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THE NATIONAL WAR COLLEGE  
NATIONAL DEFENSE UNIVERSITY

STRATEGIC STUDY

A STRATEGY TO ACHIEVE  
THE UNITED STATES LONG TERM INTERESTS IN SPACE

by

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A RESEARCH REPORT SUBMITTED TO THE FACULTY  
IN  
FULFILLMENT OF THE RESEARCH  
REQUIREMENT

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THE NATIONAL WAR COLLEGE

April 1983

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THE NATIONAL WAR COLLEGE  
STRATEGIC STUDIES REPORT ABSTRACT

TITLE: A Strategy to Achieve the United States Long  
Term Interests in Space

Robert M. Howard, Jr., Colonel, USAF  
Darrel L. Nesselth, Colonel, USAF  
James M. Stewart, Colonel, USAF  
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Date: April 1983

Space technology is a new and rapidly expanding science. As the United States develops this technology to make more extensive use of space for communications, navigation, materials and energy processing, it will become increasingly important to protect our national interests and investments in space.

The authors review the national and Department of Defense space policy and present recommendations for change which could assure that our far term interests and objectives in space can be protected and promoted over the next decades. This paper focuses on the arguments surrounding the case for military measures needed in space to deter and, if necessary, counter the threat to our space and terrestrial interests.

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## EXECUTIVE SUMMARY

The United States is at a crucial juncture in formulating policies and programs for future space efforts. Its leading competitor, the Soviet Union, has proceeded with the developing and testing of new weapons for use in space. They have deployed antisatellite systems designed to destroy US satellites. When their operational antisatellite program is viewed in conjunction with the extensive antiballistic missile deployment program, it becomes apparent that Soviet efforts to deny US capabilities could create a significant strategic imbalance in forces over the next decade.

The Congress has pressed the military services to address space and future military activities in space. The recently established Air Force Space Command reflects a growing recognition of our requirements for space defense. However, from information acquired through the literature and interviews, we believe that the Department of Defense has not yet developed an effective and comprehensive military strategy for space.

Clearly, the development of a viable military strategy requires close examination of US goals and objectives in space through all phases of conflict with respect to the Soviet Union. A sound military strategy for space must address the strategic importance of each category of space assets, the current level of

survivability required to support national security objectives, the effective integration of space assets into the overall national strategy of deterrence or damage limitation, and the impact of this strategy on the enemy. Such a strategy, we believe, must be more than merely a reaction to Soviet Union military activities in the space arena.

In this paper we set forth our perceptions of the most relevant national interests in space with a supporting military strategy for satisfying those interests. We recommend (i) a continued US position which maintains the maximum degree of freedom with regard to the use of space, (ii) removal of constraints on the research and development of military application of space technology, (iii) initiation of a space station program which builds on the Space Shuttle technology for civilian and military applications and, (iv) developing and deploying a survivable satellite launch capability to meet our military needs in time of war.

A STRATEGY TO ACHIEVE  
THE UNITED STATES LONG TERM INTERESTS IN SPACE

CHAPTER I  
INTRODUCTION

"The once formidable US lead in space exploration has slipped badly and we are slow in responding to Soviet moves to establish military superiority in space"  
--President Ronald Reagan, 1981<sup>1</sup>

The United States vigorously entered the space age only after the Soviets had achieved an initial success with the October 1957 Sputnik launch. A concerted national effort was required to put Alan Shepard into space. The series of Gemini, Viking, Mariner, and Apollo flights had, as their primary goal, the support of the United States effort to catch up in space.

The landing of Apollo 11 on the surface of the moon on July 25, 1969 fulfilled President Kennedy's goal of putting a man on the moon by the end of the decade<sup>2</sup> and placed the United States in a position of unquestioned world leadership in space technology. Over the past two decades, the United States and the Soviet Union

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1. Department of the Air Force, Military Space Doctrine, Air Force Manual 1-6. Washington D.C.: 15 October 1982. p. 7.

2. Kennedy speech at Salt Lake City, 26 September 1962.

have made less spectacular, but nonetheless significant strides in the advancement of space technology. However, the lead enjoyed by the United States has narrowed considerably during this period due to the self imposed reduction in scope of US programs and the determined efforts of the Soviets to expand their space program.<sup>3</sup>

Nevertheless, we now have space assets which provide intelligence, strategic and tactical warning, communications, attack assessment, meteorological, and navigation data which are critical to the strategic defense of the nation. During the last decade, the detection systems used to identify military threats to our national security have been upgraded from land-based systems to predominantly space-based, high technology systems.

The growing dependence of national security upon space systems has generated grave concerns among political and military leaders over satellite system effectiveness and survivability under conditions of direct attack or interference from Soviet space systems (i.e., laser, electromagnetic pulse or directed energy). The increased dependence on these defense information sources by the United States requires that we guarantee system survivability during hostile actions. The Soviet Union presently possesses an operational orbital antisatellite (ASAT) weapon system. Open source literature indicates they are aggressively pursuing both

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3. DoD Pamphlet "Soviet Military Power 1983", March 1983, pgs 65-69.

offensive and defensive laser weapon technology. As a counter to this existing threat to our space assets, the United States is developing an air-launched antisatellite system which provides a minimal retaliatory capability. No active defense system for satellite protection exists, therefore we could experience an escalation of hostilities in space to the point where nations engage in war over assets and rights. Current efforts to improve our capability in space are focused on technology development or negotiated treaties.

A noted technological forecaster contends that the use of space for military activity cannot realistically be precluded. His rationale is simply that human beings and the material resources of nations are being located in space. It is inevitable, he concludes, that nations will fight wars in space.<sup>4</sup> Moreover, it is evident that wars in general can and will be supported from space. Admiral Mahan's treatise on sea power points out that any time formidable competitors travel in the same arena, the basis for conflict is present.<sup>5</sup> The benefits expected to accrue from the peaceful use of space such as new energy resources, improved manufacturing techniques, enhancements in the quality of life, and eventually habitation of other celestial bodies can also be

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4. Dandridge M. Cole was the technological forecaster who, in 1963, proposed a "Panama Theory" of astropolitics which defined strategic areas in space.

5. Mahan, A. T., Captain, U.S. Navy. "The Influence of Sea Power Upon History: 1660-1783", American Century Series, Hill and Wang, New York, 1957. pp. 1-22.

said to form conditions for conflict.

The development of space measures to promote our national security has already evolved from reconnaissance for collecting intelligence to sophisticated systems for warning, communications, and navigation in support of terrestrial warfighting. History would indicate that this evolution will lead to warfighting in space. Proposals for space warfighting beyond the current F-15 launched ASAT program are being met with more opposition than national policy pronouncements might imply. Military operational commanders are more skeptical about the utility of space systems during conflict than many of the anti-defense advocates and space oriented politicians. The military concerns center around availability and survivability, as well as the functional contribution of space systems to our total warfighting capability.

The United States has been committed since the late 1950's to the exploration and free use of space by all nations for peaceful purposes. At the same time, the United States has reserved the right to conduct activities in space in pursuit of national security and for the benefit of mankind. Herein lies a US policy dilemma: How do we reconcile peaceful purposes in space with an active pursuit of vital national security goals? The elimination of war in space requires that in global order we have security in space similar to the public order which exists within the nation itself. Until effective global space order is established, it is

evident that all nations will insist on their right of self-defense against attacks and threats of attack from other nations. Accordingly, the United States has taken the position that its policies will include the right to prepare itself against aggression in space while separately striving for the peaceful international development of space.<sup>6</sup> Any nation taking another position would be naive. A prerequisite for maintaining "peaceful purposes" in a world of continuing international competition is the ability to plan for and to deal with the possibility of conflict.

There is no doubt that the Soviet Union is aware of the military advantages which can be achieved by using space systems. Military applications dominate the Soviet space program. It has been estimated that military related projects comprise approximately 85 percent of the total Soviet space program.<sup>7</sup> A reasonable assumption is that they see space as a medium for the natural extension of military capabilities. One potential source of motivation for their active space program is an apparent sensitivity to US technological capabilities. Past US accomplishments, such as the catch-up from the Sputnik surprise, combined with the possible apprehension about a future extension of the arms race into space could possibly explain

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6. Press Release, National Space Policy. Washington D.C.: July 1982.

7. "Soviet Military Power", Ibid.

their extensive military space involvement.

The United States military use of space focuses on peacetime deterrence through sophisticated satellite capabilities to provide warning of impending hostilities. In addition, this space surveillance supports the national policy making process by providing the data required for informed negotiations on a variety of civilian and military issues. The United States has recently announced new national and Department of Defense space policies. At first glance, these policies seem to be adequate to guide the nation safely into the future. President Reagan announced his administration's National Space Policy on July 4, 1982.<sup>8</sup> While the policy commits the US to a continued active role in space including the development and deployment of an antisatellite defense system, it specifically omits commitment to:

- A major space development program which could focus the advance of space technology thus marshalling nationwide public support for continued US leadership in space,
- An aggressive program of space research and development supporting military activity toward enhancement of national security,
- Development of a survivable space launch capability.

The DoD policy has established defense guidelines in space for the foreseeable future. While limited passive defense capabilities are to be designed into vital national space systems

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8. National Space Policy released by President Reagan on July 4, 1982

and the ASAT system will be deployed to deny the enemy certain low altitude satellites during conflict, the capability to wage war in space or actively protect national assets has been deferred.<sup>9</sup> According to Edward C. Aldridge, Jr., Under Secretary of the Air Force, "We, of course, have no weapons in space and no current development programs for weapons in space, but we are, nonetheless, obligated to be prepared to respond to any Soviet challenge."<sup>10</sup> While space policy, organization, and technology are all available, fundamental doubts and inconsistencies exist in definition of national space interests and the nature of international conflict.

In the authors' view, the above uncertainty in both the National and DoD Space Policies inhibit the United States from moving forward aggressively to guarantee long term national security interests. In subsequent chapters, we will identify specific national space interests and define objectives with the goal of developing an overall supporting strategy for the future US space program.

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9. Department of Defense Space Policy. Press Release, Washington D.C.: August 1982.

10. Defense 83, January, page 7. Space Command, Defense in the Fourth Medium.

CHAPTER II  
INFLUENCES AND CONSTRAINTS  
ON SPACE STRATEGY

Treaties and Agreements

In the late 1950's President Eisenhower encouraged the United Nations to take action to preserve outer space for peaceful uses. Since that time, many space treaties and laws have been established. While many treaties originated in the United Nations, the United States Congress initiated legislation relating to the establishment of the National Aeronautical and Space Administration (NASA). These laws and agreements focused on rights and responsibilities of nations in space.

Briefly, the international agreements over the last 20 years regulate activities in space in the following manner:

- Nuclear weapon explosions are prohibited in space.
- No nuclear weapons or any other type of weapon of mass destruction will be placed in earth orbit, on celestial bodies, or stationed in outer space in any manner.
- No military bases or maneuvers or weapon tests will be conducted on the moon or other celestial bodies.
- Systems placed in space or on celestial bodies remain the national property of the owning government. Such ownership will not be affected by the systems presence in space, on celestial bodies, or its return to earth.
- Governments will register with the Secretary General of the United Nations, as soon as practicable after launch,

information of their space objects.

- The Antiballistic Missile (ABM) Treaty prohibits developing, testing, or deploying ABM systems based in space.
- Under the SALT agreements, national technical means of verification are to be free of harm, attack, and interference. (The United States separately takes the position that under customary international law it can protect its space assets from attack, and that all space objects are free from threat or attack.)
- Outer space and celestial bodies cannot be claimed as sovereign soil by any nation.

Even though the above limitations seem clear, there exist some disagreements between the US and the USSR concerning interpretation of these concepts. For example, in the Outer Space Treaty, there is disagreement on the meaning of the words "peaceful", "military", and "aggressive". The US contends that a "military" act can be "peaceful" and that the word "aggressive" refers only to a threat of or actual armed attack and is "non-peaceful". The USSR argues that "non-peaceful" is better described by "military".

In the above example, the US interpretation implies that defense is a peaceful use of space. Theoretically, this idea seems to agree with the UN Charter, Article 51, when it refers to the "inherent right of self defense." In fact, all space-based ABM systems are prohibited by Article V of the ABM Treaty. The Heritage Foundation's "High Frontier" study proposes a space-based non-nuclear ABM system to negate the Soviet missile threat during the boost phase enroute to its targets. In the study, they argue unconvincingly that their system would not

violate the ABM Treaty. The Heritage Foundation's argument exemplifies the future legal uncertainties which will exist when effective space weapons are developed and ready for deployment.<sup>11</sup>

The USSR has developed the capability to destroy low earth orbit satellites with an orbital antisatellite weapon system. These existing and planned military weapons capabilities create increased pressure to clarify the US position on the defensive warfighting aspects of space. The Soviets have a limited space weapons capability which, past experience tells us, they will be reluctant to relinquish in some sort of a negotiated space weapons treaty. Furthermore, they should not be expected to refrain from developing improvements to their current ASAT system. The United States must develop a sound military strategy in space and lead the development of capabilities assuring the protection of our vital fourth medium security interests.

#### Militarization of Space

Both the USSR and the US have legitimate defense and surveillance military missions in space including systems for: photoreconnaissance, navigation, communications, weather observation, and strategic warning. Other types of military

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11. Daniel O. Graham, High Frontier: A New National Strategy (Washington: Hudson Institute, 1982), pl06.

missions will surely evolve as technology advances. Because future military space capabilities are not clearly defined, space weapons are wisely not being addressed in the current bilateral arms control negotiations with the Soviet Union.

There are other policy dimensions to the militarization of space which require consideration by the national political leadership and the operational military commanders. Can or should space be reserved for strictly peaceful purposes? On the surface, this would seem desirable and the idea has the active support of some serious thinkers. However, we must closely examine what is both practical and most likely to occur given the history of mankind. Consider that weapons are currently used in the conduct of warfare on earth, on the high seas, and in the air above the earth. Since wars are fought only on occasion and generally in confined areas, the use of the earth's airspace and oceans for peaceful purposes is only periodically and marginally affected by the presence of weapons in each medium. No natural boundary exists between the earth's airspace and space, therefore, an arbitrary boundary would have to be agreed upon to identify the prohibited space weapons areas. As space technology progresses, it may be difficult to remain within the parameters established at some previous date. As a practical matter, the boundaries would probably be readjusted to be consistent with new technology or rejected outright.

In the larger policy context relating to space weapons, a fundamental question must be posed. Is it realistic to believe that nation states can agree in advance to refrain from attacking military targets under conditions of general war? Such an agreement is a prerequisite for a general prohibition of warfare in space because there are today and will be in the future many communication, reconnaissance, and navigation satellites which are military targets in every respect. We submit that an agreement to protect these targets from attack could never be reached. Whether a nation will attack these targets will depend only on two factors:

- Are the means of attack available?
- Is the destruction of the target worth the probable costs?

The answer to the second question is crucial to future military space operations. The availability of appropriate weapons<sup>7</sup> is inevitable. Obviously, the calculated benefits of an attack will depend upon the military or strategic value of the target and the possible responses to such an attack.

An additional consideration is the deployment of nuclear weapons in space. The massive destructive force of nuclear weapons and the requirement for strict control of these weapons leads us to the conclusion that the deployment of nuclear weapons in space should continue to be prohibited.

DoD's task is to work within guidelines set by the limitations of technical science and the nations policy makers to produce capabilities which will guarantee our use of space in support of vital national interests. For the nations political leaders, there is a moral issue to be addressed. Should the United States develop weaponry for use in space which may be designed not only to protect but have a secondary offensive capability and thus, make the United States the "initiator" of the space arms race? Or do we wait to be second in what military history and most technological forecasters predict as the inevitable arms race?

The preferred means of controlling military space activities would be through international agreement. Even if international treaties and agreements are reached, history portends this will not protect us against the actions of belligerents when treaties are abrogated during conflict. As the most powerful nation in the free world, we must be willing and able to protect our assets. An inability to defend our space assets against hostile acts would force us to prevent interference or elect to retaliate with existing terrestrial conventional and perhaps nuclear forces. This obviously would encourage the horizontal or even vertical escalation of any conflict. The situation can be compared to freedom of the sea. Even though we advocate the principle of free access to international seas for national interests, a navy is necessary to enforce the international laws which make it viable.

If the United States or the Soviet Union push the development of military space weapons and are not regulated by arms control agreements, we can expect a weapons race in space. The potential impact that space weapons could have on world order make it imperative that either international agreements be reached or the US lead in any space weapons race in order not to jeopardize the survival of the free world. The US military space policy must embrace the fact that as long as there are material resources or human beings involved in military related activities in space, there will be a need to respond to aggression.

#### Civil Program

When Apollo XI successfully landed on the moon on July 23, 1969 and subsequently returned safely to earth, a truly historic milestone had been achieved by the United States. Not only was the lunar mission an incredible technological feat in itself, but the United States as a nation had proved in a most spectacular fashion its ability to regain technological supremacy in the world; a position which had been claimed by the Soviet Union some 12 years earlier with the launch of Sputnik.

At the conclusion of the Apollo program, the US space agencies, notably the National Aeronautics and Space Administration (NASA) and the US Air Force, began to look to the future. The Apollo program was extremely expensive. It became doubtful that the

nation was willing to continue to fund the space program at such a high level especially if the only apparent benefit would be increased knowledge of space. Continued manned spaceflights to the moon were not judged to be worth the tremendous cost. Consequently, a consensus emerged that future research and development work should be focused on earth orbiting systems and that an earth orbiting space station was the most logical program goal.

The system planners and engineers at NASA also concluded that an economical transportation system was required to place large amounts of hardware in earth orbit before a space station could be built. This new earth to space transportation system evolved into the Space Shuttle system concept and design. Because of the immense cost of the entire project and again because of a lack of a strong national consensus on the need for a space station, only the Space Shuttle portion of the program was approved for funding. The development and testing of the Space Shuttle became the principal space effort of the United States during 1970's.

Because the Shuttle program has experienced considerable delay and cost growth, there is again in 1983 considerable uncertainty, at least in the public's eye, about exactly where this nation is headed in space over the long term. The excitement over the Apollo program has waned although the final spectacularly successful tests of the National Space Transportation System (NSTS) have rekindled a certain degree of public enthusiasm.

## Domestic

The United States space strategy is driven by choices that must be made regarding scarce resources. Our major space programs must compete on their own merits for funding within a broad range of space and other programs. While there is a desire by participating interests groups to support the nation's strength in space, there are strong coalitions which fail to see the direct value of preeminence in space when compared with problems in the economy at the state and local level.

The United States has been successful in overcoming domestic inertia only when the space requirements have been clearly articulated and balanced against Soviet accomplishments. Only then has public opinion been willing to support the domestic sacrifices necessary to further the US position in space.

An increased public awareness of the nuclear strategies of the US and the USSR is an indirect influence on the future of military capabilities in space. The recent series of "Bishop's Letters" concerning the morality of a nuclear retaliatory deterrence philosophy and increasing demonstration of antinuclear sentiment in many countries is causing a reassessment of the US strategic posture. Since first employed at the close of World War II, nuclear retaliation as a means of deterring war has spawned a series of new nuclear weapon systems on the part of

both the US and the Soviet Union with the SS-20, MX, Pershing II, and GLCM as the newer editions. The omnipresent threat of annihilation and a perception of an inability to reduce the risk and occurrence of war through arms negotiations provides motivation for attempts to find other ways to maintain and improve the security of the nation. One potential course of action is to change the US security emphasis from retaliatory to defensive deterrence by using defensive weapons in space.

## CHAPTER III

### UNITED STATES LONG TERM INTERESTS AND OBJECTIVES IN SPACE

#### Policy Goals

On July 4, 1982, President Reagan released a new National Space Policy Directive. The policy reaffirmed the national commitment to the exploration and use of space in support of our national well-being, and establishes the basic goals of United States space policy which are to:

- Strengthen the security of the United States.
- Maintain United States space leadership.
- Obtain economic and scientific benefits through the exploitation of space.

#### Interests

The US interests in space have developed into two broad categories: (i) national defense to include protection of defense related assets and, (ii) scientific research to advance the exploration and future civilian use of space. The United States interests will continue to grow if space technology is seen to serve the economic and military needs of the nation.

Because the defense of the nation against hostile threats is of primary concern to the DoD, the United States is critically interested in maintaining and enhancing its strategic defense posture through spaceborne detection, sensing, and reconnaissance

systems. Our nation has learned to depend on a space network of strategic and tactical warning sensors designed to provide immediate and accurate notification of a hostile threat to national security. Sensors providing warning data are maintained in space where they have immediate access to all points of the world and do not infringe on current definitions of international sovereignty.

Space has become a most useful medium for arms control verification. The United States is committed to reducing the chance of nuclear war through negotiated controls on weapons production and deployment. High quality reconnaissance assets in space are effectively employed to verify compliance with international arms control agreements which are in our national interests.

The United States also has a national interest in spaceborne analysis of the world's mineral, agricultural, and energy resources. Not only could these resources support our own economy in time of crisis, they could also expand the knowledge gained from civilian space mapping assets and be used to improve the quality of life throughout the free world. The unhampered capability to develop space experimentation facilities could further our knowledge of deep space manufacturing techniques and technologies which is an essential prerequisite to colonizing other planets in the distant future. As has been said on numerous occasions, "Space is a place", and it is in the national

interest to learn more about that "place" while prudently exploiting its potential to serve mankind.

The evolutionary development of a manned presence in space in the future requires the United States to adequately consider the protection of these assets in space from hostile forces. These assets, whether manned space stations or unmanned national satellites, represent US technology, resources, and geopolitical interests. Overt attacks against US resources in the medium of space will, in future generations, be viewed in a similar manner as an attack on a US vessel on the high seas. Just as a ship represents a US interest in access to world markets and to unimpeded trade and travel around the globe, space assets represent US interests in political, military, and commercial spheres.

In the broader perspective, it is in our national interest to highlight the importance of survivability during conflict. Research, system design, and development should be required to establish survivability during crisis as a key program objective. While survivability of available space assets is at the core of supporting our existing and near term space interest, we must begin to articulate and refine the nations far term interests in space with the objective of designing future systems to satisfy those interests. A partial list of US interests in space might include:

- Free access to satellite orbital positions and celestial bodies necessary to meet national strategic and economic

objectives and to enhance life on earth.

- Freedom to use space in any manner deemed appropriate to enhance US strategic and tactical military capabilities. Excluded from this freedom currently by treaty is the deployment of nuclear weapons in space.
- Freedom to use space to enhance US strategic security. This might include the right to deploy a space-based defensive system.

### Objectives

These interests can be coupled with immediate or long range US objectives in space which include:

- The evolutionary development of a manned space station. Man in space offers the potential for revolutionary developments in space research.
- Continued maturation and expansion of the NSTS to meet the civil and military requirements of the nation.
- Strong national military space programs to enhance and assure the physical protection of all space and transportation assets commensurate with their contribution to national security. This includes survivability of critical national defense assets through all levels of conflict.
- A national program to develop a low cost, deep space, NSTS which might provide the link to exploration and research of other celestial bodies.

## CHAPTER IV

### ANALYSIS OF U.S. SPACE STRATEGY

The United States does not currently have a clearly defined space strategy. This is evidenced by a number of questions that have yet to be resolved. For example:

- Will the NSTS be used solely to transport and service low earth orbit satellites?
- Should there be much more ambitious plans for the NSTS?
- Will a space station be built in this decade?
- Will there be resumption of manned space flights beyond low earth orbit?
- Will the NSTS be used to support all military requirements?
- What military space systems should be planned for the future?
- What weapons will be required for space applications?

Before attempting to delineate a future US space strategy, it is necessary to first relate the long term interests and objectives to specific policies and programs. After analyzing the elements of a new space strategy, they can be prioritized and synthesized into an overall plan to satisfy the nation's needs in the most systematic and affordable manner possible.

Regarding far term US interests in space, the continued unrestricted access to space, earth satellite orbital positions, the moon, and other celestial bodies, generally requires only

that current tenets continue unchanged as official policy of the US government and are treated as non-negotiable terms of reference by US representatives in all international forums. In the foreseeable future, it is not expected that there will be any serious challenge to these positions.

Greater emphasis by the US government toward maintaining the freedom to use space to enhance strategic, theater, and tactical military capabilities is justified. What is needed is gradual, step-by-step, public education concerning the rationale supporting the need for weapons in space to insure national security. Currently, there is a sinister aura surrounding any public discussion of this subject which must be dispelled.

Use of the NSTS to support defense related R&D programs must be emphasized. In addition, military requirements must be systematically integrated into overall planning for the US space station development. All these activities should be given public disclosure to the maximum extent possible in order to develop, over time, an environment of general acceptance by the US public and the western world of the use of space in a wide variety of defensive military applications. This is not to say the United States should announce a policy of the offensive "militarization of space". The difference between the two, offensive and defensive, is substantial not only in terms of the public relations impact, but in terms of what the US actually needs to do in space.

Another long term US interest in space which was discussed in Chapter III is the freedom to develop space systems to enhance strategic defense. The United States must reexamine the question of space-based defensive ABM system development versus our current strategic nuclear offensive deterrent posture. At issue is whether continued compliance with the ABM Treaty, specifically Article 5, is in the best interests of the United States. This article prohibits the development, testing, and deployment of space-based ABM systems or their components. As discussed in Chapter II, an argument has been made (i.e., High Frontier) that a space-based ABM system could be developed using new phenomena, thus remaining committed to the ABM Treaty.<sup>12</sup> We support the logic of such a proposition. However, if the United States were to commence the development of a space-based ABM system, what purpose could be served by the continuation of a circumvented ABM Treaty? If the United States makes a decision to develop a space-based ABM system after full consideration of all the strategic implications of such a decision, then the ABM Treaty should be modified or abrogated.

Let us now examine the far term US objectives discussed in Chapter III. The first objective is the evolutionary development of a manned space station in low earth orbit. The prerequisites for this development now exist: our operational Shuttle and trained astronauts. System design and project plans for a NASA

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12. High Frontier, Ibid.

space station are well underway. It appears that formal approval of an overall program plan, schedule and funding are all that are required to commence the final phases of this program.<sup>13</sup> From a budget perspective, the key to affordability is embodied in the word evolutionary. Initial work in space should be actually accomplished inside the Space Shuttle. Experimental hardware assemblages should next be placed in orbit and revisited by subsequent Shuttle flight crews. The space station system design should accomodate both civilian and military requirements through common hardware facilities, at least in the initial phases of the program. As the system matures, separate operational and support facilities in space and on the ground may be desireable or even necessary.

The second far term objective is the full use of the Space Shuttle to support all US space transportation requirements for which it is suited. The National Space Transportation System represents a unique and versatile capability. It not only provides this nation with a reuseable, large payload launch capability, but it is also a system which can support extensive and complex manned operations in space. Given the desireability of using the NSTS to the maximum extent possible and the tremendous investment cost of that system, current government policy is to foster the standardization of payload design and

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13. Craig Covault, "Space Station Pivotal in NASA Future", Aviation Week & Space Technology, March 14, 1983, pp 83-89.

configuration for transportation by the Shuttle. In fact, commercial and military satellite system designers are reacting favorably to this policy.

This policy of maximum joint utilization raises several questions with regard to military applications. The first is the issue of ownership of the Space Shuttle and its ground support facilities. Certainly, the cost of building some number of Shuttle spacecraft and ground support facilities, which would be dedicated for military use and totally operated by the military, would be substantial. The number of military missions currently projected for the Shuttle over the remainder of this decade hardly justifies the cost of a fully dedicated military system.

Even if an ambitious space station development program with extensive military applications is soon initiated, it is still not clear whether a dedicated military Shuttle capability would be required. The government (i.e. NASA/DoD) can insure that military Shuttle missions receive whatever priority is necessary to guarantee the availability of the system when it is required without tackling the issue of Shuttle ownership directly. What is necessary, however, are clear procedures whereby the military, in particular Air Force Space Command, will begin to evolve as a principal user of the Space Shuttle System. In this context, Space Command would certainly play a significantly different role in the Shuttle operation than do commercial customers today. Two elements which are crucial to this issue are:

- Command and control of Shuttle operations.
- Funding responsibility (i.e., NASA and DoD) for Shuttle operations and support functions.

The development of policies to control these issues should begin now.

The second question regarding the use of the NSTS for military applications is that of developing an alternative launch capability. Requiring total reliance on the joint Shuttle for all military missions causes concern. Given the extreme vulnerability of the Shuttle vehicle and its launch site to a hostile attack, is it prudent to eliminate alternative space launch capabilities simply because of cost considerations? To be sure, any attack on the Shuttle or active interference with its mission by the Soviet Union or any other nation would be considered extremely provocative, possibly even an act of war. But in the future, when the role of space-based systems in support of national security is even more widespread, these systems will become more attractive military targets. The Shuttle will be a military target if it has a provocative role in a limited or large scale war effort. Certainly, if the Shuttle were used as a targeting system platform, as a weapons system platform, or as the means to access other platforms in space, its vulnerability would be a serious problem. In such a hostile environment, an alternative launch capability will be necessary to effect any individual satellite replacement or reconstitution. The important point is that as space-based

military systems gain in numbers and importance, military conflict, will likely extend into space, at least in terms of physical attacks on satellite systems. When this situation occurs, the United States must possess a relatively survivable satellite launch capability other than the Space Shuttle.

The third far term US space objective is to achieve the physical protection of all space assets commensurate with their value and use. Protection, in its broadest sense, could be extremely difficult and costly, perhaps even impossible to achieve. The phrase "commensurate with their value and use" is the key to this objective. Differing protective measures can be applied to assets depending on their importance, the difficulty to replace, and the intensity or type of threat to the particular system.<sup>14</sup> Protective and damage limiting measures include:

- Hardening
- Mobility and maneuver
- Proliferation and Deception
- Autonomy
- Reconstitution
- Deterrence
- Negotiation

Technical feasibility and cost are typically the motivating

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14. Giffen, Robert. US Space System Survivability: Strategic Alternatives for the 1990s. National Defense University Press, Washington D.C.:1982. p. 44.

factors in determining the most appropriate protective measure for a particular system. While the problem of protecting space-based assets can be a vexing one, a systematic approach for deciding on appropriate protective and damage limiting measures for every new system must be developed and implemented. Furthermore, the cost associated with protecting space-based systems should be added to the development and acquisition costs factored into each system acquisition decision. System survivability can be a crucial requirement in space-based military systems. In those cases the system design must include protective features which are cost effective and operationally appropriate.

CHAPTER V  
CONCLUSIONS AND RECOMMENDATIONS

Conclusions Regarding a New National Space Strategy

While the analysis presented in Chapter IV is not a rigorous treatment of the technical feasibility and cost effectiveness of different program alternatives, we believe that, in conjunction with the arguments presented in Chapter II, it does allow several general conclusions to be drawn about a future US program in space. These conclusions are:

- Existing international treaties and agreements do not impose particularly limiting restrictions on the use of space except for ABM systems and nuclear weapons.
- The development, testing, or deployment of space-based ABM systems would require either amendment or the abrogation of the ABM Treaty.
- The legal and moral arguments against the pursuit of space based weapons development and deployment (excluding nuclear weapons) are not compelling when weighed against national security interests.
- The United States should formulate a cohesive and aggressive strategy to employ space to satisfy our national security interests and objectives.
- Intensive efforts are necessary to identify, integrate, and articulate far term US space interests and objectives in such a way as to gain the political support necessary for the vital national space programs.

## Recommendations

Based upon our study of the issues involved, we propose an overall strategy to guide US space programs both within NASA and the DoD for the remainder of this century. A broad national space strategy should include the following fundamental elements:

- A continuation of a US policy position in all space related international forums which maintains the maximum degree of freedom with regard to the use of space. This policy must be consistent with the need for orderly management of space activity by all nations and include a general prohibition against any use of nuclear weapons in space.
- The removal of current policy constraints on all research and development work directed toward military applications of space technology. The Department of Defense should be encouraged to widen its horizons in seeking new ways to use space technology to enhance national security.
- Initiation of a broad based, evolutionary space station development program which builds upon Space Shuttle technology and capabilities to support all facets of space exploration for both civil and military applications.
- Initiation of a program to design, develop, and build a survivable satellite launch capability to augment the NSTS for military applications in time of war.

These four elements must be the cornerstones of a new forward looking space strategy. All space system initiatives currently in existence, including the Air Force antisatellite program, can continue within the context of this new strategy. The impetus of the strategy is twofold: (i) remove the artificial, self imposed, impediments to full utilization of space technology for military applications and, (ii) instill a purpose and sense of direction for our long term space efforts (i.e., space stations) in order to marshall the support of the American people and focus the

scientific efforts of the nation's industries.

We recommend the following specific national space initiatives:

- The continuation of a total prohibition against any use of nuclear weapons in space.
- Identify and include appropriate survivability measures in the development and acquisition of all space-based and related ground support systems.
- Develop active and passive space war fighting concepts and continue to incorporate these concepts into approved military doctrine.
- Conduct a formal review of candidate space-based and terrestrial ABM system concepts with a view toward assessing the continued utility of the ABM Treaty.
- Identification of an appropriate methodology for joint NASA/DoD funding of programs in support of a national space strategy.

## EPILOGUE

On March 23, 1983, during the final editing of this strategic study project, President Ronald Reagan gave a nationwide major policy speech which directed the scientific community "to define a long term research and development program to begin to achieve our ultimate goal of eliminating the threat posed by strategic nuclear missiles."

Implied in his speech was the requirement to reevaluate US nuclear strategy. World peace is currently preserved through the presence and threat of offensive nuclear forces. This direction has been widely interpreted to mean that the future could find the preservation of peace through defensive conventional forces - deployed in space.

This speech has taken the first step recommended in this paper to remove the doctrinal blinders against strategic defenses in space. Weapons in space are now "out of the closet" and will be examined by the scientific community while being debated in a variety of public forums.

We believe the President has taken our first step in developing "A Strategy to Achieve the United States Long Term Interests in Space".

APPENDIX A  
SUMMARY OF INTERNATIONAL AGREEMENTS

- o Treaty banning nuclear weapon tests in the atmosphere, in outer space, and under water (October 10, 1963).
- o Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies (October 10, 1967).

This treaty is also called the Outer Space Treaty and its main points include:

- No nuclear weapons or any other kinds of weapons of mass destruction in earth orbit, on celestial bodies, or in outer space.
  - No military bases or maneuvers on celestial bodies.
  - The use of military personnel for scientific research or other peaceful purposes shall not be prohibited.
- o Agreement on the rescue of astronauts, the return of astronauts and the return of objects launched into outer space (December 3, 1968).
  - o Convention of international liability for damage caused by space objects (October 9, 1973).

Due to this treaty, the USSR paid Canada damages when their satellite (COSMOS 962) crashed in northern Canada.

- o Convention on the registration of objects launched into outer space (September 15, 1976).

Requires each signatory country to register with the Secretary General of the United Nations, as soon as practicable, information on launched space objects.

- o Antiballistic Missile (ABM) Treaty.

Prohibits space-based ABM systems and limits number of earth based systems.

## APPENDIX B

### SUMMARY OF THE NATIONAL SPACE POLICY

#### BASIC POLICY

On July 4, 1982, President Reagan released a new National Space Policy Directive. The policy reaffirmed the national commitment to the exploration and use of space in support of our national well-being, and establishes the basic goals of United States space policy which are to:

- Strengthen the security of the United States.
- Maintain United States space leadership.
- Obtain economic and scientific benefits through the exploitation of space.

The principles underlying the conduct of the United States space program are:

- Commits to the exploration and use of space by all nations for peaceful purposes and for the benefit of mankind. "Peaceful purposes" allow activities in pursuit of national security goals.
- Rejects any claims to sovereignty by any nation over space or over celestial bodies and rejects any limitations on the fundamental right to acquire data from space.
- Considers the space systems of any nation to be national property. Purposeful interference with space systems shall be viewed as an infringement upon sovereign rights.
- Encourages domestic commercial exploitation of space capabilities, technology, and systems for national economic benefit consistent with national security concerns, treaties and international agreements.
- Supports international cooperative space-related activities.
- The United States space program will be comprised of two separate, distinct and strongly interacting programs: national security and civil.
- The Space Transportation System (STS) is the primary space

launch system for both national security and civil government missions.

- Pursuit of activities in space in support of its right of self-defense.
- Continue to study space arms control options with a goal of verifiable and equitable arms control measures consistent with national security.

#### SPACE TRANSPORTATION SYSTEM

The Directive states that the Space Shuttle is to be a major factor in the future evolution of United States space programs. The Directive establishes the following policies governing and development and operation of the Space Transportation System:

- The STS is a vital element of the United States space program.
- The United States will continue to develop the STS through the National Aeronautics and Space Administration (NASA) in cooperation with the Department of Defense (DoD). Enhancement of STS operational capability should be pursued as requirements are defined.
- United States Government spacecraft should be designed to take advantage of the unique capabilities of the STS and transition to the Shuttle should occur as expeditiously as practical.
- NASA will assure the Shuttle's utility to the civil users.
- Expendable launch vehicle operations shall be continued by the United States government until the capabilities of the STS are sufficient to meet its needs and obligations. Unique national security considerations may dictate developing special purpose launch capabilities.
- For the near term, the STS will continue to be managed and operated in an institutional arrangement consistent with the current NASA/DoD Memoranda of Understanding. As the STS operations mature, the flexibility to transition to a different institutional structure will be maintained.
- Major changes to STS program capabilities will require Presidential approval.

## THE CIVIL SPACE PROGRAM

In accordance with the provisions of the National Aeronautics and Space Act, the Directive states that the civil space program shall be conducted:

- To expand knowledge of the Earth, its environment, the solar system and the universe.
- To develop and promote selected civil applications of space technology.
- To preserve the United States leadership in critical aspects of space science, applications and technology.
- To further United States domestic and foreign policy objectives.

## THE NATIONAL SECURITY PROGRAM

The National Space Policy Directive states that the United States will conduct those activities in space that it deems necessary to its national security. The following policies which shall govern the conduct of the national security program:

- Survivability and endurance of space systems, including all system elements, will be pursued commensurate with the planned use in crisis and conflict, with the threat, and with the availability of other assets to perform the mission.
- The United States will proceed with development of an antisatellite (ASAT) capability with operational deployment as a goal with the primary purpose of deterring threats to space systems of the United States and its Allies.
- 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.
- Security, including dissemination of data, shall be conducted in accordance with Executive Orders and applicable directives for protection of national security information.

## INTER-PROGRAM RESPONSIBILITIES

The National Space Policy Directive contains the following guidance applicable to and binding upon the United States national security and civil space programs:

- The national security and civil space programs will be closely coordinated and will emphasize technology sharing within necessary security constraints.
- Civil Earth-imaging from space will be permitted under controls when the requirements are justified and assessed in relation to civil benefits, national security, and foreign policy.
- The United States Government will maintain and coordinate separate national security and civil operational space systems when differing needs of the programs dictate.

## POLICY IMPLEMENTATION

The National Space Policy Directive states that normal interagency coordinating mechanisms will be employed to the maximum extent possible to implement the policies enunciated. A Senior Interagency Group (SIG) on Space is established by the Directive to provide a forum to all Federal agencies for their policy views, to review and advise on proposed changes to national space policy, and to provide for orderly and rapid referral of space policy issues to the President for decisions as necessary.

APPENDIX C  
BIBLIOGRAPHY

Books

Baker, David. The Shape of Wars to Come., 1982.

Civilian Space Policy and Applications. Washington: Office of Technology Assessments, 1982.

Giffen, Robert. U.S. Space Systems Survivability, Strategic Alternatives for the 1990's. The National Security Affairs Monograph Series, No. 82-4. Washington : National Defense University Press, 1982.

Graham, Daniel. High Frontier: A New National Strategy. Washington: Heritage Foundation, 1982.

Military Space Doctrine Symposium. Colorado Springs, Co: U.S. Air Force Academy, 1981.

Rhineland, John B. and Willrich, Mason. SALT: The Moscow Agreements and Beyond. New York: The Free Press, 1974.

Soviet Military Power. Washington: U.S. Government Printing Office, 1983.

Space Law. Washington: Senate Committee on Commerce, Science, and Transportation, 1978.

Stine, G. Harry. Confrontation in Space. Englewood Cliffs, N.J.: Prentice-Hall, 1981.

U.S. Government Documents

Department of the Air Force. Military Space Doctrine, Air Force Manual 1-6. Washington: 15 Oct 1982.

Department of the Air Force. Space Policy and Requirements Study (SPARS). Washington: May 1981.

U.S. Presidential Directive/NSC-37. National Space Policy (U). The White House, 11 May 1978.

### Articles

"DoD in Space". Defense 83, January 1983.

Eaker, Ira. "Goals in Space and Other Priorities". Air Force Times, 5 January 1981.

Garthoff, Raymond L. "Banning the Bomb in Outer Space." International Security, Winter 80/81, pp. 25-40.

Gregory, William H. "Military Power in Space." Aviation Week and Space Technology, 18 October 1982, p. 7.

Hartman, Richard. "War in Space", The Great Frontier. Colorado Springs, Co.: U.S. Air Force Academy, p. 55.

Listvinov, Yu. "No Weaponry in Outer Space", Soviet Military Review, December 1981.

Mate, Joseph. "The Fourth Military Arena" Space: Status and Prospects, RAND Corporation, Santa Monica, Ca.

Reed, Walter. "Legal Aspects of Military Peaceful Uses of Space", The Great Frontier. Colorado Springs, Co.: U.S. Air Force Academy.

Smite, Delbert. "Space Stations", International Law and Policy. p. 89.

Stares, Paul. "Outer Space: Arms or Arms Control." Arms Control Today, July/August 1981.

von Pullkamer, Jesco. "On Man's Role in Space", Washington: Advanced Programs, Office of Space Flight, National Aeronautics and Space Administration, December 1974.

"25 Years After Sputnik: War and Peace in Space." The Washington Post, 4 October 1982.

### Unpublished Materials

Andrews, Wayne. "The Soviet Space Threat." Lecture, The National War College, Washington D.C.: 29 September 1982.

DeKok, Roger. "DoD Space Plans." Lecture, The National War College, Washington D.C.: October 1982.

Interview with Lieutenant General James A. Abrahamson, USAF,

Deputy Director, National Aeronautics and Space Administration, Washington D.C.: 3 December 1982.

Interview with Colonel Wesley Clark, USAF, Space Command, Colorado Springs, Co.: 20 October 1982.

Interview with Colonel Joseph Engels, USAF, National Aeronautics and Space Administration, Washington D.C.: 3 December 1982.

Interview with Colonel James Foster, USAF, Space Plans and Policy, The Pentagon, Washington D.C.: 5 November 1982.

Interview with Colonel Richard L. Griffin, USAF, National Aeronautics and Space Administration, Houston, Tx.: 17 December 1982.

Interview with Colonel Charles Heimach, USAF, Strategic Studies, Air Force Studies and Analysis. The Pentagon, Washington D.C.: December 1982.

Interview with Colonel Gilbert Rye, USAF, National Security Council, Washington D.C.: 4 November 1982.

Interview with Brigadier General John H. Storrie, USAF, Directorate of Space, The Pentagon, Washington D.C.: 3 November 1982.

Graham, Daniel. "The High Frontier Study: Conclusions and Recommendations." Lecture, The Technical Marketing Society of America Conference, Washington D.C.: 1 December 1982.

McFarland, R. S. "The Impact of Space Systems on Future Warfare - A Warriors Perspective". Unpublished Student Research Paper, The National War College, Washington D.C.: June 1980.

Randolph, Bernard. "Command, Control, and Communications Space Systems for National Defense." Lecture, The National War College, Washington D.C.: 24 November 1982.

Wallops, Malcolm. "National Defense in Space." Lecture, The National War College, Washington D.C.: 1 December 1982.

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