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SPACEPOWER: A STRATEGIC ASSESSMENT AND WAY FORWARD

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ABSTRACT

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Space capabilities will probably provide the greatest added value to national power, wealth, and military lethality in the 21st Century. The U.S. does not have a National Security Space Strategy to guide its activities and has largely followed its technological prowess to exploit the space medium. Meanwhile, the number of government, commercial, and non-state entities engaged in space activities has multiplied. The strategic environment is increasingly influenced by spacepower. In this age of astropolitics, failure to understand the nature of spacepower and how to wield it could lead to serious miscalculations by strategic leaders and tragic consequences for peace and stability. This paper first examines the strategic environment's most pressing global and domestic factors influencing the development and employment of spacepower. Secondly, national purpose, space interests, and current space policy are examined, followed by a survey of strategic thinking that has influenced defense space policy, programs, and doctrine. Finally, major issues are assessed and specific recommendations are offered to guide formulation of a valid National Security Space Strategy that can give substance to the National Space Policy, positively influence the strategic environment, and enable a favorable future.

SPACE POWER: A STRATEGIC ASSESSMENT AND WAY FORWARD

Space capabilities will probably provide the greatest added value to national power, wealth, and military lethality in the 21st Century.¹ It is a virtual certainty that like the land, sea, and air domains before it, the space domain's exploitation will lead to power struggles and perhaps armed conflict as nations and transnational entities pursue their interests.² The United States (U.S.) has exploited space for various national purposes within the bounds of a bipolar nuclear deterrent, duplicitous legal regime, and generations of ambiguous policy and political divisiveness.³ The U.S. does not have a National Security Space Strategy to guide its activities and has largely followed its technological prowess to exploit the space medium.⁴ Meanwhile, the number of government, commercial, and non-state entities engaged in space activities has multiplied. This growth of space activity comes in a time where cultural differences, information, and globalization have ushered in a more diverse set of security challenges. The strategic environment is increasingly influenced by spacepower, which is defined here as the space medium's exploitation for military, political, economic, and other purposes.⁵ In this age of "astropolitics", failure to understand the nature of spacepower and how to wield it could lead to serious miscalculations by strategic leaders.⁶ From a national security perspective, failure to proactively address tough spacepower issues may erode the domestic and international conditions necessary to achieve and sustain a peaceful and prosperous future. From a military perspective, decisions regarding spacepower may inadvertently create unacceptable risks and vulnerabilities for land, sea, and air forces and impede transformation efforts. Such miscalculations could precipitate catastrophic consequences for national security and global stability in the 21st Century. Hence, a National Security Space Strategy is needed to better shape a favorable future.

Strategic Theory and the Army War College's Strategy Formulation Model provide a framework for this paper to examine spacepower and space strategy formulation. Initially, the strategic environment's most pressing global and domestic factors influencing the development and employment of spacepower are discussed. Secondly, national purpose, space interests, and current space policy are examined, followed by a survey of strategic thinking that has influenced defense space policy, programs, and doctrine. Finally, major issues are assessed and specific recommendations are offered to guide formulation of a valid National Security Space Strategy that can give substance to policy, influence the strategic environment, and shape a favorable future.

The Strategic Spacepower Environment

Global and domestic trends are changing the strategic value of spacepower and are affecting the calculus of nations and non-state entities alike. Historically, the 1957 launch of Sputnik and the specter of Soviet nuclear armed spacecraft orbiting overhead were catalysts that rapidly ushered in the space age.⁷ The ensuing space race to the moon was a brazen demonstration of competing military power. In response to the space race and the threat of nuclear war, various treaties, declarations, and agreements were promulgated that comprise the international legal regime governing space activities.⁸ This space regime has mass appeal, since it exhorts idealist notions of peaceful space coexistence, celestial bodies free from sovereignty claims, and space as a weapons-free sanctuary. These notions were really peaceful cloaks that served as leverage points in a realist grand bargain between the Soviet Union and the U.S. The space regime's elements governing non-interference with national technical means, banning orbital weapons of mass destruction, and prohibiting anti-ballistic missile (ABM) systems effectively mitigated the risk of nuclear war. The space regime also prevented military domination of space by either the U.S or the Soviet Union, but its ambiguity on certain issues did permit space's militarization.⁹ As a result, the U.S. now enjoys the world's most technically advanced military and intelligence space capabilities. Over time, the world has become multi-polar and new threats are not confined to rational nation states. To deal with these new realities, the U.S. withdrew from the space regime's ABM treaty with Russia in order to enable a national missile defense system against North Korean and Iranian threats. Similarly, other aspects of Cold War era space thought may warrant adaptation to meet the challenges of globalization and transnational threats in the 21st Century.

The principal value of satellites is their extensive view of earth, which enables effective and efficient gathering and dissemination of information.¹⁰ Recognizing the value of satellites, many entities are engaged in commercial, civil, and scientific satellite applications adding to the quality of life for societies and individuals. Profitable international space consortia are growing, many businesses are engaged in space services, and where trade goes the flag follows. Russia, Europe, Japan, Canada, India, and China continue to develop space launch and satellite capabilities.¹¹ Next to the U.S., Russia has the largest number of national satellites. Russia is also pioneering space tourism and is an important contributor to international scientific space endeavors. France intends to increase its space budget by 50 percent, and other European countries are following suit to develop multinational space defense systems.¹² China is expanding its civil-military satellites and intends to conduct a manned mission to the moon. This fantastic growth and exploitation of space has evolved in a relatively benign political and

military environment, and many space system dependencies have developed. Despite these dependencies, most entities continue to respect peaceful space principals and do not interfere with national and commercial space systems, but there are some concerns.

While the high vantage point of satellites may provide their principal value, this same attribute makes them easily observed and lucrative targets.¹³ Therefore satellites are vulnerable to attack and as the strategic environment becomes more volatile, hostile entities are more likely to exploit this weakness. Cases of state and non-state entities developing anti-satellite capabilities or purposefully interfering with satellites are on the rise.¹⁴ Iran recently launched a medium range ballistic missile to sub-orbital altitude, purportedly to develop its own peaceful space capabilities for communications.¹⁵ Terrorist and drug trafficking organizations have demonstrated an adept ability to exploit satellite services to facilitate their planning, communications, and operations.¹⁶ China kinetically destroyed one of its own satellites, illuminated a U.S. satellite with a laser, and has advocated space warfare in military publications.¹⁷ While provocative, China's actions could be in response to a line already crossed by the U.S. with its own laser test on a satellite, kinetic interceptor tests on ballistic missiles in mid-course space transit, and a plethora of military publications exhorting the need to assure U.S. space superiority. These trends are likely to continue, and spacepower dynamics may dominate the behavior of nations and non-state actors in the near future.

Meanwhile, international scientific endeavors and space exploration continue to inspire large cross-cultural segments of the global population. The International Space Station, robotic Mars explorations, and other space projects continue to foster international partnerships and provide benefits from spin-off technologies. The recent discovery of massive amounts of frozen water on Mars will undoubtedly inspire human exploration.¹⁸ Rising concerns over global climate change, natural disasters, stressed food and energy sources, and the very real threat of asteroids devastating civilizations are making survival imperatives more prevalent in international political dialogue. Civil and scientific space projects help in understanding these natural phenomena and shaping responses, but unfortunately they languish as governments divert resources to address more immediate pressures.¹⁹ Private capital is a potential source to invigorate space research and exploration, but the space regime's prohibition against sovereign rights on celestial bodies removes traditional financial incentives for private entities to explore and exploit these resources.²⁰ Earth sensing satellites, deep space sensors, and space projects that expand human presence elsewhere in the galaxy are more important to societies than ever before. The importance of spacepower is growing and changing the political calculus of governments.

In addition to these global trends, domestic factors are also changing spacepower's dynamics and influence on the strategic environment. The technological advantage and global market share of various U.S. space industries are eroding as globalization and proliferation foster new foreign space competitors. Maintaining a competitive edge is driving U.S. space service companies to innovate and seek relief from government licensing restrictions on technology exports.²¹ The space launch industry has long suffered from high costs that make space-based solutions to various government and military needs unattractive and inhibit commercial exploitation of space. Smaller, netted satellites and launch projects like Falcon 1 and the X-Prize offer the prospect of reducing launch costs to very affordable levels.²² Mass production of standard satellite buses that can host a variety of sensor and relay payloads are likely to mature in the near future. Laser communications technologies will migrate to space and expand the pool of available bandwidth, increasing data throughput, and reducing the latency of long range communications.²³ These technological advances will dramatically increase the pace of space exploitation.

National Aeronautics and Space Administration (NASA) projects continue to impress, but the media and the public have grown relatively complacent about space activities unless tragedy strikes. Conversely, Congress is anything but complacent. Emerging threats to space systems, growing defense and intelligence space budgets, satellite program failures, and Nunn-McCurdy breaches have caused Congress to exert pressure on the national security sector. As a result, defense and intelligence space acquisition policies were modified, the space roles and functions of the Services were clarified, and the DoD established the Air Force as the Executive Agent for Space, among other reforms.²⁴ Apparently these actions have not gone far enough. Congress again indicated that further change is needed by requiring the Secretary of Defense (SecDef) to conduct another independent review and assessment.²⁵ The resulting June 2007 report is expected to address defense space needs and efforts to fulfill those needs, ways to improve space organization and management, and the ability of DoD to execute future space missions.²⁶ In combination, these domestic and global space factors are having significant effects on the volatility, uncertainty, complexity, and ambiguity of the strategic environment and bringing the importance of spacepower to the forefront.

National Purpose, Space Interests and Current Policy

The U.S. national space purpose finds its roots in the ideals, pioneering spirit, and conflicts that forged the nation.²⁷ Fundamental truths enshrined in the U.S. constitution are exhibited by U.S. advocacy for an international plan to mutually control space in a way that

incorporates the tenets of peaceful cooperation.²⁸ Extending human presence into the virtually unexplored frontier of space invokes romantic notions of national destiny and inspires the collective U.S. technological genius.²⁹ The U.S. constitutional commitment to a common defense and preference for collective security arrangements includes protecting vital space interests.³⁰ The global spread of individual freedoms and democracy, international legal and trade regimes, reliance on cooperative international security arrangements, and a globalized economy have transformed an American national purpose into the values and beliefs that drive many of the world's societies.

U.S. national space interests center on free enterprise and national security. The U.S. has derived great wealth and technological benefit from its government and commercial space activities. The space domain's exploitation for national security broadened the array of remote sensing, communications, missile warning, and other satellite functions that U.S. military and national power depend upon.³¹ Globalization of space enterprise has created an international space market of nearly one hundred billion dollars in annual revenues accounting for over one million jobs worldwide.³² One third of global space revenue and employment is attributable to the U.S. commercial space sector.³³ The U.S. Space Enterprise Council estimates that additional multi-billion dollar space business opportunities now exist in launch, metals, pharmaceutical and other sectors.³⁴ Properly nurtured by government and unimpeded by law or policy, the U.S. commercial sector could maintain a technological and competitive edge and simultaneously enable advanced national security capabilities.³⁵ Affordable and responsive launch, mass satellite production, applied materials and technology research, and development of pharmaceuticals are just some of the near future commercial developments with military application.³⁶ Wild card developments like neutrino detection satellites to detect and locate every nuclear device on the planet are also possible and would dramatically alter the strategic environment.³⁷ Less urgent, but no less important is a national interest in space projects motivated by survival imperatives to meet environmental challenges and expand human presence in the galaxy. Thus, American national interests in fostering a secure environment to conduct space exploration, space commerce, and enable national security are vital and shared interests with many nations.³⁸

The purpose and vital space interests of the U.S. are reflected in the 2006 National Space Policy. The space policy provides a clear vision, if not initiating a grand strategy, in its declaration of guiding *principles* and *goals*.³⁹ The policy recommitments the U.S. to ensuring freedom of access and use of space for peaceful purposes by all nations and maintains the long held rejection of sovereignty claims over outer space or celestial bodies. These principles are

asserted in order to cooperatively extend space benefits to all humanity, enhance space exploration, and to protect and promote worldwide freedom. Peaceful purposes by all nations includes the right of free passage through space, the right to “operate in and acquire data from space...without interference”, and the right to conduct “defense and intelligence...activities in pursuit of national interests.”⁴⁰

Consistent with these principles, the National Space Policy considers all components of space systems vital national interests and purposeful interference with space systems is an infringement on national rights. Therefore, the U.S. “*will preserve its rights, capabilities, and freedom of action in space.*”⁴¹ Possible actions the U.S. might take include the use of dissuasion and flexible deterrent options to counter others from impeding those rights or developing capabilities intended to do so. The U.S. will also take actions to “*protect its space capabilities, respond to interference; and deny, if necessary, adversaries the use of space capabilities hostile to...national interests.*”⁴² Further, the U.S. will oppose new legal regimes, arms control agreements, or other restrictions that seek to impair its rights and prohibit or limit access to or use of space.

Based on the policy’s principles, fundamental goals are established that cut across the national security, diplomatic, civil, scientific and commercial space sectors. Focusing on national security, the goals are to strengthen the nation’s space leadership, ensure that space capabilities are available in time to further policy objectives, and enable unhindered U.S. space operations to defend national interests.⁴³ Goals to defend national space interests include encouraging international cooperation, and use of U.S. space capabilities by friends and allies in order to advance national security, homeland security, and foreign policy objectives. In keeping with the policy’s principles and goals, the SecDef and Director of National Intelligence (DNI), in conjunction with the Secretary of State, are directed to develop capabilities, plans, and options and pursue diplomacy in order to achieve the policy’s objectives.

Past presidential space policies relied on ambiguous, evasive, and even contradictory language.⁴⁴ The new space policy is less timid in its clear assertion of long held principles, but judging by news dispatches registering official complaints from Moscow, Chinese anti-satellite demonstrations, and the tenor of media commentaries, the policy is widely misinterpreted.⁴⁵ There is even a degree of contrived disinformation asserting that the space policy is clearing the way for deployment of space weapons and a unilateralist push toward U.S. domination of space.⁴⁶ The administration sought to clarify that the U.S. will continue to abide scrupulously by the outer space treaty, but the policy reflects the new realities of emerging space threats, recognizing that not all countries can be relied on to pursue exclusively peaceful space goals.⁴⁷

Despite these strategic communications, the policy is likely to remain controversial until an acceptable national security space strategy gives it substance.

Strategic Concepts and Schools of Thought

Despite the absence of official national security space strategy, four schools of thought have dominated the shaping of policy and tenor of public discourse since the advent of spacepower.⁴⁸ They are the *Sanctuary*, *Survivability*, *High-Ground*, and *Control* schools.⁴⁹ *Sanctuary* stems from the premise of early nuclear deterrent strategy that defense against nuclear missiles is futile, and space, as an enabler of missile warning and arms control verification, should remain weapons-free by treaty and international law. *Survivability* contends that satellites are inherently vulnerable and shouldn't be depended upon for critical military functions. *High-Ground* rejects the mutually assured destruction nuclear deterrent strategy and asserts that space-based missile defense weapons should be used to defend against nuclear attack. *Control* uses sea and air power analogies oriented on allowing free passage of satellites in peacetime, but seizing control of space and achieving space superiority in time of war. Defense policy, doctrine, and culture widely trends toward versions the *Control* school.⁵⁰

Two strategic concepts add a fresh perspective and alternative to the mix of strategic thought. In the book *Neither Star Wars Nor Sanctuary*, O'Hanlon advocates a *Hedging* concept where the U.S. would continue to respect the current outer space regime, while simultaneously developing the capabilities needed to engage in space warfare, without being the first to deploy such weapons.⁵¹ If another entity crosses the space weapons line and violates the sanctuary premise, the U.S. could quickly gain control with its own deployment of space weapons.⁵² Additionally, Dolman in the book *Astropolitik: Classical Geopolitics in the Space Age* promotes a strategic concept called *Astropolitik* where the U.S. would withdraw from the space legal regime, replace it with a free market form of celestial sovereignty, and seize military control of low earth orbit with space weapons.⁵³ These actions would establish a police blockade to control international access to space and efficiently destroy anti-satellite capabilities.⁵⁴ Thus the U.S., as the most benign national power, could quickly create and maintain a safe operating environment, assure free access to space, and usher in a new age of space exploration replete with economic incentives for private enterprise.⁵⁵

Given the schools and concepts above, a clearly acceptable and valid choice for space strategy is not evident. These strategic concepts, together with defense policy and doctrine advocating space control and space force application, fuel assertions that the new space policy is clearing the way for the U.S. to weaponize and dominate space.⁵⁶ Such perceptions about

U.S. spacepower exacerbate domestic and global factors that increase the strategic environment's uncertainty and volatility. Formulating valid space strategy may provide a way forward that yields a positive outcome.

Toward Valid Space Strategy and Effective Spacepower

Formulating valid space strategy provides a vehicle to give the national space policy substance and dispel myths about U.S. intentions. Strategy formulation, by its nature, evaluates and validates the appropriateness, practicality, and consequences of policy.⁵⁷ The formulation process informs decision-makers of what spacepower can and cannot achieve, its associated costs and benefits, and areas of dissonance that require adjustment of either national policy, defense policy or strategy.⁵⁸ Valid space strategy must justify its objectives, the methods used to obtain them, and costs in blood and treasure when considering second and third order effects on the strategic environment.⁵⁹ The chosen ends, ways and means must be suitable, acceptable, and feasible. Further, the level of risk must be acceptable after examining the entire logic and assessing whether the consequences of its failure or success result in a more or less favorable strategic environment.⁶⁰

The earlier examination of space strategy's elements provides a basis to identify and assess the areas of dissonance that, if resolved, could yield valid space strategy. In the formulation of space strategy six concerns come to the fore. First, the lack of comprehensive spacepower theory contributes to the ineffective development and wielding of spacepower. Second, desired changes in the operating environment are not well understood and require better articulation. Third, selected objectives are typically improper and inappropriate. Fourth, supporting concepts and capabilities are usually unsuitable or infeasible. Fifth, typical strategic concepts and their supporting means would create effects in the operating environment that are undesirable and the associated risk is unacceptable. Finally, a tendency towards space-centric logic results in a general failure to demonstrate value and relevance to other forms of power and the outcome of events on land.

The first concern is fundamental since strategic theory is a precursor to strategy. Spacepower suffers from an acute malady since it lacks a theoretical foundation comparable to that of land, sea, and air power.⁶¹ While some have tried their hand at the theoretical foundations of spacepower and partially succeeded, the Clausewitz, Douhet, or Mahan of spacepower has yet to step forward. Consequently there is a vacuum of comprehension about the nature, structure and dynamics of spacepower, its interdependencies with other forms of national and military power, and its effects on the strategic environment across the spectrum of

conflict.⁶² As a result, policy is directed, doctrine promulgated, and programs resourced based on a variety of views, parochial interests, and a presumed need for space superiority and space weapons.⁶³ Recognizing this shortcoming, the Under Secretary of Defense (Preparation and Warning) requested that the National Defense University craft a comprehensive spacepower theory.⁶⁴ This effort is eminently needed to provide a basis for valid and enduring space strategy.

The second concern is to understand desired changes in the strategic environment that advance favorable outcomes and precludes unfavorable ones.⁶⁵ The strategic environment exhibits complex, self organizing behavior and continuously seeks to find an acceptable order or relative balance.⁶⁶ Understanding the interdependent dynamics between spacepower and the strategic environment provides the insight and parameters to see the limitations and possibilities of space strategy and a path or multiple paths toward policy's goals. Thus space strategy must change, leverage, or overcome both global and domestic factors examined earlier and modify the strategic environment's equilibrium in a way that creates a favorable outcome.

Updating the space regime's security mechanisms to reflect the contemporary strategic environment could result in desired changes that enhance national security and stabilize international spacepower dynamics. With time, diplomacy, and objective analysis by other nations, the U.S. space policy's principles could gain universal appeal. Codifying these principles with Russia, China, and others might yield a needed degree of certainty and trust between spacepowers in order to reduce volatility. Treaties to ban all manner of space weapons may be naïve and ineffective over the long term, but they have mass appeal. Harnessing that popular support could provide negotiation leverage for other beneficial security agreements. For example, agreeing to a carefully defined orbital weapons ban seems plausible if certain anti-satellite and protection capabilities are not prohibited in order to defend against potential treaty violators and maintain the principle of sovereign rights. Incorporating the orbital weapons ban within a broader international space security agreement could enable a wider range of intelligence, law enforcement, economic, diplomatic, and military options to deal with purposeful interference and other hostile space acts. Such reforms and new international organizations could result in greater visibility into the operations of satellite service providers in order to detect, locate, and monitor terrorist and criminal activity or more responsively deny service and respond to purposeful interference. Other aspects of an agreement could establish conditions that justify the use of conventional military force to counter hostile space acts. These types of changes or variants of them may remove uncertainty about U.S. intentions, reduce the

likelihood of a space weapons race or space warfare, facilitate national space policy objectives, and precipitate more cooperation and stability in other international affairs.

Changes in the domestic environment are also required. The national security sector organizes and manages space largely as an adjunct capability to other organizations, despite the need for specialized capacities unique to the space medium. Dedicated space professionals within military and other organizations are surely needed to fully integrate space capabilities. However, the rising importance of spacepower suggests the time may have come to execute bold leadership, visioning, and organizational change processes in order to develop people who will more effectively shape and execute America's spacepower in the 21st Century.

The third concern is ensuring space strategy objectives are properly selected, appropriate to the desired policy, and create the desired strategic effect.⁶⁷ Identifying correct objectives requires careful deliberation and should result in a marked departure from old paradigms. Attaining space superiority, unilateral space control, and applying force from space have long dominated strategic thought and defense policy.⁶⁸ However, as strategic objectives these notions may be fundamentally flawed for several important reasons.

First, they rely too heavily on analogies from other domains. These analogies do not comprehensively account for the unique medium of space with its different spatial and temporal scales, orbital physics, and operational characteristics. Space is as different from land, sea, and air as the latter are from each other.⁶⁹ Unlike the other domains, there are no territorial or international spatial distinctions to delimit space. Similarly, satellites can't stop or maneuver around denied sovereign territory. Satellites, by their nature, inherently violate traditional notions of sovereignty and spatial control. The unique physics of the space domain and operational characteristics of satellites create multiple security dilemmas that are not easily explained away by earthly analogies.

Second, spacepower's brief history shows that the notion of space dominance invokes undesirable international actions and consequences. Pursued as an objective, space dominance or its variants are likely to create a deleterious if not catastrophic effect. Nations have grown accustomed to surrendering a small degree of sovereignty to relatively benign orbital sensors and relays given their positive effect on security and wealth. However, the specter of space weapons orbiting overhead and in the control of any single entity is a degree of sovereignty no nation is likely to surrender peacefully, no matter how benign the controlling power might be. Such coercive orbital military capabilities, particular if used to apply force to earth, probably rise to the level of a disproportionate and unprecedented military instrument.

Taken together, these considerations pose a moral challenge in adhering to the just cause, right intent, proportionality and legitimacy considerations of the *Just War* tradition.⁷⁰ Just as the specter of space weapons and Soviet space domination sparked the space race and the strong U.S. response in the Cold War, the same or worse reaction against U.S. space hegemony should be expected. Pursuit of unilateral U.S. space superiority would likely exacerbate perceptions of American imperialism, could permanently fracture important international relationships, and result in undesirable if not irreparable consequences. Further, the U.S. constitutional formula that separates and balances power to protect liberty and tranquility from tyranny, suggests that space dominance by any nation is antithetical to fundamental national beliefs and values.⁷¹ Proper space strategy objectives must be congruent with these notions of peaceful international coexistence under the rule of law, balance and separation of power, and reflect the preference for collective security arrangements to protect common space interests while adhering to the *Just War* tradition.

Thus, while the new space policy does not advocate space superiority as an objective, its inculcation of defense policy and doctrine language, which does, is problematic.⁷² DoD policy and doctrine advocating U.S. space control, space superiority, and force application should be expected, but these notions are advocated without a full theoretical foundation to rationalize the need for and consequences of space preeminence. This is not to say that objectives to establish some form of a controlled and stable space operating environment or the capacity to protect and defend space interests are not needed. It is to say that adopting current language from defense policy and doctrine into space strategy is probably not acceptable. Different paradigms are needed to formulate more appropriate objectives and temper cultural tendencies toward unilateralist space dominance objectives.

The fourth concern is to formulate strategy that relies on strategic concepts and capabilities that are suitable and feasible.⁷³ Following the pattern of warfare in the land, sea, and air domains, the torment of humanity is likely to spill over into space.⁷⁴ The history of warfare explains the predominant defense establishment view that space warfare is inevitable, and space control is the linchpin for military spacepower. However, enabling higher strategy and defending our space interests does not necessarily lead to selection of space warfare with orbital space weapons as the ways and means of choice for space strategy, even if a *casus belli* condition arises to justify space warfare.⁷⁵ As discussed earlier, while the high vantage of satellites for sensor and relay functions gives them their value, the same high vantage is also a vulnerability making them easily targeted and engaged. The same vulnerability holds true for orbital space weapons. Orbital satellite weapons, whether intended for space to space

engagements or application of force to earth, are readily negated from earth based attack. Additionally, launch facilities, ground control sites, and communication links also present additional points of vulnerability to defeat an orbital weapon system. Modifying land, sea, and air capabilities for anti-satellite purposes or orchestrating the employment of joint forces against other segments of a space weapon system provide effective alternatives to orbital space weapons at less operational risk and cost. This basic argument makes the pursuit of orbital space weapon systems unsuitable for space strategy.

However, defending and protecting space systems from lethal or non-lethal attacks requires timely and precise information to discriminate purposeful interference from unintentional actions, quickly assess the impacts for operational commanders, identify and locate the offender, and orchestrate a rapid and effective response. This makes space situational awareness capabilities the prime concern for military spacepower's means. It is technically and fiscally feasible to field distributed and networked sensor and relay constellations hosted on small satellites to serve as unarmed space sentries, scouts, or target designators. The right combination of human, technical, and electronic intelligence along with netted orbital sensors and relays could provide timely and quality information in order to orchestrate rapid defensive and offensive responses to hostile acts.

In the event an adversary decides to employ orbital weapons or ground-based anti-satellite capabilities, operational risk posed by the loss of key satellite capabilities is readily mitigated by means other than space weapons. Affordable and responsive launch, mass production of satellite buses for a variety of standard payloads, networked arrays of small satellite sensors and relays, and balancing the space layer with interdependent high altitude and aerial layers are just a few of the ways to mitigate satellite dependence without resorting to space weapons. Therefore, barring some other compelling consideration or a wild card, it is hard to rationalize and justify the development and deployment of orbital space weapons as acceptable, suitable, and feasible means of valid space strategy, given the other viable alternatives.

The final issue is formulating a space strategy that is integrated and valuable to the application of other military and national power across the spectrum of terrestrial conflict. Space strategic concepts often suffer from space-centric logic or sea and air power analogies that devolve into the realm of space warfare tactics.⁷⁶ People live on land and belong to politically organized security communities, so military power has strategic meaning only to the extent its effects are relevant to the outcome of conflict on and with respect to land.⁷⁷ While conflict might precipitate from activities in space, spacepower alone is insufficient to determine outcomes

across the spectrum of human conflict.⁷⁸ This strategy logic is geographically universal and temporally eternal.⁷⁹ Thus space strategy must not only be valid, it must influence the outcome of events on land. This requires space strategy that demonstrates value to the prosecution of higher strategy and broader policy, and development of interdependent spacepower capabilities that add synergy to the application of other military and national power.

Recommendations and Conclusion

Given this examination and assessment, there are six broad recommendations that encompass theory and strategy, DoD processes, and international cooperation. These recommendations should be considered in total since they holistically build upon one another. The first two recommendations deal with higher level theory and strategy. First, the DoD should complete current spacepower theory development efforts and promulgate the results for joint education, defense culture assimilation, and further refinement. Second, building on spacepower theory and considering the arguments of this assessment, the SecDef should have the Joint Staff lead an interagency effort to develop several space strategy options and promulgate a National Security Space Strategy under the auspices of the National Security Council's Space Policy Coordination Committee (PCC). As part of this broad recommendation, the strategy effort should be carefully unveiled through a thoughtful strategic communications and foreign diplomacy plan in order to minimize adverse reaction from external actors. The formulation process should identify and resolve areas of dissonance between the National Space Policy, defense policy, doctrine, and the chosen strategy. This would then form the basis for international deliberations aimed at modifying the current space regime.

The next two recommendations deal with defense processes. First, the Chairman of the Joint Chiefs of Staff should introduce the National Security Space Strategy into defense's Joint Strategic Planning System in order to drive a National Military Space Strategy, assist in formulating the Chairman's strategic guidance and assessments, inform the Chairman's planning and programming advice, and guide the activities of the Functional Capability Boards and Joint Requirements Oversight Council. The space strategies should also cause alignment of corresponding activities in defense planning and resourcing, capabilities integration and development, and joint concept development processes. Second, the Chairman needs to ensure the joint concept development process specifically produces a Joint Integrating Concept for Space that complements the space strategies in order to synchronize Service concept development and related force generation activities.

The last two recommendations focus on complementary interagency and global efforts that can be done in parallel or subsequent to the strategy effort. First, after reaching agreement with Russia and China, the State Department and NASA should secure the support of all space faring nations and establish an International Space Exploitation and Settlement Agency (ISESA). As part of this recommendation, this new organization should develop a bold shared vision that will inspire the world with aggressive cooperative space exploitation projects. Projects considered might include ways to mitigate global warming, divert threatening asteroids, or conduct a manned exploration of mars. They should also create licensing and revenue sharing schemes to foster exploitation of celestial bodies by private enterprise and public-private partnerships while still maintaining celestial sovereignty prohibitions. These projects would build confidence and trust between the U.S., Russia, and China. The agency could lay the groundwork for a new outer space regime built on economic interests and financial incentives rather than military concerns. The second recommendation, which builds on other international security cooperation efforts, would have the DoD and State Department take the necessary actions to establish an International Space Security Organization (ISSO). Activities associated with this new organization could include collaborative development and employment of affordable and responsive launch, mass produced satellite buses and payloads, netted small satellite constellations, and a globally networked support infrastructure. The security cooperation effort should focus on combined space situational awareness operations with supporting reconnaissance and surveillance efforts. Future security cooperation efforts could involve complementary legislative reforms, intelligence sharing, law enforcement mechanisms, and other partnerships to strengthen international consequences for purposeful interference and hostile space acts. To the extent Russia and China are included; the ISSO could enable transparency into space activities, ameliorate space related political tensions, and reduce the likelihood of space conflict.

In conclusion, this research paper has shown that spacepower remains misunderstood, underdeveloped and underexploited despite the dramatic advances realized since the launch of Sputnik in 1957 and the race to the moon. Spacepower offers the prospect of tremendous benefits to humanity. However, spacepower introduces new challenges and dynamics that, left unattended, increase the volatility of the strategic environment and are likely to precipitate armed conflict on earth or in space. Failure to understand the nature of spacepower and how to wield it productively could lead to serious miscalculations and tragic consequences. Some aspects of this paper's assessment and recommendations may, with time and closer scrutiny, require reexamination. Nonetheless, the intentional thrust in a new direction is needed.

Formulation of valid space strategy provides the mechanism to find the right path through the strategic environment and marshal the forces of the DoD, nation, and the world in a way that makes spacepower a positive force for peace, prosperity, and stability in the 21st Century.

Endnotes

¹ Colin S. Gray, "The Grammar Of Strategy, II: Altitude And Electrons," in *Modern Strategy* (Oxford: University Press, 1999), 258.

² Gray, 257.

³ Everett C. Dolman, "Shaping the Outer Space Regime: Then And Now," in *Astropolitik: Classical Geopolitics in the Space Age* (Portland: Frank Cass, 2002), 113-141; Gray, 254-256.

⁴ Gray, 254-256.

⁵ James E. Oberg, *Space Power Theory* (Colorado Springs: U.S. Air Force Academy, 1999), 2.; Gray, 255-256.

⁶ Dolman, 12-16.

⁷ Walter A. McDougall, "A New Era of History and a Media Riot" and "A Space Strategy For The United States" in *The Heavens And The Earth: A Political History of the Space Age* (Baltimore: Johns Hopkins University Press, 1985), 141-209.

⁸ Ibid.

⁹ Dolman, 113-141.

¹⁰ Oberg, 124.

¹¹ Ibid., 60-64.

¹² Peter B. De Selding, "French Minister Urges 50% Hike in Space Spending," *Defense News*, 5 March 2007

¹³ Oberg, 124-125.

¹⁴ Bill Gertz, "Moscow, Beijing Eye Space Weapons," *Washington Times*, 17 January 2007; James Oberg, "The Dozen Space Weapons Myths," *Space Review*, 12 March 2007; P.R. Chari, "Wars in space," *The Times of India*, 9 March 2007; Dale Anderson, "China ASAT: Space Preservation or Space Destruction," *Space Review*, 12 March 2007.

¹⁵ The Associated Press, "Iran's Space Program Raises Fears of Missiles," *AIM Points*, March 2007 [journal on-line]; available from <http://aimpoints.hq.af.mil>; Internet; accessed 20 March 2007.

¹⁶ Raphael Perl, *Narco-Terrorism: International Drug Trafficking and Terrorism – A Dangerous Mix*, Testimony presented to the U.S. Congress, Senate, Committee on the Judiciary (Washington, D.C.: Congressional Research Service, 20 May 2003).

¹⁷ Bill Gertz, "Officials Fear War in Space by China," *Washington Times*, 24 January 2007; Times Wire Reports, "Official Confirms Anti-Satellite Test," *Los Angeles Times*, 23 January 2007; Peter N. Spotts, "Alarm Over China's Arms Pursuit – In Space," *Christian Science Monitor*, 20 November 2006.

¹⁸ Guy Webster, "Mars' South Pole Ice Deep and Wide," 15 March 2007, linked from the *National Aeronautics and Space Administration Home Page* at "Mission News," available from http://www.nasa.gov/mission_pages/mars/new/mars-20070315_prt.htm; Internet; accessed 20 March 2007.

¹⁹ Dolman, 137-138.

²⁰ Ibid.

²¹ *International Traffic in Arms Regulation*, vol. 22, sec. 38 (1993).; John W. Vinter, "Meeting Minutes," Commercial Space Transportation Advisory Committee, Washington D.C., 25 October, 2006.

²² Vinter, 1-9.; Jeremy Singer, "Responsive Space: Making space launch faster, easier, and cheaper sounds simple. It's not.," *Air Force Magazine*, March 2006 [journal on-line]; available from <http://integrator.hanscom.af.mil/2006/March/03022006/03022006-18.htm>; Internet; accessed 23 March 2007.

²³ Tony Ruggiero, "Laser Zaps Communication Bottleneck," *Science and Technology Review*, December 2002 [journal on-line]; available from <http://www.llnl.gov/str/December02/Ruggiero.html>; Internet; accessed 23 March 2007.

²⁴ Commission Members, *Report of the Commission to Assess United States National Security Space Management and Organization, Executive Summary* (Library of Congress, January 2001), i – E1; Rumsfeld, Donald, *Letter to The Honorable John Warner, Chairman, Committee on Armed Services* (Washington, D.C.: U.S., Department of Defense, May 2001), 1-3.

²⁵ National Defense Authorization Act for Fiscal Year 2004, sec 913 (2006).

²⁶ Ibid.

²⁷ Steven Lambakis, *On the Edge of Earth: The Future Of American Space Power* (Lexington: University Press 2001), 5-7, 73-75.

²⁸ Ibid., 211-216.

²⁹ Ibid.

³⁰ Williamson Murray, MacGregor Knox, and Alvin Bernstein, *The Making of Strategy* (Cambridge: University Press, 1994), 208-216.

³¹ Frank G. Klotz, "Space, Commerce, and National Security," *Council on Foreign Relations Paper* (1998), 1-15.

³² U.S. Census Bureau, "The 2007 Statistical Abstract, The National Data Book," available from http://www.census.gov/compendia/satab/science_technology/space/; Internet; accessed 20 March 2007.

³³ Ibid.

³⁴ Phillip J. Bond, *Market Opportunities in Space: The Near-Term Roadmap*, Speech presented at the Commercial Space Workshop, U.S. Chamber of Commerce (Washington, D.C.: Under Secretary of Commerce for Technology, 7 November 2001).

³⁵ Ibid.

³⁶ Ibid.

³⁷ Oberg, 131.

³⁸ The new National Space Policy defines all Space Capabilities and their supporting infrastructure as "vital" and describes them as comprised of national security, commercial and scientific sector space capabilities.

³⁹ George W. Bush, *U.S. National Space Policy* (Washington, D.C.: The White House, August 2006), 1-2.

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Ibid.

⁴³ Ibid. Items in this paragraph are all taken from the National Space Policy.

⁴⁴ Dolman, 155.

⁴⁵ Bill Gertz, "Moscow, Beijing Eye Space Weapons," *Washington Times*, 17 January 2007; James Oberg, "The Dozen Space Weapons Myths," *Space Review*, 12 March 2007; P.R. Chari, "Wars in Space," *The Times Of India*, 9 March 2007.

⁴⁶ Ibid.

⁴⁷ Agence France-Presse, "U.S. Opposes Ban on Weapons in Space," *Defense News*, 13 December 2006.

⁴⁸ John J. Klein, *Space Warfare: Strategy, Principles and Policy* (New York: Rutledge, 2006), 16-18; David E. Lupton, *On Space Warfare: A Space Power Doctrine* (Maxwell Air Force Base: Air University Press, 1988), 51-121.

⁴⁹ David E. Lupton, *On Space Warfare: A Space Power Doctrine* (Maxwell Air Force Base: Air University Press, 1988), 51-121.

⁵⁰ Examples of this trend are found in John J. Klein, *Space Warfare: Strategy, Principles And Policy* (New York: Rutledge, 2006); Larry J. Schaefer, "Sustained Space Superiority: A National Strategy for the United States," Occasional Paper No. 30 Air War College (August 2002).

⁵¹ Michael E. O'Hanlon, *Neither Star Wars nor Sanctuary: Constraining the Military Uses of Space* (Washington, D.C.: Brookings Institution Press, 2004), 133-147.

⁵² Ibid.

⁵³ Dolman, 12-54.

⁵⁴ Dolman, 156-165.

⁵⁵ Ibid.

⁵⁶ The Joint Staff, *Joint Doctrine for Space Operations*, Joint Publication 3-14 (Washington, D.C.: U.S. Department of Defense, 9 August 2002), ix-x.

⁵⁷ Ibid, 6-7.

⁵⁸ Ibid.

⁵⁹ Harry R. Yarger, "Strategic Theory for the 21st Century: The Little Book On Big Strategy," *The Letort Papers* (February 2006), 65-71.

⁶⁰ Ibid.

⁶¹ Gray, 258.

⁶² Gray, 254-256.

⁶³ This is the author's assessment from many years of working various DoD and Army space policy, programs, doctrine and operational issues.

⁶⁴ Deputy Under Secretary of Defense (Preparation and Warning) Thomas Behling, "Space Power Theory," memorandum for President, National Defense University, Washington, D.C., 13 February 2006.

⁶⁵ Yarger.,17-48.

⁶⁶ Ibid.

⁶⁷ Ibid., 48-55.

⁶⁸ Multiple DoD Instructions, Joint and Service publications establish *space superiority*, *space control*, and *space force application* as the key terms and definitions in the policy, doctrine and conceptual lexicon of the department to describe space programs, functions and purpose.

⁶⁹ Gray, 260.

⁷⁰ Anthony E. Hartle, *Moral Issues In Military Decision Making* (Kansas City: University Press, 2004), 96-97.

⁷¹ Murray et al., 211.

⁷² The national space policy uses “Space Control” and “Force Application” language in its specific guidance to DoD. This is a lift from defense policy and doctrine which presumes a military need to achieve space superiority and control of space.

⁷³ Yarger, 66-71.

⁷⁴ Gray, 258-259.

⁷⁵ Hartle, 96-97.

⁷⁶ Gray, 256.

⁷⁷ *Ibid.*, 258-259.

⁷⁸ Oberg, 127.

⁷⁹ Gray, 259.

