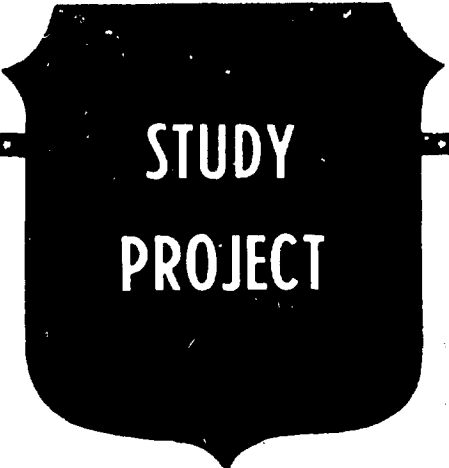


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THE UNITED STATES' MILITARY STRATEGY IN SPACE

BY

LIEUTENANT COLONEL EVERETT RAY YOUNT, JR.

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THE UNITED STATES' MILITARY STRATEGY IN SPACE

An Individual Study Project
Intended for Publication

by

Lieutenant Colonel Everett Ray Yount, Jr.

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Project Adviser



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U.S. Army War College
Carlisle Barracks, Pennsylvania 17013
27 March 1989

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ABSTRACT

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The Soviet Union's overwhelming capabilities in space pose a continuing and accelerating threat to the national security interests of the United States. A comprehensive, coherent, and complementary National Space Strategy integrating political, economic, socio-psychological, and military elements of power is vital to securing these interests. This paper was designed to examine the military element of power as a component of the integrated national strategy. During research it was discovered that the United States does not have clearly stated political, economic, and socio-psychological strategies in space, and that the statement of the military element of power is unstructured, incomplete, and ambiguous. It was further discovered that there are numerous approaches to a military space strategy, but that there is no consensus regarding appropriate objectives and concepts. This paper examines key military issues in space and presents a recommended definitional and structural framework for objectives, concepts, and components of a national military space strategy.

INTRODUCTION

What is our national military space policy? What should it be? An entire cottage industry is grappling with the concepts of operations in space. This endeavor is complicated by a lack of concrete experience. Analysts and strategists are wrestling with the ambiguous and the unknown, and can rely only on analogies. Unfortunately, these analogies may or may not approach reality; only time will tell. Some of the uncertainties facing neophyte space strategists, as well as some food for thought, are captured below:

The first missile powers contemplate space with the perspective of the first oceanic naval powers, when they contemplated the globe. Their existing legal and political conceptions do not cover it, and their experience provides them only with analogies. They can have little notion of the problems to which it will give rise, or of the political, strategic and economic importance it will have for them. It is not even clear what it is, or what the human activities are that will be specially connected with it.¹

There are those who believe that we have not yet succeeded in articulating a comprehensive and coherent strategy for space. Space

initiatives abound, as do debates espousing the pros and cons of these initiatives; some of the more well known include the Strategic Defense Initiative (SDI) and the effect of Anti-Satellite (ASAT) systems. The issue, however, is...are these and other initiatives being debated within the context of a coherent national military strategy, or is each issue being debated in a vacuum? A strong argument can be made for the latter:

What the U.S. space program has been missing are compelling answers to the essential and central question of Where, What, and Why. Where are we headed? What important national goals should we be pursuing in our space program? And why are they of such critical significance? Do we have a workable and coherent national strategy for "getting from here to there," with strategic milestones and goals that must be achieved along the way?²

This paper will analyze our current military space policy. A primary purpose is to ensure that we are being driven by strategic analysis and logical thought, rather than being pulled in multiple but unrelated directions by the technology which happens to be available. The model for analysis will be as follows:

- o What are our **national interests** in space?
- o What are the **threats** or challenges to those interests?
- o What is the **national space strategy** of the United States?
(Political, Economic, Socio-psychological, and Military

strategies in response to those threats and challenges?)

- o What are the specifics of the **national military space strategy** (i.e., the specifics of the military element of the national space strategy)?
 - oo **Objectives** (Ends)
 - oo **Concepts** (Ways)

After articulating our current national interests in space and summarizing the threat to those interests, this paper will examine our national space strategy and will argue that the political, economic, and socio-psychological elements need significant additional emphasis in order to give our nation a coherent overarching strategy in space. The section on the military element of power will demonstrate that the objectives of the military space strategy are well articulated, but that the structure and vernacular of concepts need to be standardized within the space community. The final portion of the paper will recommend acceptance of a standard set of concepts, and provide a detailed listing of recommended components for those concepts.

NATIONAL INTERESTS IN SPACE

A clear, but necessarily broad articulation of national interests should be the starting point for all strategies (political, economic,

socio-psychological, and military). Debating national interests is a stimulating exercise, but is beyond the scope of this paper. Thus, the following national interests related to space as published in President Reagan's Presidential Directive on National Space Policy dated February 11, 1988, are accepted as the starting point for this analysis. This directive reflects a refinement of the articulation of space interests over several years, to include minor changes from the January 1988 National Security Strategy of the United States. These interests as stated in the directive are:

- (1) To strengthen the security of the United States;
- (2) To obtain scientific, technological, and economic benefits for the general population and to improve the quality of life on Earth through space-related activities;
- (3) To encourage continuing United States private-sector investment in space and related activities;
- (4) To promote international cooperative activities taking into account United States national security, foreign policy, scientific, and economic interests;
- (5) To cooperate with other nations in maintaining the freedom of space for all activities that enhance the security and welfare of mankind; and
- (6) To expand human presence and activity beyond Earth orbit into the solar system.³

These statements are obviously broad, covering the entire sector of vital space interests to the United States. In reviewing these statements it is clear that all interests impact on the national security of the United States either directly (i.e., to strengthen or enhance the security of the United States) or indirectly (i.e., military applications of evolving technology, security spin offs from private sector investment, military applications of man in space, etc.). Moving from these broad interests, the next step in developing the national military strategy in space is to identify and evaluate the threats or challenges to these interests.

THE SPACE THREAT

The major threat to the goals of the United States in space is the Soviet Union, and if capabilities and actions are an indicator, the threat is formidable. Current literature abounds with evidence that the Soviet Union has an extensive, aggressive, and coherent national military space policy backed by rapidly evolving capabilities that clearly exceed those of the United States in several key areas. In their doctrinal publications, the Soviets argue that mastery of space is an important prerequisite for achieving victory in war.

Their stated objectives include attaining and maintaining military superiority in space, denying the use of space to other nations, and assuring maximum space-based support to land, sea, and air operations. They have allocated resources at a high, stable rate, up to an amount approximating 60% of their strategic funds.⁴ Wrapping all of this up, the Soviet Military Space Doctrine states in rather sobering terms:

The Soviet armed forces shall be provided with all resources necessary to attain and maintain superiority in outer space sufficient both to deny the use of outer space to other states and to assure maximum space-based military support for Soviet offensive and defensive combat operations on land, at sea, in air, and in outer space.⁵

This vision, focus, and investment have generated dramatic results. Secretary of Defense Carlucci stated, "(we) concluded that while the United States space systems are superior in performance and on-orbit endurance, the Soviets possess some considerable advantages in warfighting capability. Their strength is evident in two areas, anti-satellite capability and the ability to rapidly surge or reconstitute to increase performance in crisis or war."⁶

Voluminous evidence exists to support his conclusions. While the United States has experimented with a fighter launched anti-satellite (ASAT) weapon (a program killed by the Air Force subsequent to Congressional constraints on testing), and debated which service would assume the lead in ASAT development, the Soviet Union has possessed a

dedicated, operational ASAT weapon for over sixteen years.⁷ At present, "(t)he Soviet Union possesses the world's only operational anti-satellite system....Contrary to what has been stated by some, this operational Soviet system is reliable and effective and poses a direct threat to our low-earth-orbit satellites. We have conclusive evidence that their co-orbital anti-satellite capabilities are fully operational. In addition, other Soviet systems have inherent anti-satellite capability."⁸

With regard to launch capabilities, the Soviets possess twice as many classes of launch vehicles as the US, and have conducted five times as many launches over the past seven years. Their launch capability is so robust that if their entire satellite network was destroyed, they could reconstitute it within two to three months. They currently man a year-round space station which, among other things, conducts military experiments, and they are in the process of developing a heavy launch vehicle which will enable them by the turn of the century to build large, military-capable complexes in space.⁹

Looking beyond the scope of Mr. Carlucci's assessment, the Soviet Union is robust not only in anti-satellite and reconstitution capabilities. According to Keith Payne's Strategic Defense: "Star Wars" in Perspective:

The Soviet Union also is well advanced in the area of "Star Wars" technology. For example, Soviet laser weapon programs date back to the mid-1960s and are much larger than the U.S. effort: and since the early 1970s the Soviet Union has had a research program to

explore the feasibility of placing particle beam weapons in space. Soviet programs to develop "directed energy weapons" (DEW) for strategic defense - including BMD, antibomber and antisatellite weapons - have been in the past and will continue to be pursued vigorously.¹⁰

From this review, it is clear that Soviet research in the same areas in which Soviet policy makers criticize U.S. initiatives has been underway for decades. In fact, at the same time that the Soviet Union was criticizing President Reagan's Strategic Defense Initiative (SDI), "...Soviet strategic defense programs include(d)...the world's only operational BMD system."¹¹ The Soviets are so far ahead of us in this area that William Van Cleave argues convincingly in his Fortress USSR:

The term Strategic Defense Initiative is itself misleading. To many it seems to connote a major U.S. initiative, which can only begin a new arms race between the United States and the Soviet Union. A better, and far more accurate, term would have been the U.S. Strategic Defense Response (SDR) - to the Soviet Strategic Defense Initiative, as well as to the enormous and still growing Soviet strategic offensive capability.¹² (Emphasis in original.)

It is clear from the above and a cursory review of other current

literature that the Soviet Union has an awesome arsenal for space, and that they have an exceptionally clear concept of their goals and objectives. The program is aggressive, dynamic, and expanding, approximating 100 launches per year (as compared to ten to fifteen for the U.S.). They possess a diverse and extensive inventory of space launch vehicles. They are making well documented and increasing use of space for worldwide photographic and electronic reconnaissance and surveillance.¹³ Not only are they significantly ahead of the U.S. in putting payloads in space, they exceed our experience by a margin of three to one in manhours in space (133,000 hours in orbit to 44,000 hours).¹⁴ In fact, the only functional area in which the Soviets can be said to be behind is in satellite longevity, which is much shorter than that of the U.S. The positive result is that in spite of their surge and reconstitution capabilities, the actual number of Soviet satellites in orbit at any given time is about equal to the number of U.S. satellites in orbit. The disadvantage is that this particular shortcoming has forced the Soviet Union to develop a much more robust launch capability and satellite inventory. When the quality of their satellites improves as a result of evolving technology, the Soviet's reconstitution capability will take on more ominous implications, and will render their space program formidably ahead of ours in every area.¹⁵

The Soviet Union has obviously embarked on an aggressive, multi-faceted program designed to assure their mastery of space. Their aggressive approach, and their lack of **glasnost** with respect to the various elements of their space program, should cause the entire globe to pause and question their intentions. It is clear at the macro

level that:

The Soviets...view space as a fundamental strategic operating medium, one providing unparalleled opportunities and fulcrums for applying national power to achieve permanent advantage. They see space as a geopolitical highground.¹⁶

And, more sobering for the defense interests of all free world nations, "The Soviets have clearly grasped the military advantages that will accrue to the nation that is able to gain and maintain control over space."¹⁷ More to the point, after grasping the conceptual advantages, they are taking positive and concrete steps to acquire the requisite control.

What does the Soviet Union intend to do with their massive current and evolving capabilities? The answer to this question vis-a-vis "intent" is in reality irrelevant. Capabilities are the key, which correctly implies that prudent planners must react to capabilities, not to intentions. Capabilities are real, and are long term. Whatever the current intentions of the Soviet leadership, we cannot ignore the implications of their goal to attain and maintain space superiority, the existence of an ASAT capability for over a decade, the existence of a BMD capability for over two decades, and their tremendous inventory of payloads and launch vehicles. These capabilities are a formidable reality, whereas intentions are a state of mind which may be fleeting or deceptive. Gorbachev's current intentions may truly be benign, but intentions can change overnight.

The cause of change is also irrelevant. Whether the source of change is a new direction by the current leadership, a change in leadership, or the revelation that **glasnost** and **perestroika** were a grand stratagem to lull us into a sense of complacency, the hard and fast capabilities of the Soviet Union remain the same, as does the devastating impact that these current capabilities could have on the free world. It is incumbent on current leaders to formulate a national space strategy in response to these capabilities.

NATIONAL SPACE STRATEGY

The United States does not have a clearly articulated, coherent national strategy for space. This is not to be confused with a national **military** strategy for space, which does exist and will be outlined and discussed in the next section. What the United States is lacking is a tightly knit, optimal strategy which applies all elements of power to the space challenge. These elements are traditionally considered to be Political, Economic, Socio-psychological, and Military (or National Security). The more elements of power that can be applied to any challenge, the greater the prospects for success. In the case of space, the only clearly articulated element is the military element.

President Reagan did provide some broad policy guidance in his Presidential Directive on National Space Policy, in which he stated that our fundamental guiding objective has been and should remain space leadership, and in which he articulated the requirement for preeminence in the key national security, scientific, technical, economic, and foreign arenas.¹⁸ The detail of the directive covered national security, and then expanded into guidance for a Civil Space Policy, a Commercial Space Policy, and an Inter-Sector Policy designed to deconflict potential problems between the national security and civil sectors. Although portions of the directive indirectly addressed economic and political aspects (by reference to the civil sector), there was no mention whatsoever of socio-psychological initiatives. A review of additional literature such as a Presidential Statement on Space in the form of a White House press release,¹⁹ and the National Security Strategy of the United States,²⁰ reveals a consistent approach to the problem; i.e., emphasis on national security aspects, discussion of civil sector aspects, indirect reference to political and economic approaches, and no mention of socio-psychological elements.

The Soviet threat to our national interests in space is formidable and potentially devastating. Although the primary purpose of this paper is to evaluate the application of the national security element of power to meet this threat, one of the primary findings of this paper is that the United States is not optimizing a total space strategy by marshalling all elements of power. Although it is beyond the scope of this paper to analyze the economic element (resources? industrial incentives?), the political element (bipartisan consensus?

allied co-development?), and the socio-psychological element (awaken the public to the true Soviet threat? to our total BMD void?), it is incumbent on our leaders to immediately embark on a coherent, tight, total strategic approach. Soviet capabilities indicate that no less than the security of the free world is at stake.

Our leadership has however clearly articulated a national space strategy for one of the elements of power, national security. The scope, objectives, and concepts of this national military space strategy are described in detail and analyzed below.

NATIONAL MILITARY SPACE STRATEGY

Military Strategy is the combination of military objectives (ends), military concepts (ways), and military force (means) to achieve national security policy objectives.²¹

A national military strategy is composed of three parts, two of which will be analyzed and evaluated in this paper. The three parts are generally accepted (in a slight modification to the above) as military objectives, concepts to support these objectives, and the resources necessary to execute the concepts. Objectives are usually stated as verb phrases (e.g., deter war, defend US territory, etc.), and are considered to be the most difficult - but also the most

important - step in a well thought out model of objectives, concepts, and resources. Concepts are phrased as acceptable conceptual courses of action to achieve the objectives (e.g., forward defense, mobilization, etc.), and resources identify the specific means which will be applied to the accomplishment of the concept (e.g., strategic forces, general purpose forces, dollars, materiel, etc.). An alternative method of looking at this methodology is ends, ways, and means.²² The scope of this paper is to address objectives (ends) and concepts (ways) as a backdrop against which senior decision makers can apply resources (means).

There have been many attempts to articulate a clear and concise set of national military objectives for space. Evaluating these approaches requires an appreciation for the degree to which the military has become dependent on space, and the implications derived therefrom, especially the need to protect current capabilities for which there may be no back-up. Although, "(t)he U.S. commitment to the military uses of space was not planned - it (just) happened," the fact remains that the military has permitted itself to become more and more heavily dependent on space based systems.²³ A quick review of the uses of space based systems heightens our appreciation for this vulnerability:

- o Photographic Reconnaissance. Includes strategic intelligence, monitoring compliance with Arms Control agreements, and battlefield surveillance.
- o Electronic Reconnaissance. Includes communications surveillance and radar surveillance (air defense, missile early warning, etc.)

- o Ocean Reconnaissance. Locating and tracking vessels.
- o Early Warning. Specifically oriented on detecting launch of land or sea based ballistic missiles.
- o Nuclear Explosion Detection.
- o Communications. Communications satellites have reduced our reliance on land lines, underseas cables, and relays (which are frequently on foreign soil).
- o Navigation. Capabilities include weapons guidance as well as information for ships, submarines, and aircraft.
- o Meteorological. Weather data.
- o Geodetic. Includes effect of gravitational forces on accuracy of ballistic missiles as well as more traditional mapping capabilities.²⁴

A review of these capabilities and uses in space highlights the absence of two key items: Weapons in Space, and Strategic Defense. A strategic offensive capability is clearly present; i.e., offensive weapons which travel through space enroute to their targets. None of these weapons are stationed in space, however, which is a hotly debated concept to be addressed in detail below. Especially sobering is the fact that the United States has no strategic defensive capability related to space; i.e., there are no defensive weapons stationed in space, and there is absolutely no system, space based or ground based, capable of defending this nation from a single incoming missile.

Objectives. Dependency on space, current and evolving uses, inadequate redundancy, and the lack of any space related strategic defensive capability are a few of the vital issues facing senior

policy makers and space strategists alike in their efforts to clearly and concisely articulate national military space objectives. Although an active filtering and refining process to state these objectives has been ongoing, recent strawmen have ranged from too general, to too specific, to "impure"; i.e., a combination of objectives, concepts, and resources rather than pure objectives. A representative listing follows:

From the Fiscal Year 1989 Annual Report to the Congress:

- o Strengthen deterrent posture.
- o Enhance capability to fight and win.**25**

From the U.S. Space Command's 2nd Draft of Joint Doctrine for Space Operations:

- o Contribute to national security objectives.
- o Ensure free use of space for US and allies.
- o Increase joint warfighting effectiveness, readiness, and survivability.
- o Provide force enhancement systems.
- o Protect US, allied, and friendly space systems.
- o Prevent use of space as a sanctuary for aggressor activities or operations.
- o Exploit potential advantages of space to further

national security objectives.**26**

From The Emerging Role of the U.S. Army in Space:

- o Enhance survivability of US satellites and spacecraft.
- o Provide improved surveillance of space, including warning that our space systems are being attacked.
- o Develop adequate command and control systems for space defense.
- o Develop space defense weapons systems, the first being ASAT (Anti-satellite).**27**

This process of filtering, combining, and refining led to a statement of our current national military space objectives by President Reagan in his previously mentioned Presidential Directive on National Space Policy.**28** The objectives in this directive reflected minor adjustments to an earlier objective statement, also by President Reagan, published in the January 1988 National Security Strategy of the United States.**29** The ultimate objectives, from the Presidential Directive, are as follows:

Space activities will contribute to national security objectives by

- 1) deterring, or if necessary, defending against enemy attack;
- 2) assuring that forces of hostile nations cannot

- prevent our own use of space;
- 3) negating, if necessary, hostile space systems;
and
- 4) enhancing operations of United States and Allied
forces.**30**

A review of these four objectives shows that they are simple, straightforward, and most importantly, comprehensive. Included directly or by implication are accommodation of all critical uses presented earlier, all substantial elements from the strawmen addressed above, and defensive capabilities including both strategic defense and defense of our own space assets. The comprehensive nature of these national military objectives is critical considering that they should be the standard against which all concepts are measured. Every concept should relate directly to one of these objectives. Furthermore, adequate and comprehensive concepts should exist in support of each of these objectives to reasonably assure the accomplishment thereof. These objectives, and the analytical parameters just discussed, provide the framework for review of national military concepts for space in the next section.

Concepts. As in the case of objectives, the iterative process of developing concepts has experienced numerous false starts, revisions, refinements, and polishing. Some of the more dramatic and divergent approaches will be reviewed below. However, prior to a look at these dramatically different approaches, the actual concepts as stated in the Presidential Directive, as well as some minor revisions and

refinements in several earlier documents will be reviewed. It's clear from this review that of all the major ways of looking at concepts for space, the broad framework that led to our current concept statement was embraced early by several schools of strategic thought, and has subsequently been analyzed and evaluated by numerous theoreticians in an iterative process leading to the Presidential Directive.

The four concepts of National Military Space Strategy are:

Space Control

Force Application

Force Enhancement

Space Support

Although these concepts can be found in numerous forms and formats, or found exactly as stated above in several sources, the Presidential Directive is the source of record.³¹ Although the Presidential Directive addresses some components of each of these concepts (which will be analyzed in detail in later sections of this paper), it fails to provide definitions for the concepts themselves. However, several definitions are available from earlier efforts by other bodies in the iterative process. The best definitions are found in the 2nd Draft of the Joint Doctrine For Space Operations dated 1 June 1988 prepared by the United States Space Command, as follows:

Space Control. Operations that provide freedom of action in space for friendly forces while, when directed, denying it to an enemy, and include the broad aspects of protection of US and US allied space systems and negation of enemy space systems. Space

control operations encompass all elements of the space defense mission.

Force Application. Combat operations conducted using space and space-related weapons with the objectives of defending U.S. and allied interests or projecting power into areas controlled or threatened by enemy forces. A combat function of the space operations mission.

Force Enhancement. Combat support operations conducted using space and space-related systems to improve the effectiveness of terrestrial, maritime, and space-based forces. These operations are normally conducted in conjunction with other forces to achieve mission objectives, to accomplish specified tasks, and to provide direct operational support to terrestrial/maritime combat and space-based forces. Space force enhancement includes such capabilities as communications, navigation, and surveillance. A combat function of the space operations mission.

Space Support. Operations required to ensure that space control operations, space force application, and space force enhancement activities can be accomplished. A combat support function of the space

operations mission that includes such activities as launching and deploying spacecraft, maintaining and sustaining spacecraft while on orbit, recovering spacecraft if required, and exercising the command and control required to effectively employ space systems in support of combat operations.³²

These definitions mix pure definition with examples and (at least from the perspective of the Army) would benefit from some minor changes in terminology regarding combat support and combat service support functions. However, they are presented in their entirety in order to give the reader as comprehensive an understanding as possible of the best and most illuminating definitions available.

As indicated previously, identification of these four elements as the concepts for national military space policy was an iterative process, with much refinement and fine tuning leading to the current framework. For example, Secretary of Defense Carlucci in his article "DoD's Space Policy" in Defense 88 lists two categories, Space Support of Force Enhancement, and Space Control. Although the term "space support" appears with "force enhancement," items generally associated with space support (on-orbit sparing, proliferation, reconstitution, etc.) are discussed under space control.³³ Furthermore, there is no discussion whatsoever regarding Force Application, i.e., the intent or resolve of the United States to utilize space and space related weapons to project power into areas controlled or threatened by enemy forces. If the United States does not intend to "militarize" space by using space and space-related weapons, that policy decision should be

clearly stated rather than implied by omission. If on the other hand the United States does possess such resolve and intent, that should also be clearly stated. Further confusing the issue is that the only reference to space based weapons in the Force Application section of the Presidential Directive is in the context of strategic defense rather than projecting power into enemy territory.³⁴ These inconsistencies should be resolved. Does Force Application include projecting power into areas controlled by or threatened by enemy forces? If yes, projected "from" space or "through" space? All documents should clearly address this specific portion of our space policy, with unambiguous statements of our intent and resolve.

Other minor deviations from the above framework for concepts can be found in the Joint Doctrine For Space Operations, the United States Military Posture FY 1989, and the Army's Draft Space Capstone Doctrine published in June 1988, as Coordinating Draft, FM ASI-X1, Space Support For Army Operations. The joint doctrine document overlays a combat, combat support, and combat service support framework on the four concepts previously mentioned, as well as adding a fifth concept titled General as follows:

Combat Element

- Space Control
- Force Application

Combat Support Element

- Space Support
- Force Enhancement

Combat Service Support

- General (including personnel administration, training, logistics, and maintenance)³⁵

The Joint Staff posture statement structures the four concepts exactly as in the Presidential Directive, and does an excellent job expanding thereon.³⁶ It would benefit only from consistency in construct and the addition of clear definitions in each section. The Army's coordinating draft of FM_ASI-X1 does the best job of focusing from Presidential guidance to the national security space sector. The authors chose not to use the terms Space Control, Force Application, Force Enhancement, and Space Support;³⁷ however, portions of these concepts are quoted from the Presidential Directive, rearranged, and presented in a structure that is not as clear and concise as the Presidential Directive itself. Additionally, although all portions of the Space Control, Force Application, and Force Enhancement concepts are ultimately presented, portions of the Space Support concept are not.³⁸

The purpose of the immediately preceding discussion of minor deviations from the Presidential Directive is to demonstrate that the space community is not yet on common ground definitionally, much less structurally. The entire area of space theory is fertile and alive as various civilian and military theorists attempt to conceptualize the unknown. This effort would be enhanced by a definitional and structural framework. An excellent and well thought out framework does exist as a result of numerous iterations, refinements, enhancements, and polishing. A major finding of this study is that

the entire space and space related community should accept the concepts of Space Control, Force Application, Force Enhancement, and Space Support as defined above, and use this framework as common ground from which meaningful discussion and analysis of appropriate elements and resources can be applied. The space community should consolidate its gains to date by standardizing the vernacular and theoretical framework, and then move forward to the next level of evaluation and analysis based on these generally accepted definitions and concepts.

Alternative Approaches. As indicated earlier, some dramatically different conceptual approaches have evolved as strategists and theoreticians have grappled with the roles of the United States and the military in space. These approaches do not necessarily exclude either the objectives or concepts described above; in several cases they simply approach the problem from different angles. The most significant of these could be called the Schools of Space Doctrinal Thought, the schools being Sanctuary, Survivability, Control, and High Ground. This alternative evaluates the broad, conceptual approaches (schools) to the use of space, and then develops concepts and objectives based on the selected alternative. A review of the schools of doctrinal thought approach shows that the schools, which are mutually exclusive, cut across the boundaries of Space Control, Force Application, Force Enhancement, and Space Support, but that no single school provides as comprehensive a strategic umbrella as the Space Control, Force Application, Force Enhancement, Space Support model. Characteristics of the schools are as follows:

Sanctuary.

- Value of space systems is to surveil in order to detect surprise attacks and verify compliance with arms control agreements.
- These types of systems are stabilizing.
- Overflights are permissible.
- Space should be a war free sanctuary.
- Treaties to ban space weapons should be sought.
- Anti-satellite (ASAT) systems are destabilizing.
- Satellites that directly support military forces are destabilizing.

Survivability.

- Space systems can support military forces.
- Space systems are less survivable than terrestrial forces.
- Since an enemy can destroy space systems, don't rely on them for warfighting functions.
- Must have a retaliation-in-kind capability.
- Emphasize redundancy.
- Single mission satellites are better than multi-mission.
- ASATs have an offensive role; used to hold enemy's space forces at risk.

Control.

- Control space and you control the mediums below.
- Space lines of communication must be controlled if terrestrial wars are to be won.
- Deterrence is enhanced by an ability to control space.
- Space control will be coequal with air control and sea control.
- Establish space control (superiority) first, then support terrestrial forces.
- Wars still won in lower environments.
- Active defense in space required.
- Defend choke point or strategic orbit locations with area defense.
- Deny enemy's use of space using space or ground based ASATs.

High Ground.

- Wars will be won or lost in space.
- Domination of space will result in domination of the lower-lying mediums.
- Ballistic Missile Defense (BMD) can reverse preeminence of the offense.
- If both sides have BMD, winner of the battle in space will prevail; the loser will not use nuclear weapons since he would suffer nuclear destruction through retaliation.
- "Center of Gravity" will move into space.

-Wars will no longer be fought on earth; battle will occur in space, and as soon as one side prevails in space, opponent will capitulate in order to avoid nuclear destruction.³⁹

Current literature is replete with near fervent pleas to avoid any militarization of space; i.e., to declare space a sanctuary. However, given current and evolving technology and the nature of mankind, dispassionate analysis can only agree that the chances of space remaining a sanctuary are remote,⁴⁰ and that "...the Soviet Military establishment would prefer to destroy, or severely degrade, U.S. military assets in space, at the risk of losing its own, rather than treat space as a sanctuary for mutual exploitation."⁴¹

The concept in the High Ground school that warring nations will send their knights into space to joust, with the outcome of the space conflict being accepted by the warring nations thereby eliminating spillage of blood on terrestrial mediums is appealing, but Utopian and naive. "Navies have not made land armies obsolete. Air forces have not made navies or armies obsolete."⁴² And, "(w)e can't hope to make the earth safe from warfare by moving combat into space."⁴³ The attainment of idealistic goals is a commendable objective for which all should strive, but realism must prevail.

A review of the Survivability and Control schools reveals that some (although clearly not all) of their elements have been incorporated into the objectives and concepts for national military space strategy. However, as indicated at the beginning of this section, no single school provides an overall strategic umbrella under

which the United States formulated its current objectives and concepts. Some of the schools were eliminated completely from realistic consideration, whereas others were accepted in part, but not in whole.

One slight twist to the above schools of thought appears in International Security Dimensions of Space, in which the author describes three schools of thought, Sanctuary, High Ground, and Military Theater.⁴⁴ The author eliminates the Sanctuary and High Ground options in favor of the Theater approach. However, his analysis, which is structured more in terms of the Space Control, Force Application, Force Enhancement, and Space Support line of reasoning than in Schools of Space Doctrinal Thought, is not as complete as the former model.

One last thought is that there is another school out there called "SDI Is All We Need." This concept is actually a spin off from the High Ground school as articulated earlier. Proponents argue that once this 100% leak proof defensive umbrella is deployed throughout the world, all nations will be able to withdraw from the arms race and eliminate all Intercontinental Ballistic Missiles (ICBMs) or any other missile or weapon system designed to pass through or be deployed in space. Again, optimism and realism are commendable qualities, qualities which may in fact lead in the direction of better solutions. Realistic analysis argues, however, that technology will never evolve to the point that a 100% leakproof umbrella can be provided, any more than the invention of the bow and arrow resulted in every arrow finding its mark, or the invention of the rifle resulted in every bullet finding its target. SDI will be addressed in more detail

below.

This examination of alternative approaches to the formulation of the objectives and concepts of our national military strategy in space reinforces that the objectives and concepts articulated in the Presidential Directive represent the most reasoned and comprehensive approach to our national strategy. Other approaches are incomplete or unrealistic, either of which would be detrimental to the security of the United States. It is also clear from this review that the best and most reasoned elements of the various alternative approaches fit neatly into Space Control, Force Application, Force Enhancement, and Space Support.

Having suggested the embracing of these concepts and objectives by the entire space community in order to provide a common language and starting point for further theoretical evolution, it should be noted that there is very little discussion in the literature of appropriate components or elements of these concepts. The following section will identify those general components included in the Presidential Directive and propose a strawman of recommended elements, concept by concept.

RECOMMENDED COMPONENTS

Although the Presidential Directive does provide some discussion related to each concept of Space Control, Force Application, Force Enhancement, and Space Support, it is inconsistent in its depth and specificity. For example, Space Control lists several items, to include clear and specific guidance on the attainment of an Anti-satellite capability. The Force Enhancement section, on the other hand, is so general as to be of no redeeming value to policy makers and planners. The Force Application and Space Support sections fall somewhere between these extremes.

This section will analyze each concept. The methodology will be to initially quote the Presidential Directive in its entirety (which is relatively brief except for Space Control), and then propose a list of specific components which either complement or expand on Presidential guidance. Some components will appear in more than one concept. For example, there are power projection components associated with Space Control, the scope of which is negating systems in space only, and in Force Application, the scope of which includes projecting power onto ground, sea, or air based targets.

SPACE CONTROL. From the Presidential Directive:

Space Control.

-- The DOD will develop, operate, and maintain

enduring space systems to ensure its freedom of action in space. This requires an integrated combination of antisatellite, survivability, and surveillance capabilities.

-- Antisatellite (ASAT) Capability. DOD will develop and deploy a robust and comprehensive ASAT capability with programs as required and with initial operational capability at the earliest possible date.

-- DOD space programs will pursue a survivability enhancement program with long-term planning for future requirements. The DOD must provide for the survivability of selected, critical national security space assets (including associated terrestrial components) to a degree commensurate with the value and utility of the support they provide to national-level decision functions, and military operational forces across the spectrum of conflict.

-- The United States will develop and maintain an integrated attack warning, notification, verification, and contingency reaction capability which can effectively detect and react to threats to United States space systems.**45**

As can be seen, this section itself contains guidance which

ranges from the specific (ASAT) to the general (survivability enhancement program). Following are recommended components for the Space Control concept, some of which complement, and some of which expand upon the scope of the Presidential Directive.

ASAT. As stated above. The United States must deploy an effective and robust system as quickly as possible. The Soviets have one, and have had one for over a decade, while the United States has been vacillating, first over the requirement, and later over the proponent. Arguments for and against ASATs literally fill volumes, but they are desperately needed for two reasons:

We have a security interest in countering Soviet satellites that might help their naval and land forces to defeat our forces in wartime. But we also want to protect spacecraft like communications and early warning satellites that contribute to stability and the integrity of our nuclear and conventional forces.⁴⁶

Opponents argue that ASATs are destabilizing. They hypothesize that if the United States had a known ASAT capability, and a Soviet early warning or communications satellite ceased operation, even if due to a malfunction or meteor strike rather than due to an act of aggression, the Soviets might assume that the United States had knocked their satellite out in preparation for an attack, which could in turn precipitate a Soviet "retaliatory" strike. Opponents further

argue that the intentional destruction of Soviet satellites, even if deemed to be a minor escalatory step, is in itself destabilizing and could cause a preemptive strike by the Soviet Union since, "blinded," they may suspect the worst.

These arguments miss a critical point. The Soviets have ASATs and the United States doesn't. All arguments can at this moment be analyzed in reverse; i.e., would the United States be motivated by satellite failure or overt acts of aggression against US "eyes and ears" to launch a retaliatory strike? Is it not "destabilizing" that the Soviets have deployed an ASAT system and the United States hasn't? The Soviets clearly have no intention of stabilizing the situation by withdrawing their capability. In the absence of a Soviet willingness to even admit this capability, much less to eliminate it, it is critical that the United States field an efficient and effective ASAT, if for no other reason than to target Soviet ASATs (as opposed to targeting Soviet communications or intelligence satellites). The additional and inherent capability of targeting their "eyes and ears" will enhance stability through parity.

Included within this ASAT capability should be an element of diversity or robustness, to include:

- Space or ground based directed energy, laser, and particle beam weapons.
- Orbital interceptors.
- Space mines.

Survivability. Required survivability initiatives for space based assets employed in the Space Control concept include:

- Satellite hardening
- Proliferation
- Redundancy
- Maneuverability
- Reconstitution
- Stealth technology

as well as other more general Survivability initiatives enumerated in the Space Support concept below.

Ground Based Surveillance. To succeed in its Space Control mission, the United States must observe and acquire enemy systems designed to deny friendly use of space. Ground based acquisition and tracking systems are less vulnerable than space based systems, thereby enhancing security and stability. The United States should significantly expand ground based surveillance systems in order to reduce the number of space based systems dedicated to this mission. (See the Space Support section below for additional discussion of the vulnerabilities of ground based systems.)

FORCE APPLICATION. From the Presidential Directive:

The directive states that the DOD will, consistent with treaty obligations, conduct research, development, and planning to be prepared to acquire and deploy space weapons systems for strategic defense should national security conditions dictate.⁴⁷

This statement is imprecise and ambiguous, and fails to demonstrate the resolute will of the United States. Specifically, it implies, but does not clearly state, that the United States is considering abrogating the 1972 ABM Treaty which prohibits space based defensive weapons (i.e., "...be prepared to acquire and deploy space weapons systems for strategic defense...."). Secondly, it does not clearly state that the United States will pursue ground based ABM research (i.e., it appears to tie Force Application to space based strategic defense). Finally, as noted earlier, it omits any reference to projecting power from space into areas controlled or threatened by enemy forces.

The United States must develop a strategic defense system, whether called a Strategic Defense Initiative (SDI) or a Strategic Defense Response (SDR). The latter, of course is more appropriate considering that the Soviet Union took the initiative in this arena over two decades ago,⁴⁸ and currently deploys the world's only active Ballistic Missile Defense system; aggressive pursuit of an SDR can properly be viewed as a belated effort to achieve stability in the world by, once again, attempting to gain parity with the Soviet Union.

As with ASATs, the arguments pro and con related to strategic defense fill volumes. The bottom line however is that no responsible government can legitimately stake its entire security from nuclear annihilation on the threat of a response in kind. But that is exactly what has occurred.

Should deterrence fail, the United States currently does not have the ability to destroy enemy ballistic

missiles after their launch...**not a single one**, even if launched by accident.**49** (Emphasis added.)

Incredible. One can only assume that the public does not fully comprehend their vulnerability to accidental launch, to an act of a madman, to capabilities of evolving non-Soviet nuclear powers, or to evolving third world non-nuclear capabilities. The leadership of this nation should change this totally unacceptable situation by capitalizing on the fifteen-plus billion dollars invested to date in research and development, and deploying a Ballistic Missile Defense system, whether ground based or space based or a combination thereof.

The latter point above was that the Presidential Directive's description of Force Application omits any reference to projecting power from space into areas controlled or threatened by enemy forces. Perhaps this omission is intentional in order to create an air of uncertainty. Perhaps it is intentional in order to avoid a confrontation with Congress regarding either funding or intent. Neither these nor any other rationalizations warrant omission of this capability from stated intentions. The United States must continue to develop capabilities to enhance national security and survivability. Weapons which use space (i.e., pass through space) already exist. Space based weapons are inevitable. This nation must not unilaterally pursue idealism to the point of placing its existence at risk. The United States should clearly and unequivocally state its resolve to use space and space-related weapons to project power into enemy territory in order to protect vital national interests. Space is not a sanctuary.

With the above points in mind, recommended components for Force Application are:

Strategic Defense. An aggressive effort is required to develop a redundant, survivable ground and space based strategic defense system.

- Ground. Ground based components should be simple, autonomous, and mobile.

- Space Based. Space based systems are admittedly vulnerable; hence the reliance on the redundancy of ground systems with complementary capabilities. However:

Space-based systems have many inherent advantages over ground-based systems. The space system has a better field of view. There is no atmosphere to interfere with the kill mechanism. The space-based system can be closer to the target, and in any event the attack geometry is likely to be better.**50**

Ground and Space Based Offensive Weapons. An equally aggressive program is required in order to develop a redundant, survivable system of systems capable of projecting power into territory held by or threatened by an enemy. Some ground based systems already exist. What is needed is space based systems, primarily capable of projecting power from space to the ground, and a system of ground based systems to back them up in order to prevent over-reliance on a single element. The same advantages indicated above continue to apply. Although these weapons would complement already existing general purpose and

strategic forces, special consideration should be given to prioritizing their use against the enemy's space force launch capability.

The "center of gravity" for an adversary's space forces may be their launch capability. Denied this capability, it becomes possible to isolate the battlefield in space and destroy spacecraft which cannot then be replaced. Thus, the first objective of a space campaign aimed at imposing defeat on the enemy must be to blockade or destroy an enemy's ability to launch payloads into space.**51**

FORCE ENHANCEMENT. From the Presidential Directive:

The directive states that the national security space sector will develop, operate, and maintain space systems and develop plans and architectures to meet the requirements of operational land, sea, and air forces through all levels of conflict commensurate with their intended use.**52**

As indicated earlier, this section (quoted in its entirety from the Presidential Directive) is so general as to be of no redeeming value to policy makers and planners. It basically encourages the development of plans, architectures, and systems to meet all requirements of all services in any conflict. The obvious problem

with such a broad brush approach is that virtually any initiative will fit, and the result will be an unrelated assortment of unfocused initiatives rather than a series of complementary developmental projects focusing on a specific concept and objective of our national military space policy. Further, this discussion completely omits reference to activities during periods of peace, unless by rigid adherence to a definition that the "spectrum of conflict" includes peace at the lower end of the scale. The most significant and far reaching applications of Force Enhancement occur with equal or greater impact during peace than during conflict. This section clearly should be reworked.

Recommended components for the Force Enhancement concept are as follows:

Reconnaissance, Surveillance, and Target Acquisition (RSTA). An aggressive program of research, development, and deployment is required to enhance or create space based sensors with the following capabilities:

- Photoreconnaissance
 - Strategic intelligence
 - Battlefield intelligence, including direct downlinks to the theater level commander on the ground
 - Arms control verification
- Communications intercept
- Radar Intercept
 - Air defense
 - Missile early warning

- Target acquisition
- Fire support
- Ocean reconnaissance (a refined and highly focused package of photo, communications, and radar capabilities)
- Indications and warning (also a combination of the above designed to provide tipoff and cueing relative to attack warning, notification, and verification)
- Nuclear explosion detection (to monitor testing and verification)
- Infrared (to detect missile launch and weapons firing)

Communications. The highest priority of this component should be a proliferation of simple, redundant satellites to reduce our command and control vulnerabilities stemming from overdependence on existing satellites.

Navigation and Positioning. Research and development should be accelerated to improve weapons guidance as well as positional applications.

Metereology. Improved weather data, and the availability thereof to theater and lower commanders, will significantly enhance operations.

Geodetic. This component focuses on improved mapping techniques as well as on refined applications of the effect of gravity on the accuracy of ballistic missiles.

Search and Rescue. Enhancements in locating downed crews and equipment, and in guiding rescuers, will result in improved resource utilization, efficiency, and morale.

Permanently manned space stations. Numerous proponents and opponents of this concept argue fervently in favor of or against permanently placing men in space. Those against argue initially that even though the Soviets have over three times as many manhours in space as the United States, there is no need to catch up or gain parity in this area. Soviet manhours are allegedly based on necessity, not initiative, since Soviet technology is not nearly as advanced and they have been forced to use crews in their attempts to gain parity with US capabilities.⁵³ Those against further argue that men in space are destabilizing since losing a satellite to an ASAT is one thing, but the loss of lives will have a more profound effect on the target nation populace, galvanizing the national will in support of retaliation.

Those in favor argue simply and convincingly that men in space provide increased flexibility for command and control, surveillance, equipment set-up and inspection, refueling and repair, and a myriad of other man-system interactions. The most compelling rationale however is the stability derived from the presence and application of the cognitive and intuitive power of man versus machine in space.

Given the advantages of men in space, no responsible American leader should propose to unilaterally keep space free of manned stations for idealistic reasons while our nation's principal adversary

is improving and refining his man in space capability daily. Based on all of the above, the United States should aggressively pursue permanently manned space stations. In order to reduce system vulnerability and dependence, there should be multiple stations. In fact, one study recommends:

...approximately 400 stations, each with a crew of 3 to 5. Any single such "frontier post" would be highly vulnerable to attack, but it would be very difficult to destroy all of them, and impossible to do so in secrecy.⁵⁴

Survivability. Survivability initiatives to meet the requirements for the Force Enhancement concept are similar to those in the Space Control concept; i.e., hardening, proliferation, redundancy, maneuverability, reconstitution, and other more general initiatives enumerated in the Space Support concept below.

SPACE SUPPORT. From the Presidential Directive:

Space Support. The directive states that:

-- The national security space sector may use both manned and unmanned launch systems as determined by specific mission requirements. Payloads will be distributed among launch systems and launch sites to minimize the impact of loss of any single launch

system or launch site on mission performance. The DOD will procure unmanned launch vehicles or services and maintain launch capability on both the East and West coasts. DOD will also continue to enhance the robustness of its satellite control capability through an appropriate mix of satellite autonomy and survivable command and control, processing, and data dissemination systems.

-- DOD will study concepts and technologies which would support future contingency launch capabilities.**55**

The Space Support concept encompasses all aspects of launching, deploying, sustaining, maintaining, and recovering space systems, which obviously affects virtually all facets of Space Control, Force Application, and Force Enhancement as well. Therefore, any initiative from these latter concepts must plan for and consider applicable Space Support elements in order to optimize survivability.

The hub around which the entire Space Support concept revolves is the extraordinary degree to which the United States is already dependent on space systems for national security, and the equally extraordinary fragility and vulnerability of those systems. Warnings of these susceptibilities are voluminous, and range from the benign to the alarming.

...the United States and, to a lesser extent, the Soviet Union are now heavily dependent on the

services that military satellites provide for their national security.⁵⁶

Others state that we have become so dependent on the Command, Control, Communications, and Intelligence (C3I) capabilities provided by satellites, but have done so little, or nothing at all, to enhance their survivability, that "...space could become our Achilles' heel without us even recognizing it."⁵⁷

Another view on overdependence concerns the ability (or lack thereof) to revert to pre-satellite techniques:

The employment of artificial satellites has turned out to be more advantageous than the earlier techniques used....In addition to this, especially in the USA, the conventional non-satellite-based techniques have been neglected to such an extent that it would be extremely difficult to return to using them.⁵⁸

If one accepts our extraordinary dependency on satellites, and acknowledges the Soviet's anti-satellite capability, the following finding is most disturbing of all:

The shuttle, of course, is so vulnerable to attack, both in orbit and on the ground, and its two coastal launching sites are so vulnerable, that it is inconceivable that the United States could launch any

new or replacement satellites once any hostilities had broken out.**59**

Recommended components for the Space Support concept are as follows:

Reconstitution. The United States desperately needs a "surge launch" capability, i.e., the ability to rapidly launch replacement satellites. The attainment of this capability should be the highest priority of the national military space strategy. Although hardening, maneuverability, and other survivability initiatives should be pursued, they are extremely expensive and should be relegated to a lower priority. Uncontrolled pursuit of these latter initiatives would once again manifest a long standing American tendency to opt for a small number of high cost, more technologically sophisticated, expensive systems rather than a large number of simple yet effective systems. "Better is the enemy of good enough." In space, the United States should focus on a proliferation of "good enough" systems by concentrating on two elements of reconstitution, satellites, and launchers.

-- Satellites. An aggressive program of proliferation of satellites should include:

o "Cheap sats." The United States should

...apply its technological advantage in computers, sensors, materials, power systems, and microminiaturization to create

cost-competitive, lightweight, short-lifetime satellites that could provide feasible options for short-term military and crisis management use.⁶⁰

- o On-orbit spares.
- o Hidden spares in high orbit.

-- Launchers. This nation must overcome and avoid repetition of short-sighted and damaging earlier decisions such as one which compelled the Air Force to design all of its new satellites for launch from the shuttle. Even though this national level decision was vehemently objected to by the military, it was "...deemed necessary in order to justify the shuttle financially."⁶¹

- o More, simpler, less expensive launchers.
- o Expendable launchers.
- o Mobile launchers.
- o A robust space shuttle fleet.
- o A fleet of Heavy Lift Vehicles. Necessary to gain parity with Soviet capabilities and for the establishment of permanently manned space stations.

Survivability. Although this component should have a lower priority than reconstitution as mentioned above, some enhancements are warranted in the areas of:

- Hardening.
- Maneuverability.

Deception.

- Decoy satellites.
- "Stealth" technology to reduce radar, infrared, optical, and communications signatures.

Technological. Overlaps many of the above areas.

- Cheap Sats.
- Stealth.
- Anti-jam communications.

Industrial Base. Significant, coherent, well thought-out programs must be initiated throughout the industrial base to support the required surge launch capability and technological enhancements.

STRATEGY RECAPITULATION

A recapitulation of the recommended National Military Strategy in Space (objectives, concepts, and components) as presented above is at Appendix A.

RECOMMENDATIONS

The following recommendations stem from the research, analysis, and evaluation detailed above:

- * That the national leadership of the United States analyze, evaluate, select, and articulate political, economic, and socio-psychological elements of national space strategy in order to optimally apply all elements of power. (Currently, only a national security element is specified.)

- * That the United States formulate a national military space strategy in response to challenges posed by Soviet capabilities, not in response to alleged Soviet intentions.

- * That the space community accept the National Military Space Strategy Objectives as currently stated in the Presidential Directive on National Space Policy dated February 11, 1988.

- * That the concepts of Space Control, Force Application, Force Enhancement, and Space Support, as defined in the Joint Doctrine for Space Operations, be embraced as the common vernacular and framework from which further theoretical development can evolve. This recommendation implies:

- o Clear articulation of the will of the United States to base weapons in space and to project power from space to enemy controlled or threatened territory.
- o Consistency among National Command Authority, DoD, and Military Department documents regarding this resolve and will.

* That the Presidential Directive provide unambiguous, clear guidance in its articulation of the Force Application and Force Enhancement concepts.

- o Force Application. Should include Power Projection in addition to Strategic Defense.
- o Force Enhancement. Should be more specific, and should include conditions of peace as well as war.

* That the concepts of Space Control, Force Application, Force Enhancement, and Space Support include the components presented, with specific emphasis on the needs for an ASAT system within Space Control, space based weapons and a Strategic Defense System in Force Application, permanently manned space stations in Force Enhancement, and a surge launch capability of cheap-sats and launcher proliferation in Space Support.

CONCLUSION

The Soviet Union's overwhelming capabilities in space pose a continuing and accelerating threat to the national security interests of the United States. A comprehensive, coherent, and complementary National Space Strategy integrating political, economic, socio-psychological, and military elements of power is vital to securing these interests in view of the formidable threat. This paper has focused on the military element of power as a component of the integrated national strategy. The findings and recommendations are designed to present a definitional and structural framework for optimizing application of the military element of power, and hopefully will stimulate further discussion as to an improved model or will serve as a common point from which further theoretical evolution may occur. In either case, it is critical that national leaders move forward immediately in the development and application of a National Military Strategy in Space in order to counter Soviet adventurism and to enhance the security of the United States.

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Appendix A

NATIONAL MILITARY STRATEGY IN SPACE

RECAPITULATION

The following is a recapitulation, in outline form, of the recommended National Military Strategy in Space (objectives, concepts, and components) as presented in this paper.

I. Objectives.

- A. Deter, or if necessary, defend against enemy attack,
- B. Assure that forces of hostile nations cannot prevent the United States' use of space,
- C. Negate, if necessary, hostile space systems, and
- D. Enhance operations of United States and Allied Forces.

II. Concepts and Components.

A. Space Control.

- 1. Anti-Satellite Systems.
 - a. Space and ground based.
 - b. Orbital interceptors.
 - c. Space mines.

2. Survivability.
 - a. Hardening.
 - b. Proliferation.
 - c. Redundancy.
 - d. Maneuverability.
 - e. Reconstitution.
3. Ground Based Surveillance.

B. Force Application.

1. Strategic Defense System (ground and space based).
2. Offensive Weapons (ground and space based).
3. Survivability (para A.2. above).

C. Force Enhancement.

1. Reconnaissance, Surveillance, and Target Acquisition.
 - a. Photoreconnaissance.
 - b. Communications Intercept.
 - c. Radar Intercept.
 - d. Ocean Reconnaissance.
 - e. Indications and Warning.
 - f. Nuclear Explosion Detection.
 - g. Infrared Collection.
2. Communications.
3. Navigation and Positioning.
4. Meteorology.
5. Geodetic.
6. Search and Rescue.

7. Permanently Manned Space Stations.
8. Survivability (para A.2. above).

D. Space Support.

1. Reconstitution.

a. Satellites.

- (1) "Cheap-sats"
- (2) On-orbit spares.
- (3) Hidden spares in high orbit.

b. Launchers.

- (1) More, simpler, less expensive.
- (2) Expendable launchers.
- (3) Mobile launchers.
- (4) Robust space shuttle fleet.
- (5) Heavy Lift Vehicle fleet.

2. Survivability (para A.2. above).

3. Deception.

a. Decoys.

b. Stealth technology.

4. Technological.

a. "Cheap-sats"

b. Stealth technology.

c. Anti-jam capability.

5. Industrial Base.