be why space will become the main battleground once US space monopoly ends. The battle for control of space will be the total war. Anti-satellite weapons will be used extensively to eliminate the earth attack satellite systems. Anti-satellite weapons would have to be developed and deployed to counter the enemy space control weapons. The never-ending cycle will drive a continuous arms race in space.

Joint Pub 3-14, Joint Space Doctrine, assigns force application and space control as primary space missions. Force application will include attacking airborne and terrestrial targets and possibly missile defense. These will be the primary missions of a future "Airspace Force." At a conference in Huntsville Alabama in 2002, J-5 Vice Director of US Space Command admitted that the command is directly responsible for this type of mission. The type of global reach described has not been seen before. Although, stealthy B-2 bombers can apply precise force anywhere in the world, the time to get there is not comparable to the speed of delivery from space.

Stealth is never absolute. Conventional Tomahawk and air-launched cruise missiles will become obsolete. Space control will be a second primary mission, defined as the ability to assure freedom of action in space and deny the same to the enemy. This translates into an ability to defend US space assets from space. US policymakers have put the task in the hands of the US Space Command. However, the US Army has addressed the issue as well. They are concerned that such space based capabilities will negate the current advantage they possess by the use of satellite imagery, communications and precision targeting.

**The New Strategy**

To assess the impact of offensive space weapons on military strategy in the 21st Century, one must look at history. After World War I, many in the fledgling US Army Air Service and elsewhere throughout the world were expounding the theory of air power. Strategic bombing of cities was presumed to eliminate the enemy's will to fight bringing all future conflicts to a rapid conclusion. Guilio Douhet proclaimed that the side who had control of the air would win the next war. Billy Mitchell proved how air power would master the air above the sea as well as land by sinking the German battleship Ostfriesland from the air in 1921.[31] The obvious conclusion was that land and sea forces were no longer needed. Air power had arrived. But like many new innovations, its promise was well beyond its ability to deliver.

Another revolutionary weapon introduced at the end of World War II, the atomic bomb, demonstrated the dominant role air power would play. Many now believe these weapons showed, as Mitchell had predicted, that air power would eliminate the need for conventional military forces. Nuclear attack would decide all future wars. The fear of nuclear annihilation kept the two superpowers from engaging in a conventional military confrontation and "mutually assured destruction." Real deterrence had arrived.

The argument for a space force that will reduce or eliminate the need for other surface or air forces generates similar claims. Space-based weapons, responding in seconds, penetrating anywhere on earth, always available, flexible and lethal, can become the new weapon of choice to control and end conflict and prevent through the fear of attack any aggression on the part of our enemies. On the other end, they can kill us all; especially if nuclear.

In reality, nuclear weapons have not eliminated the need for a robust conventional weapons capability to include navies and armies; and it is likely space-based offensive weapons will not either. Generally, dream usage of new weapon systems do not often materialize as expected. Ultimately, war is reduced, and some would argue always reduced, to man versus man, the essence of human confrontation.

History has shown also that the ability to attack from more than one direction or dimension using more than one weapons system has been a valuable force multiplier. Although space weapons may be a formidable asset to the Joint Force Commander, a commander will still rely more conventional "tools in the regular toolbox" weapons systems.

Currently, space weapons do not have the destructive power of nuclear weapons unless they themselves are nuclear. Such deployment of nuclear weapons in space is particularly confrontational and should definitely not be pursued unless some truly remarkable circumstances somehow arise. Therefore, space weapons become just another conventional precision attack weapon. They will continue to be an augmentation to other weapons, not a replacement. Nuclear military strategy is unlikely to be affected.

Although space weapons may have a role in future conflict at sea, peacetime presence and crisis response missions, including Marine Corps contingency operations are not likely to disappear. The Navy will have a viable and significant role to play in this arena. Aircraft carriers, as the showpiece of American diplomacy and the center of crisis response operations, will still be a viable and reliable tool; but strategists will need to consider defending them appropriately. Simply put, there will be nowhere to hide.

Ground combat operations will be needed for the same reasons they are utilized today - permanent conflict termination. Without ground forces present inside the

enemy nation, the end of war may not be affected on the term desired by the US political leadership regardless of how difficult it often is to win the peace. Army forces will remain the final tool in US power diplomacy. The Air Force may have expanded roles in the control of space but will, politics aside, not delete any of its current airborne missions and rely solely on space-based offensive weapons. Close air support and air reinforcement operations will serve the same functions they have in the past and the long range bombing option will still provide an alternative choice.

Space control warfare, with anti-satellite missions in prominence, will impact future strategy and planning. Information technology and the data received and heavily relied upon by field commanders, provided today to the commander from satellites, may be interrupted. Back-up systems will have to be developed, possibly using unmanned aerial vehicles (UAVs) able to provide real-time surveillance, intelligence, and targeting information in lieu of satellites or the old fashioned way.

Revolutionary changes in the conduct of war in the next century cannot solely be predicted based on the presence of space offensive weapons. As a force multiplier, they can be a significant asset to a commander due to their quick reaction, measured lethality, and global availability. Kinetic weapons will have an added capability to destroy deeply buried command or ammunition bunkers. Regardless, as a significant factor in influencing the outcome of a conflict and in totally eliminating the need for other more conventional weapons, they will not alter the status quo, just enhance it.

Anti-satellite weapons will have a significant place in future military planning. Using the same kinds of technologies described, whether space-based or ground-based, the US space control mission will eventually be expanded. The US historically has resisted up until the current Administration, placing any anti-satellite weapons systems in operation. The expectation is still that this system will remain ground-based. However, a space-based system could easily be developed as the logical follow-on to the ground-based one.

Another likely scenario to begin space weaponization would be the first space-based anti-ballistic missile defensive system, consisting of some type of laser. This system would be the obvious follow-on to the Airborne Laser program. Because President Reagan gave the impetus to ballistic missile defense in the 1980's, before the fall of the Communist governments in the former Soviet Union, and because of the evil publicity engendered by Saddam Hussein's use of Scud missiles during Desert Storm, the public support for such a program will likely be fairly positive.

Both of these weapons system development programs are likely scenarios for the beginning of the militarization of space, which could open the door for further

offensive weapons development and deployment. The future of space, beyond the information age, is likely to be warfare.

**Conclusion**

A new set of rules for the conduct of war will have to be devised and a whole new set of ideas of strategy learned by those charged with the conduct of war.
-Brig. General Billy Mitchell, USA (1925)

The US could be the first nation to break the international self-imposed moratorium on placing offensive weapons in space. The American public's sense of fair play that the US always abides by the rules in international conduct will suffer a setback, although no treaties would be broken. But it is likely that the US public will support defensive weaponry, such as anti-satellite systems, especially since 9/11. Unilateral arming of space will cause a credibility problem with US allies around the world. However, the current administration hasn't seemed too concerned in this regard.

The US cannot afford the exorbitant financial expenditure of space weaponization at this time. The US must do all it can to avoid a space war. The optimum way to do this will be to ban anti-satellite weapons. However, this will not by itself eliminate the threat from space. Space-based anti-ballistic missile systems are likely to also be produced which can easily be transformed into ground attack systems.

The US must consider and define the gains, if any, from the unilateral deployment of offensive space weapons. Less costly and equally effective systems for anti-ballistic missile defense exist or can be developed that are ground-based or airborne. The commercial use of space is extensive; especially in the domain of communications. Opening space up to potential conflict would devastate American industrial and commercial activities. Simply put, denying the West access to commercial communications satellites would bring all our economies to their knees in very short order.

The questions to be answered by US policymakers and military planners can be consolidated into three significant issues. First, will the US be able to afford these systems and are they worth the investment? Secondly, will US arrogance expect other nations to refrain from matching US efforts in space once the US breaks the moratorium? Thirdly, will offensive space weapons threaten the stability of the world?

These questions have no simple answers. Many would argue that it is time to ban all weapons in space. They compare this decision to the one made in abandoning pursuit of a neutron bomb. However, the pursuit of technological advancement will continue and the military has the responsibility to continue to develop better weaponry in order to stay ahead of potential competitors. Conflict between

competing nations is not likely to end soon and has existed since time immemorial. Finding a more effective way to prepare and to win the next war is an obligation not a theory. The US must lead and, as the scouts say, be prepared. There is no question that protection of space assets, including but not limited to communications satellites, constitutes a major national security strategic asset for every nation.

NOTES

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8. Ibid, 12.
9. Ibid, 13.
10. Space Handbook, 42.
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12. Spares, 135. The playing of the "China card" by then President Nixon has been discussed as one aspect of the relaxation of tensions with the Soviet Union and the beginning of the détente era in the US-Soviet relations. See, e.g., Henry P. Kissinger, Diplomacy (New York: Simon and Schuster, 1994), 703-761.
13. Michael R. Mantz, The New Sword: A Theory of Space Combat Power (Maxwell Air Force Base: Air University Press, 1995), 7.
14. Kerry Gildea, "Air Force Space Officials Believe US Use of Space is Inevitable," Defense Daily, 28 Feb 2002.
15. John Markoff, "Next Wave in High Tech: Tiny Motors and Sensors," N.Y. Times, 27 Jan 1997.
16. New World Vistas, directed energy volume, xiii.
17. See Williams A Owens, "The Emerging System of Systems," Proceedings 121, no.5 (May 1995): 35-39.
18. Air University, Air Force 2025: Vol. 4, chap 3, pg 13.
19. Ibid.
20. New World Vistas, v.
21. Ibid, vii-viii.
22. Ibid, ix.
23. Ibid, xii.
24. Ibid, x.
25. Air Force 2025, 38.
26. Ibid, 39.
27. Ibid, 38.
28. Ibid, 40.
29. The one exception may have been President Clinton's use of cruise missiles to persuade Saddam Hussein not to wage war against his Kurdish population in northern Iraq in September of 1996. This is very analogous to the situation I have described because of the low

possibility of collateral damage and the lack of placing US personnel in harm's way. Perhaps this prophecies the war of the future.

30. Mantz, 45.
31. Carl H. Builder, The Icarus Syndrome (New Brunswick: Transaction Publishers, 1994), 53.

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