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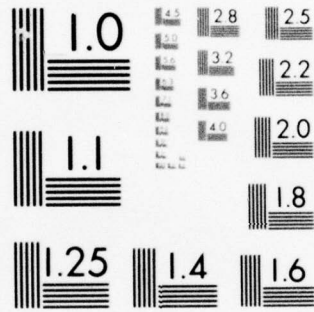
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A TURNING POINT IN SPACE: HAS THE TIME ARRIVED FOR A NATIONAL REVIEW OF OUR SPACE POLICY?

By

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The study investigates whether world conditions have changed to the extent that current policies which guide the national space effort may be in need of review. It examines, historically, how the space efforts of the United States and the Soviet Union have evolved. Primary emphasis is placed on the policy direction which has brought each of the national space programs up to the present. Technological factors have made a very significant impact upon the development of the space programs of both nations.		

Therefore, technological problems and opportunities are examined in detail. The study focuses on four fundamental issues which confront the national space effort as we enter the third decade in space. These issues are:

- (1) The overlap and convergence between civil and military programs.
  - (2) The question of whether "space for peaceful purposes" continues to remain a valid policy alternative.
  - (3) How dependent have we become upon space?
  - (4) Is space an arena where we have vital interests as a sovereign nation?
- The study conclusions are that we may have passed a significant turning point in space and, therefore, the time is overdue for a comprehensive review of our national space effort. Such a review, conducted by the highest levels of government, should include a management review of selected items and should resolve the four major political issues mentioned above.

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USAWC MILITARY STUDIES PROGRAM PAPER

A TURNING POINT IN SPACE:  
Has the Time Arrived for a National  
Review of Our Space Policy?

A GROUP STUDY PROJECT

by

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13 May 1977

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## PREFACE

This Group Study Project was produced under the aegis of the US Army War College Department of Military Strategy, Planning and Operations. The scope of the Project and general method of investigation were devised by the authors. The need for this Project became obvious to the authors during the "Core Curriculum Phase" of instruction at the Army War College (August-December 1976) when numerous guest lecturers said or implied that the US had no National space policy. It seemed to the authors that this lack of a coherent National space policy was having a noticeable detrimental effect on the security of our country as well as on its political and economic fortunes. The authors were aware that this subject became of interest at the highest levels of our National Government during the later phases of our study. Because of this high level interest, the authors heeded recommendations made by National Security Council staff and Office of the Secretary of Defense Staff Members who suggested that our work be written at the unclassified level to reach the widest possible audience. Since this subject is of such interest and currency, the authors chose to do most of their research through personal interviews with those persons who are in positions of responsibility concerned with formulation and administering the civil and military space programs. In most cases, the authors found it necessary to establish a nonattribution relationship with key officials in order to obtain candid opinions. Their opinions contributed significantly to our understanding of the situation

but could not be identified in the text of the paper. A deliberate effort was made to conduct this study without being constrained by any existing philosophy or bias toward any branch of the United States Government.

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## CHAPTER I

### INTRODUCTION

#### Background

Based on this investigation the authors of this paper feel it is time for a review of US national space policy. Indeed what is our national space policy? Some policy is very explicit while some is only implied. Reasons why our space policy should be reviewed are contained in Chapter IV where four significant issues are discussed. Furthermore, our policy needs to be reviewed because there appears to be a basic difference between the way the US and USSR views space. The USSR views space where national interests are at stake while the US views space as a medium where commercially related tasks can be accomplished more efficiently or effectively. The available technology, US dependency on space systems, and the recent anti-satellite tests by the USSR all focus synergistically on the requirement for a comprehensive space policy review.

Issues that need to be examined might include the following:

- What is our national space policy?
- What is the mechanism to implement our national space policy--who is in charge?
- What are the guidelines for the interaction of the military and civil space programs?
- What should be an appropriate management system for these space programs?
- Is the maintenance of space for peaceful purposes still a valid concept?
- What should be our military posture on space?
- What should be our space technology posture?
- Should our space systems be survivable?

Answers to these questions should insure that in the future U.

space programs will be coordinated, directed, managed, and budgeted so as not to lose our technological edge or become vulnerable to a space-related threat.

It appears that we have passed a threshold where our national space policy needs to be reviewed to take into account the new environment generated in part by the USSR, in part by the burgeoning new technologies, and in part by new world power balances and political and economic realities. We believe that the United States has reached A Turning Point in Space.

#### Objective of the Paper

The objective of this paper is to demonstrate the need for a Presidential level review of our national space policy. We will analyze our space programs from a historical and technical point of view and then surface significant issues which clearly show the need for a review of United States space policy. A secondary objective is to provide a stimulus for further study by the various government agencies involved in space to whatever new policies, strategies, or doctrines are necessary to guide this nation through its third decade in space.

#### Investigative Procedures

The primary method of investigation was personal interviews with governmental and private leaders in the space field. The subject of space policy was sensitive to many of the people we interviewed and most of them would talk only on a nonattribution basis. Consequently, there are very few personal references noted

in this paper. We also made an extensive review of current literature and frequently relied on personal analysis and experience.

#### Organization of the Paper

Chapter II discusses historically the US and USSR space program. The US space program can be characterized as having a civilian scientific orientation with a clear separation of military and civilian space efforts. The USSR space program is described as politically directed and militarily oriented, exploiting space for national objectives. Chapter III discusses the technological issues and the relationship between technology and policy. Chapter IV discusses in some detail four of the more significant issues concerned with our present space policy. They are:

- The increasing overlap and convergence between military and civil programs.
- The question of whether space for peaceful purposes is still a valid concept.
- How dependent the US is on space.
- Is space an arena where we have vital interests as a sovereign nation?

Chapter V concludes the paper with the authors' recommendations. Our space policy however defined is over 20 years old. Applied technology from space has provided the US with a measure of international prestige and has served our foreign policy objectives well. Policy development and managerial capability to guide the national space program appears to have trailed system proliferation. It appears that recently there may have been significant shifts in the relationships among the major space powers with the advent of the Soviet anti-satellite program. We believe that it is now time for

a comprehensive review, perhaps a redefinition, an articulation, and the creation of a mechanism for day-to-day management of a US national space policy.

For the most part, our present space policy is over twenty years old. We begin our review of space policy by taking an historical look at the origins of that policy.

## CHAPTER II

### AN HISTORICAL OVERVIEW

#### US Space Program--Policies and Objectives

The policies and objectives of the US space program are found in many documents. In fact, a review of available literature reveals that there is no one single document which contains a listing of space objectives or policy. Sources of space policy and objectives can be found in:

- UN Resolutions
- Treaties
- Acts of Congress
- Presidential Proclamations
- DOD guidance, directives, and studies

Historically, the environment of the early US space program during the Eisenhower years can be described as "calm conservatism." Prior to the Sputnik I launch, the administration did not view the space program as a race. In fact, low estimates of the political significance of satellite launches were given by the administration. The Soviet launch of Sputnik I undermined these assumptions of the US space program and even the broader foreign policy assumptions, especially the notion that the US was the unsurpassed world leader in military, economic, and technological power. One of the administration's initial reactions to Sputnik I was to elevate the status of the Science Advisory Committee. This committee with presidential endorsement issued a pamphlet "Introduction to Outer Space" on 26 March 1958. In it were a listing of four "factors" of importance for future US space programs. These were:

- The compelling urge of man to explore.
- The defense objective.
- National prestige.
- New opportunities for scientific observation and experiment.

The report concentrated on the second and fourth factors in accordance with Eisenhower policy and recommended the establishment of a space agency with a civilian, rather than a military, orientation. The report articulated a clear policy--separation of civilian and military programs with a definite emphasis on civilian efforts. Although this policy came under attack, it survived and resulted in the National Aeronautics and Space Administration being established.<sup>1</sup>

The National Aeronautics and Space Act of 1958 which created NASA was a clear reflection of the policy adhered to by the Eisenhower administration. The Act declared that the policy of the US would be that "activities in space should be devoted to peaceful purposes for the benefit of mankind." The Act established NASA to guide research and development in space, to provide a mechanism for coordination and integration of the civilian and military space effort; and to encourage international cooperation in space. The Act also declared that "activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the US shall be the responsibility of the Department of Defense."<sup>2</sup> The early years of the US space program

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<sup>1</sup>President's Science Advisory Committee, "Introduction to Outer Space" (Washington, D.C.: The White House, 1958), pp. 1-14.

<sup>2</sup>National Aeronautics and Space Act, PL 85-568, 29 July 1958.

indicated a clear preference for a predominant civilian/scientific voice in determining space policy with a distinct separation of military and civilian programs--that preference continues even until today.

In order to provide a review of past US space programs and chart a course for the 1970s and beyond, President Nixon established the President's Space Task Group (STG) on 13 February 1969. The STG recommended emphasis in five major areas:

- Application of space technology for the direct benefit of mankind.
- Operation of military space systems to enhance national defense.
- Exploration of the solar system and beyond.
- Development of new capabilities for operating in space.
- International cooperation and participation.<sup>3</sup>

Subsequently, President Nixon toned these recommendations down considerably and translated them into six specific goals. Again, the specific goals reflect a strong civil orientation in the space effort. These goals were:

- Moon exploration.
- Bold exploration of the planets.
- Cost reduction of all space programs.
- Extending man's capability to live and work in space.
- Practical space applications.
- International cooperation.

These goals have set the stage for the seventies and unless modified by subsequent administrations are expected to continue to guide our space effort.<sup>4</sup>

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<sup>3</sup>President's Space Task Group, The Post Apollo Space Program: Directions for the Future, Space Task Group Report to the President, September 1969.

<sup>4</sup>Arthur L. Levine, The Future of the US Space Program (New York: Praeger, 1975).

DOD Directive 5160.32, 6 March 1961, addresses specific space policy for the military. The directive established the Air Force as the Service primarily responsible for the development, production, and deployment of space systems for warning and surveillance of enemy nuclear delivery capabilities and all launch vehicles, including launch and orbital support operations. To avoid duplication of effort the directive also established that the Director of Defense Research and Engineering will serve as the focal point for space technology and space systems when more than one department is involved. Recent Defense Planning Guidance contained numerous items on space or space-related activities. The importance of maintaining a strong technological base was specifically mentioned:

To maintain an overall military balance and minimize the likelihood of technological surprise, the US must maintain a technological base superior to that of any adversary.<sup>5</sup>

From the foregoing one can conclude that although the military potential for space is being recognized, the predominant interest for our national space effort retains a civilian-scientific emphasis and a separation of military and civilian programs. Four national objectives of the US space program can be surmised:

- Preservation of national security.
- Scientific exploration for the benefit of mankind.
- Application of space systems technology for peaceful purposes to promote human welfare.
- Maintain technological excellence.

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<sup>5</sup>U.S. Department of Defense, Defense Policy and Planning Guidance (U) (Washington, D.C., November 4, 1975). SECRET--paragraph quoted is unclassified.

The civilian-scientific emphasis of the US space program is apparent. Recent developments in both the US and USSR may now call for a comprehensive review of our national space policy. The review should be prepared to explore those issues suggested in the introduction and readdress the civilian/military balance of the US space program. The potential military uses of a space shuttle, the growing US dependence on space systems for battlefield support; the high cost of space systems (which tend to force the convergence of military and civil space systems); the recent Soviet initiatives in space; all contribute to the requirement for a space policy review. Our twenty-year-old policies may no longer be applicable for space operations and opportunities in the 1980s and beyond.

USSR Space Program--Policies and Objectives

It appears that the basic purposes of the USSR space program have not changed since the early sixties. We are convinced that the Soviet space program is a major element in the total strategy of their leadership and their space effort pursues political objectives established by that strategy. In the early 1960s, the main thrust of Soviet policy toward the West was a weakening and, if possible, destruction of the Western alliance system. Throughout this period, both Western European confidence in the US and US self-confidence vis-a-vis the USSR rested heavily on the assumption that the US had and could maintain a military, scientific, and technological superiority over the USSR. If that assumption could be destroyed, then the USSR could reasonably expect to see a growth in neutralist and

pacifist sentiments in Western Europe. The Soviet Union has projected the image with their space program that their society is more purposeful, forceful and highly motivated than American society, and that the USSR can marshal and allocate its resources in a more efficient manner.

The Soviet leaders in exploiting their space program for political gain were not only concerned with power projection, but they also tried to convey the impression that their power was dedicated to peaceful purposes. They did this by proclaiming that all Soviet space activities were only for peaceful and scientific purposes; by suppressing public evidence of Soviet military space programs; and by pointing out that the US concern over the military potential of outer space gave support to the Soviet contentions that the US space program was primarily motivated by military considerations.<sup>6</sup>

The Soviets in formulating their initial space program viewed space as an arena in which to extend the Cold War. The graphic demonstration of their broad technological base through space launches, in addition to their conscious attempt to exploit space for political purposes, were designed to be supportive of other instruments of national policy to achieve overall political objectives.

During the early 1970s, the Soviet objectives in space have not changed; however, there have been some significant shifts which were based on a changing world scene. For example, during the early part

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<sup>6</sup> A. L. Horelick, The Soviet Union and the Political Uses of Outer Space, Rand Report P-2480, November 1961.

of the decade, Vietnam created tension between the US and USSR and the USSR's political responses to the US space activities were structured accordingly. At the same time, they continued to enhance their own space programs.

The success of Apollo 14 (31 January-9 February 1971) was not acclaimed by the Soviets. Instead they returned to the traditional theme of denigrating the American space effort by comparing Apollo 14 to the Lunokhod I mission. The value of an automated exploration of the moon was contrasted to the "dangerous" manned exploration.

The Soviets in the early 1970s continued to magnify their space achievements by stressing perfectability. This of course was enhanced by their shroud of secrecy surrounding failures. Even with the death of their cosmonauts, an aura of perfectability was maintained. Another familiar theme was the Soviet emphasis on the peaceful purposes of their space program. Again the intent would appear to be to cast the USSR in the most favorable political light.

An additional aspect of the Soviet space program (which really began in the 1960s) was the close identification of space achievements with the Communist Party and the Soviet government. Soviet leaders were continually featured prominently in space efforts to maximize party linkage. The purpose was apparently to create the image and reality that the Party was the sole source of space achievements and therefore is a fit object of public confidence and trust. A missing theme in the early seventies was the Soviet accusation that US space efforts were largely military in nature. This could be attributed to the Soviet's own large military space program,

the launch of three anti-satellites in 1971, and the acceptance of "national technical means of verification" in the SALT I agreement.<sup>7</sup>

In summary the Soviet's political uses of space in the early 1970s were a reflection of the tension produced by the US expansion of the war in Indochina. Political themes included:

- Downgrading the US space program.
- Magnifying the Soviet space program.
- Identifying the space successes with the Party.
- Accentuating the positive and peaceful nature of the Soviet space effort.

Since the early 1970s, there have been some notable shifts in emphasis in Soviet space relations with the US. Since this time, there has been little downgrading of the US space effort and essentially no exaggerated claims for Soviet space efforts--probably due to their many failures. Finally, there appeared to be an easing of restrictions on secrecy. The joint Apollo-Soyuz flight was probably the biggest contributor to this change of relations. Some persistent themes from the early 1970s have remained. Identification of the Party with the Soviet space program and its attendant rituals still glorified the Soviet system, its leadership, and its ideology. It can be safely assumed that the driving force behind the space program was still the Party and not the scientific community.

What emerges from an overview of the seventies is the Soviet's real commitment to space exploitation. Space for the Soviets has always been an arena that allowed power projection and the enhancement

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<sup>7</sup>Staff Report, Soviet Space Programs 1971-1975, Goals and Purposes, Organization, Resource Allocation, Attitudes Toward International Cooperation and Space Law, Report prepared for Committee on Aeronautical and Space Sciences, U.S. Senate, 30 August 1976, pp. 27-47.

of international prestige. Space has been an essential factor in international politics from the days of the Cold War to the present days of restraint under detente.<sup>8</sup> Recent anti-satellite tests by the Soviets are a clear indication that they view space as an area for military exploitation. According to Dr. John Erickson, Director of Defense Studies, University of Edinburgh, and a well-known expert on Soviet policy, the Soviets view space as a fourth arena in which war is a likely prospect.<sup>9</sup> Thus, it would appear that the Soviets have answered the question, "Is space still for peaceful purposes?"

This chapter has summarized the US and USSR space policies and objectives. The differences are apparent. Historically, it appears the USSR has always viewed their space program as a national interest while at the same time the US has viewed space as a place where activities can be accomplished more effectively or efficiently. The historical chapter has implied that because of US/USSR differences and other developments, a review of US space policy is necessary. The chapter to follow on Technology will highlight additional differences, which will also indicate a need for a review of US space policy.

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<sup>8</sup>Ibid., pp. 48-62.

<sup>9</sup>Interview with Professor John Erickson, University of Edinburgh, at the US Army War College, 22 March 1977.

### CHAPTER III

#### TECHNOLOGY

One of the more significant aspects of any review of space policy is the influence that a rapidly expanding space technology has on that policy. New technology seems to have a way of generating new policy problems in the political and economic areas. As technology advances, so must the policies that influence and control it. Of course, technology is not alone in its influence on space policy; rather it is inseparably intertwined with political and economic policies and influences. Therefore, in order to facilitate the discussion of policy in this paper, we have included a separate chapter on technology. For simplicity, we define space technology as that technology which is used in space or which supports space systems.

##### The Nature of Space Technology

Technology has a momentum of its own which is self-perpetuating: cannot be ignored, can be used for good or evil, and must have some semblance of control. Nowhere does technology have a wider field in which to operate than in outer space. Space technology allows man to extend his will over vast areas of space, and over the terrestrial world and its peoples in a way never before possible. This technology is rapidly producing revolutionary capabilities for mankind to better itself and/or to possibly destroy itself. Space technology has already become inseparably intertwined with the economic, political and military goals of many nations.

Today the United States is rich in technology. It is one of our greatest strengths. According to Possony and Pournelle, "Technology flows on without regard for human intentions, and each technological breakthrough offers the possibility for decisive advantages to the side that first exploits it."<sup>1</sup> Such advantages will be fleeting because others will certainly gain the same technology in the future. If we are not to lose our great strength, we must apply our technology with imagination, initiative and determination to enhance our world position economically, politically and militarily.

#### Soviet Technology

It is important to have some appreciation of how the Soviets, our strongest rivals in space, feel about technology--especially military technology. While we probably do not know their actual philosophy, we can get an insight from several recent statements by key US officials. In responding to remarks by MG George Keegan, Jr., which indicated that the USSR has already achieved military superiority over the US, a JCS spokesman said that "The available evidence suggests the USSR is engaged in a program designed to achieve such superiority but that they have not attained this goal."<sup>2</sup>

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<sup>1</sup>Stefan T. Possony and J. E. Pournelle, The Strategy of Technology, p. 2.

<sup>2</sup>"Military Leaders Clash on Soviet Threat," Aviation Week and Space Technology, 7 February 1977, p. 16.

In a recent posture statement, Dr. Currie (former DDR&E) said:

"The Soviets are investing increasing resources in space technology for military purposes. Their level of activity reached an all-time high in 1975, and the systems they put into orbit are significantly more sophisticated than those deployed in the past. The trend signified by these activities indicates that their space systems will soon contribute substantially to the effectiveness of their command and control systems, and directly to the performance of their strategic and general purpose forces."<sup>3</sup>

Also in the DDR&E FY78 posture statement, we find that the Soviet leadership is committed to assuring "That the USSR triumphs over the U.S. in the crucial struggle for military-technological supremacy."<sup>4</sup>

In his book, Soviet Conquest from Space, Peter James (a former intelligence analyst on Soviet space programs) states, "the Soviets believe that they must surpass the United States in science and technology to achieve military and strategic superiority."<sup>5</sup>

William R. Kintner of the University of Pennsylvania Foreign Policy Research Institute comments that "The Soviet leaders are Marxists who clearly believe that mastery of technology will inevitably lead to mastery of the political order."<sup>6</sup>

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<sup>3</sup>Edgar Ulsamer, "Will the Soviets Wage War in Space?," Air Force, (December 1976), p. 31.

<sup>4</sup>Edgar Ulsamer, "The USSR's Military Shadow Is Lengthening," Air Force, (March 1977), p. 46.

<sup>5</sup>Peter N. James, Soviet Conquest from Space, p. 41.

<sup>6</sup>William R. Kintner, "Alternate U.S. Strategies and America's Future," Foreign Policy Institute, University of Pennsylvania, p. VII-2.

We must be careful not to fall into the trap caused by the assumption that there is a symmetry of motives and behavior between ourselves and the Russians. We would be foolish to believe that the Soviets would not do things we would not do for moral or humanitarian reasons.

The Soviets appear to have a centrally directed technological strategy which permits them to focus their efforts on military-related technology with a goal of enhancing their relative position with respect to the U.S.<sup>7</sup> By concentrating their efforts on selected portions of military technology, such as space weapons, they are able to gain local superiority where desired. Time is not as critical to the Soviets in the technology conflict as it is to the US because they know that our goal is to contain Communism, not to defeat it. They know that they will have time to develop a counter to any technological breakthrough that we discover.

If the Soviets are genuinely trying to achieve military superiority over the US, and it seems that they are, space offers many unique opportunities. It is only logical to predict that, sooner or later, revolutionary advances in space weapons will occur. If the Soviets are the first to develop such weapons, our national interests and maybe even our national survival could be at the mercy of the Russians.

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<sup>7</sup>Staff Report, Soviet Space Programs 1971-75, Goals and Purposes, Organization, Resource Allocations, Attitudes Toward International Cooperation and Space Law, Report prepared for Committee on Aeronautical and Space Sciences, United States Senate, 30 August 1976, pp. 74-83.

Possony and Pournelle summarize our technological position relative to the Soviets quite well:

The challenge is clear. We are engaged in a conflict for technological dominance. The center of our power position is threatened by the Soviet drive to surpass us and become superior. While the relative technological position is important to political, economic, diplomatic, and the psychological struggle, it is vital to military conflict.

Superiority in military technology is the prerequisite of strategic success. This is especially true in the era of aerospace nuclear warfare, when a surprise attack made possible by an unexpected technological advance could lead to sudden defeat of the seemingly strongest power. The danger is especially acute in the current period when expanding technology can be used to implement aggressive ideology. In spite of the richness of U.S. resources, two resources are neutral: time and will. The time advantage goes to the one who has the will to grasp the initiative.

#### Technological Surprise

The United States has already been subjected to technological surprise by the Russians in space--Sputnik I for example. In the past we have been able to absorb such surprises because of our overwhelming strategic military and economic strength. In today's world, a major technical surprise could bring about dire results. Technical surprise could result in psychological damage causing despair or overreaction by our leaders and the population. National power and influence are determined by what people believe (i.e., the perceptions of the international community). If the Soviets

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<sup>8</sup>Stefan T. Possony and J. E. Pournelle, The Strategy of Technology, p. 56.

surprise the world with a spectacular technological innovation in space, it is likely they will be able to increase their power and influence in a disproportionate manner.

A major surprise in military space technology could thrust the Soviets into a position of clear dominance. Further, a clear military superiority in space could present the Soviets with the option of denying the United States the opportunity of developing a counter-capability. We obviously cannot permit the Soviets to develop an impenetrable "fortress in space."

It is important to recognize that in any future crisis, or war, we will probably have to compete with the resources at hand. The outcome of the conflict may have been decided years before by the men who made the decisions on our "future" policy and strategy, especially with regard to what technology, equipment or systems we acquire. Time is a critical dimension in a technological contest. We cannot afford to be surprised by some technological development which we cannot counter in time to prevent a decisive advantage to the enemy. It would seem, therefore, that we are driven toward a space policy of maintaining technological superiority or, at worst, parity.

#### Space Technology Itself

The space shuttle is about to open wide the door to space. The space technology now available and that which is forecasted for the 1980-2000 time frame will enable the performance of almost any

function imaginable.<sup>9</sup> Such functions as personal wrist radios which provide communications and location service and energy generation space stations which transmit vast amounts of power to the earth are in the technological forecast.<sup>10</sup> There are literally hundreds of ways that have been identified to use existing or projected space technology for both civil and military purposes.<sup>11</sup> However, in this paper, only the following major areas of space technology will be discussed to point out some policy problems.

Spacelift. (Including all means of lifting objects into space and the inherent ground support systems.) In the past, civil and military users had rather dedicated launch vehicles and support systems and there seemed to be few conflicts. The space shuttle program will provide a new method of spacelift which offers many advantages but it will be the only major launch vehicle. This will place all users in competition which is bound to create policy problems. Further, since it is to be the only launch system, the entire space effort for all users is highly susceptible to catastrophic disruption in the event of accident or hostile action against any part of the system.

Sensors. (Including all means of sensing natural or manmade phenomena from terrestrial and space sources, both actively and

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<sup>9</sup>"Advanced Space System Concepts and Their Orbital Support Needs (1980-2000)," Aerospace Corporation Report No. ATR-76 (7365)-1, Vol. 1 Revised, p. 5.

<sup>10</sup>Ibid., pp. 19-26.

<sup>11</sup>"Advanced Space System Concepts and Their Orbital Support Needs (1980-2000)," Volumes 1-5; also, "A Forecast of Space Technology 1980-2000," National Aeronautics and Space Administration, NASA SP-387, (January 1976).

passively.) One of the greatest impacts that space technology is expected to have on mankind in the near future concerns the information acquired from improved and more numerous remote sensing devices. Technology promises incredible increases in sensor capability such as improvements in sensitivity by factors of 30 to 3000. NASA estimates that by the year 2000, earth application satellite sensors will be capable of returning the equivalent of one million 300-page books per day.<sup>12</sup> Although electromagnetic sensors have the widest application, particle, chemical, biological and physical properties sensors will also be returning vast quantities of data to the earth. It is fairly obvious that such greatly improved sensing (especially of the earth and its atmosphere) will raise international political problems associated with data dissemination and sovereignty issues.

Of course we can expect ever expanding uses of sensors by the military. For example, according to a recent Aviation Week and Space Technology article, the first DOD satellite to be placed in orbit by the shuttle will include a sensor to detect the movements of strategic aircraft from space. This sensor is the top priority experiment and it will use newly emerging technology.<sup>13</sup> This technology also has obvious civil applications and we can anticipate civil/military problems over the use of such technology.

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<sup>12</sup> Ibid., pp. 3-117

<sup>13</sup> Jeffrey M. Lenorovitz, "USAF Defining Shuttle Sensor Payload," Aviation Week and Space Technology, 14 March 1977, p. 44.

Manned Space Station. (Including all means of supporting manned operations in space.) The creation of a permanent space facility may be the most useful way to continue the advancement of manned-flight technology.<sup>14</sup> Such a space station is not thought of as an end in itself but as a means for technological support of a number of other objectives which can benefit from our growing knowledge of how humans can work in space and provide a foundation for the future. The basic reasons for man in space, military or civilian, include: man can see things sensors cannot see; man can receive, analyze, and react to a wide variety of stimuli that computers and data systems cannot (i.e., he can provide command and control); man can operate, repair, assemble and test hardware and software in space; man can do research, even on himself; and man can project his nation's power into space. There are many possibilities for difficult civil and military policy issues arising out of the technology which permits man to build space stations.

Weapons. (Including all types of weapons that may be used in space; i.e., nuclear, energy beams, conventional and electronic warfare.) At the present time we know of no weapons of any kind in space. However, there are firm indications that the Soviets have built and tested a ground-based satellite interceptor weapon system for use in space.<sup>15</sup>

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<sup>14</sup>"Outlook for Space, A Synopsis," National Aeronautics and Space Administration, (January 1976), p.55.

<sup>15</sup>Lawrence Freedman, "The Soviet Union and Anti-Space Defense," Survival, (January/February 1977), pp. 16-23.

Weapons in space, or weapons directed at space objects, would be rationalized by such concepts as deterrence, protection of civil and military space assets and projection of national power and influence into space. Other than for high energy lasers, there probably has not been very much work on space weapons because of the lack of a clear-cut need. Nuclear weapons and other weapons of mass destruction are precluded from space by the Outer Space Treaty.

Recent technology improvements in areas such as space lift, sensors, computers, and communications have so tied terrestrial civil and military operations to space-based systems that it now becomes necessary to think about deterring interference by any other nation with our space systems. We also need to think about protecting our civil and military space systems and possibly even to think about projecting our national power into space. Since weapons technology is a highly advanced field of technology, it is easy to imagine logical expansions of present weapon concepts for space application without any scientific breakthroughs. For example, we can imagine:

mass transfer weapons such as guns and fragmenting explosives launched from the ground or from space platforms or placed in some holding orbit such as a mine;

energy beam weapons such as lasers used from either ground or space platforms;

nuclear weapons launched from the ground or parked in space for subsequent use; and

electronic weapons such as jammers used from either ground or space platforms.

The technology that would allow the use of weapons in space in many

cases is already well in hand. Therefore the need for crucial policy decisions relative to our national security interests are becoming particularly critical.

Command, Control and Communications. (Includes all means of controlling space assets; i.e., spacetrack systems, satellite control, command center functions and the computers, display systems and other data handling systems that are necessary to control and use space-based systems; and communications to, from and with space for all purposes.) Technology has been moving faster in this area than in most any other. Space-based communications will have to increase to accommodate higher data transfer requirements generated by the space sensors and by the rapidly expanding terrestrial communications requirements. Large-scale integration of electronic circuits will affect communication and data systems as transmitters, receivers and antennae are fully integrated and as communications systems themselves are integrated with data processing, storage and display systems.<sup>16</sup> Earth satellite communications will probably continue to grow at a phenomenal rate, generating national and international policy problems concerning frequency allocation, national control of communications vital to another nation, direct broadcasting of radio and television into other countries and possible civil vs. military use of space assets during crisis situations.

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<sup>16</sup>"A Forecast of Space Technology 1980-2000," NASA SP-387, p. 3-118.

### Technological Leadership

There are several problem areas associated with our present state of technological leadership. The authors feel that there is a lack of understanding and appreciation of what technology can do and of what is in the forecast. This is a particularly difficult problem to overcome because most political leaders do not have a technical background and/or interest, and because technology is moving so fast that it is hard for anyone to keep up with new developments. The authors also believe that we have very few men who have the vision, wisdom, courage, and political opportunity to make bold decisions on behalf of technology. President Kennedy made a bold technological decision (although not only on behalf of technology) in 1961 when he decided that "This nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to earth. . . ." <sup>17</sup> In this decision, President Kennedy sought to use space technology as an instrument of national strategy to demonstrate our technical superiority and to boost our national prestige. It is interesting that American leaders view the use of technology as a means of controlling nature, whereas Soviet leaders view the use of technology as a means to control man. <sup>18</sup>

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<sup>17</sup>US Congress, Senate. Committee on Aeronautical and Space Sciences, Documents on International Aspects of the Exploration and Use of Outer Space, 1954-1962, 88th Cong., 1st Sess., 1963, S. Doc. 18, pp. 202-204.

<sup>18</sup>John M. Logsdon, The Decision to Go to the Moon, p. 164.

We believe that, again, wise and bold decisions from the President are needed regarding our place and purpose in space. He needs to set policies and goals and to solidify national morale and understanding regarding space. Whether or not to seek technical superiority or parity with the Soviets (militarily) and with other nations (economically) must be a key element of his guidance.

At other levels of government, we feel that a "management breakthrough" is needed to implement policy, develop strategy, allocate resources and exploit the benefits of the technology that is and is to be.

Finally, our research indicates that one of the more pressing leadership problems is the development of an organizational mechanism whereby the necessary guidance, coordination and cooperation between the civilian and military space technology programs can be effected. We cannot afford dual development programs for something as costly as space technology. The present notions that the civilian side doesn't want to be contaminated by military classification or restricted on dissemination of data gained from space may be passe. Perhaps, if the dream "space is for peaceful purposes" only is no longer valid, then a policy decision which allows a more integrated civil/military space technology program is appropriate. The joint development and use of the space shuttle is already a step in this direction.

#### Technology and Policy

In the past few decades new technology has been welcomed without too much concern for the future. New policies could be developed in

the traditional, slow and cumbersome manner to assimilate the new technology into the existing order of things. Our research indicates that policy responses to technology have usually been formed on a case-by-case basis and frequently as a side effect of budgetary decisions. The brisk pace of technological advances in space appears to have rendered the ad hoc, de facto, method of policy formation not only obsolete, but dangerous. The rapidly expanding importance of space to both the civilian and military communities requires cohesive planning for the future so that the national interests of the United States are preserved and protected.

As for the present state of space technology and policy, it could be argued that the Congressional declaration of policy and purpose set forth in the National Aeronautics and Space Act of 1958 is still valid and sufficient:

The preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere.<sup>19</sup>

It can also be argued that this policy is outdated. Dr. Malcolm R. Currie, former Director of Defense Research and Engineering, recently proposed before the Congress a different version of this policy. He said, "I believe this nation must maintain a posture of unequivocal technological superiority." He went on to say,

"A willingness to settle for technological 'equivalence' is not sufficient; it would be a step to eventual disaster. My overriding concern is that we

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<sup>19</sup>"National Aeronautics and Space Act of 1958," Public Law 85-568.

ensure that we have the climate, the direction, and the national commitment always to seize and maintain the technological initiative. This is fundamental to our security, fundamental to our economic well-being, fundamental to our role in the world. It is our strength. We must recognize it as a national imperative for our future survival and prosperity."<sup>20</sup>

It is important to realize that even though the Space Act does set forth space policy regarding some aspects of technology, it does not necessarily follow that the policy is being fulfilled. In many respects the policy that is being practiced is better reflected in the Congressionally approved budgets than in the policy statements which may be several years old. We cannot be a "leader in aeronautical and space science and technology" as the Space Act mandates, if the necessary programs are not submitted by the President and if the funds are not appropriated by the Congress.

Although the civil side of our national space policy seems to be fairly well grounded in the Space Act, the military side seems to have no explicit base at all. There are several policies concerning military "don'ts" in the various space treaties and agreements, but we could not find any "do's." However, there are probably many other documents, such as National Security Decision Memorandums and Presidential Decision Memorandums, which establish policy for certain elements of the government, including the military, and which are not available to the public. (One such example was mentioned in Chapter II, page 8. Although our national strategy for

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<sup>20</sup>"Technological Superiority Required," Aviation Week and Space Technology, 7 February 1977, p. 7.

implementing various policies may well be classified, we feel that the fundamental national policies should be known and supported by the American people.

#### Technology Summary

Our study of space technology and space policy has led us to the conclusion that the rapidly advancing nature of space technology has outstripped the formulation of policy for its use. This apparent disharmony is one of the main reasons we feel it is time to readdress our national space policies and also to develop a means whereby policy is not allowed to get so far out of phase with technology.

We feel that our national leadership must address this space policy issue with wisdom, vision and courage. They must present to the American people and gain their support of whatever policies they deem are prudent and necessary for our national well-being.

We believe that it is essential that the United States establish a broad and enduring policy framework that will insure that the benefits of new technologies are effectively and expeditiously brought to bear for the betterment of mankind and for the enhancement of the security of the United States.

We note that in many respects technology is a pervasive and fundamental element in many current space issues. In the next chapter we will identify four of these current issues and address them from a broad perspective.

## CHAPTER IV

### MAJOR ISSUES IN THE SPACE ARENA

After considering the historical context of our involvement in the space arena, along with past, present, and future technology which makes such involvement possible, it is essential to also consider some of the significant issues which now confront us as we prepare to enter our third decade in space. Some of the more fundamental issues which confront our national space efforts are:

- \* The increasing overlap and convergence between what has traditionally been the civil and military programs.
- \* The question of whether our historic policy of "space for peaceful purposes" remains valid in view of recent developments.
- \* How dependent have we become upon space?
- \* Is space an arena where we have vital interests as a sovereign nation?

In the subsequent paragraphs each of these issues will be examined.

#### Convergence of Space Programs

As was previously outlined in the historical chapter, the civil and military space programs of the United States were designed to be independent and were to pursue different objectives. For the most part, this clear distinction between the two programs has been maintained. It is clear, however, that the technology which has supported both programs tends to drive them together. The same aerospace

industry which has supported the civil programs has also supported the military space effort.

There are many areas in which the civil and military space efforts are quite similar. Examples are:

\* Communications efforts sponsored by civil programs such as COMSAT, as well as the numerous military communications programs such as the Air Force Satellite Communications System, the Navy Fleet Satellite Communications System, and the Defense Satellite Communications System.

\* Remote-sensing is an area in which there is also considerable civil as well as military interest. Civil efforts such as LANDSAT and SEASAT are well known. Similar activities, although driven by different operational requirements, are believed to be encompassed in the military programs.

\* Meteorological satellites are a part of the civil, as well as the military space effort.

\* Manned Space Stations are programs that have been pursued by both NASA and the Air Force. While the missions for such stations may differ significantly depending upon whether they are utilized by the civil or the military sector, it is doubtful that the technology differs significantly.

This listing is far from being all-inclusive; however, it does serve to show that there are significant areas of our national space effort where there may be needless overlapping of effort.

The standard spacecraft concept may be a step toward eliminating some of the duplication. Boeing Aerospace Co. is developing such a concept for NASA. Both NASA and the Air Force have current programs aimed at standard spacecraft with an objective of producing a standard satellite which would reduce the demands for funds for satellite design and leave more resources for payload, equipment, and mission operations. Major elements of the Boeing program are reported to be: block buys of a core vehicle; modification of that core vehicle by using installation kits; and the use of low-cost techniques in design and fabrication.<sup>1</sup> The results of such a concept should be a vehicle that is more adaptable to a broad spectrum of potential users and should tend to alleviate the necessity to design and build a complete satellite for every requirement. It would appear that the standard spacecraft approach would become a particularly attractive option when the Space Shuttle becomes operational to provide for volume launch of spacecraft.

It is apparent that while the individual program requirements may differ, the basic technology which will satisfy military requirements could also satisfy a significant part of the civil program requirements. It is also very probable that much of the civil technology could be used to satisfy military requirements. If these assumptions are correct, one must wonder if it is in the national interest to continue to pursue two separate and costly technology

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<sup>1</sup>"Standard Satellites under Development," Aviation Week and Space Technology, 23 August 1976, pp. 50-52.

programs, with each aimed toward somewhat similar ends in many cases. Space, being one of the more costly technological arenas, raises the question of whether we can continue indefinitely to afford such an expensive philosophical luxury.

Inherent within a merger of civil and military space efforts is the question of how will one safeguard information which is vital to our national security. This does not imply that the civil space sector is a bad security risk; rather it focuses on the different motivations which drive the programs. The civil program has been structured toward the use of space for peaceful purposes and international cooperation in space research and exploration. Fundamental to such an orientation is the free distribution of information gained through space activities. Conversely, the military space sector advocates that certain information obtained through the space effort could severely jeopardize national security if that information was made available for international distribution. Recognizing the very real concerns for each sector, it would still appear that an arrangement can be reached which would satisfy the legitimate interests of both the civil and military programs regarding the distribution of data acquired through the space effort.

An additional issue related to the convergence of the civil and military space programs is how do you, or should you, be able to make use of civil assets during periods of national emergency. We believe that the answer to the second question is an equivocal "yes." As a nation we must be able to make full and complete use of all critical civil assets during times of crisis such as a severe

national disaster or a war. Past precedents in the sea transportation, air transportation, critical production facilities, and communication systems support this as being our national position on the use of such assets.

While one may agree that being able to use civil space assets in time of national emergency is a capability that is essential to us as a nation, we have been unable to find any effort being made to form a structure or a system to bring this desired capability to reality. Precedents show that amalgamating civil resources into the national or military system has, in most cases, been a time-consuming process. It is certainly not something that should be attempted during an emergency if no prior planning or coordination and testing has been done.

One may reasonably anticipate that very difficult problems would surface should there be a requirement to bring civil space communication assets into government service. As an example, one might find that there are frequency mismatches between civil and military systems; that military ground terminals are incompatible with civil satellites; or that the various computers required to integrate and control space assets use different languages. These examples are only conjecture, the point being that the probability for finding such problems does seem likely and that in the midst of a severe national emergency is not the time to discover and solve such problems. The time element required to effect these solutions would probably be prohibitive in a crisis environment.

The preceding paragraphs have only scratched the surface of the much broader issue of the civil-military convergence and relationships in the space arena. However, it does bring to light the fact that technology continues to make more pervasive the intermeshing of the two programs. While it does appear that programs are intermeshed in some areas, unfortunately there does not appear to be a system or structure to take advantage of the intermeshing so as to integrate, or tie, the two programs together to solve national requirements in time of crisis. When one considers the budgetary constraints, as well as the magnitude of the civil and military space efforts, it would appear that some system which is able to preclude unnecessary duplication and to provide for the required degree of integration would be in the national interest. Fundamental, however, to such a solution must be the ability to satisfy the divergent motivations of the civil and military space programs.

#### Is Space Still for Peaceful Purposes?

Although the premise that space is for peaceful purposes has been fundamental to our national space policy since it was articulated by President Eisenhower, recent events give cause to wonder whether such a policy will continue to be adequate. Indeed, one may have reason to question whether that policy may have already been overcome by events. A recent news article states :

Russia and the United States are moving toward fighting future wars in space. The two superpowers now have the potential to wage space battles between unmanned satellites, but some experts

envision manned spaceships in the 1980's  
fighting hundreds of miles above earth. . . .<sup>2</sup>

Whether this represents an overstatement of the facts may be debated.

However, Dr. Malcolm Currie has said:

"The Soviets have developed and tested a potential war-fighting antisatellite capability. They have thereby seized the initiative in an area which we hoped would be left untapped. They have opened the specter of space as a new dimension for warfare. . . ."<sup>3</sup>

Space as an arena for future warfare is certainly an issue of significant proportions.

Before examining the issue of space as an arena for combat, it is necessary to first look at our motivations for participation in space. We have previously established the historical reasons for our entry into space; however, it is necessary to look at the current and future reasons for remaining involved in space. It is generally accepted that there are four basic reasons for using space systems for various military support functions:

\* Uniqueness--Some functions essentially can be done only from space. For example, a near real-time warning of a ballistic missile attack.

\* Economics--Some functions such as long-haul communication are done more economically from space.

\* Functional Effectiveness--Some functions, for example

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<sup>2</sup>Edwin G. Pipp, "U.S., Soviets Gear up for Outerspace Wars," Detroit News, 23 March 1977, p. 7E.

<sup>3</sup>HQ USAF (SAF/OII), Air Force Policy Letter for Commanders, Washington, D.C., 15 November 1976.

meteorology, are done more effectively from space.

\* Force Effectiveness Enhancement--Some space functions can greatly enhance the effectiveness of terrestrial forces, thus serving as a force multiplier.<sup>4</sup>

Certainly the above-listed reasons for the military use of space are equally as applicable to the civil or to the commercial utilization of space, along with other factors. The recent study, Outlook for Space, was commissioned by NASA to identify and examine the various possibilities for the civil space program over the next twenty-five years. It states:

The outline of the national civil strategy in space is clear. Our programs must focus on the main challenges of:

- \* Accelerating the development of economic and efficient space services for society
  - resources management, environmental understanding, and commercial returns from the unique contributions of space.
- \* Continue the outreaches of exploration
  - probing the history of the universe, understanding the physics of the stars, and searching for other life and cultures.
- \* Maintaining technological excellence
  - readiness to respond to national needs and opportunities on Earth as well as in space; capabilities to communicate and operate anywhere in space; means to manage vast amounts of information; and competence to explore new sources of energy.
- \* Expanding the human society beyond its planet Earth
  - reaching, probing, exploring to satisfy humanity's needs to expand its horizons, to search for new worlds and new truths, to find its cosmic heritage and thereby assure its survival on Earth.<sup>5</sup>

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<sup>4</sup>COL Morgan W. Sanborn, USAF, "National Military Space Doctrine," Air University Review, (January-February 1977), pp. 75-79.

<sup>5</sup>"Outlook for Space, A Synopsis," National Aeronautics and Space Administration, (January 1976), p. v.

Taken together, the four basic reasons for a military presence in space, along with the objectives of the civil strategy in space, it appears that space and the things which we choose to do in or from space have become fundamental to those things which we have determined to be "in our national interest" to continue to be able to do. As was stated by Professor Lincoln Bloomfield, "The politics of outer space, at least in this stage in history, are of course the politics of inner space. . . . Power and prestige still remain as the twin engines of politics in a world of states."<sup>6</sup> Professor Bloomfield's thoughts are as valid today as they were when he made the observation some fifteen years ago, for there is little doubt that space programs contribute significantly to the power and prestige of the major participants. While it seems to be generally accepted that "space is simply a medium" through which we accomplish things that enhance our national power and prestige, or "it is a place where these things are accomplished,"<sup>7</sup> one must wonder how long this will remain valid. Recent events tend to argue that it is quite possible that the "stakes of the game in the space arena" may have been raised to the extent that space may have become more vital to our national interest than would be the case if space remained a "medium" to accomplish terrestrially related tasks. In fact, one must question whether

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<sup>6</sup>From a speech by Prof. Lincoln P. Bloomfield, before the New England Regional Conference on Space, Cambridge, Mass., 13 November 1962.

<sup>7</sup>The statement that they "view space simply as a medium for accomplishment of terrestrially related activities" was made by a number of senior Government Executives, civil as well as military, during the course of the research for this paper.

space has already become an area where we have a "national mission" which is vital to our national interests, and we have yet to recognize the transition.

Professor John Erickson argues that the Soviet Union began to transition to a true military space program in 1969 or 1970. Prior to that time the Soviets, like the United States, had essentially structured their space program upon the general philosophy of "the use of space for peaceful purposes."<sup>8</sup> However, Professor Erickson believes that the Soviet Union reached a conscious decision that space is a logical arena in which to pursue their quest for strategic superiority. The decision to acquire a war-fighting capability in space follows doctrinally their general philosophy of strategic warfare.

Professor Erickson argues that the fundamental task for the Soviet military, either prior to or at the start of hostilities, is to "blind and deafen the enemy." Such action would most certainly be aimed at space-based assets which are a fundamental part of our warning and surveillance systems. He argues that the Soviets have a large space program and it is growing rapidly. Some reasons for this growth are:

--their very large strategic missile program which must be supported by space-based reconnaissance assets;

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<sup>8</sup>The thoughts attributed to Prof. John Erickson, University of Edinburgh, were obtained from an interview conducted at the US Army War College on 22 March 1977.

- their blue water navy where they use space systems such as their ocean surveillance satellites<sup>9</sup> as a space based element of their fire control systems to allow real-time targeting of our maritime assets; and
- that space assets are fundamental to the command and control of Soviet forces in theater warfare.

In the Soviet quest for strategic superiority, Professor Erickson is convinced that they have already made the decision that space is a lucrative area for competition. The Soviet Space Program covers all aspects of space and space operations; scientific, technical, commercial, and military. He is convinced that the things which they are currently doing, and actively planning to do, project well into the 21st century. By the early to mid 1980s he feels that the Soviet strategic emphasis will logically transfer to space warfare types of systems such as the antisatellite and orbital weapons systems. In summary, Professor Erickson believes that the dimensions and emphasis of strategic warfare has already begun to shift to space and that in the foreseeable future, space will become a fourth arena of military conflict.

Conclusions somewhat similar to those expressed by Professor Erickson are to be found in Lawrence Freedman's article, "The Soviet Union and 'Anti-Space Defense.'"<sup>10</sup> In that paper he examines

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<sup>9</sup>Soviet ocean surveillance satellites have been described recently in a number of publications. See: "Soviet Space Activities in 1976," Air Force Magazine, (March 1977), pp. 73-74, and "Backfire: Long Shadow on the Sea-Lanes," United States Naval Institute Proceedings, (March 1977).

<sup>10</sup>Lawrence Freedman, "The Soviet Union and Anti-Space Defense," Survival, (January/February 1977).

the evidence that is available on the background and character of the Soviet interceptor satellite program and attempts to explain the Soviet interests in this system. He concludes that from the Soviet viewpoint, there are a number of plausible missions for such a system. They range from the destruction of satellites broadcasting unwelcome television messages into the Soviet homeland (possibly of significant concern to them in this era of confrontation on human rights), to the other extreme of a general attack upon the American strategic nervous system satellites for command, control and communications, and surveillance. Within this conflict spectrum, he feels the most likely mission would be found in attacking American satellites which operate at low altitudes. He says that surveillance of all military activity at a time of confrontation is of great strategic significance; therefore, such an effort to negate these systems is not inconceivable in times of severe crisis or war. He also points out that unlike the Soviet Union, the United States does not keep satellites on standby for emergencies.

Others have pointed out that the Soviet effort to develop an anti-satellite weapons system might be aimed toward the day when the US military has men aboard spacecraft or when the Space Shuttle is used for military purposes.

Some argue that space is in fact an ideal place for warfare to begin. Space systems are not within the field of public view, yet they are systems of significant value to the national effort. Such reasoning would be reinforced by the fact that satellites are inanimate objects; that to kill a spacecraft is different from, and

less provocative than destroying an aircraft or sinking a ship. The statement that "robots have no mothers" may have significance to both sides in the conflict. However, this distinction is of no particular consequence until one side has the means to raise an objection by force or through negation of the vehicle. It would appear that the potential for such an objection now exists within the arsenal of the Soviet Union.

Although the Soviet Union appears to have demonstrated at least a limited war-fighting capability in space, newspapers and technical journals indicate that the US decision as to what approach to take to meet the threat is yet to be made. Aviation Week has reported that the Air Force antisatellite system concept calls for a ground-launched, direct-ascent antisatellite vehicle, armed with a conventional, nonnuclear warhead. However, even the concept is yet to be approved and it could be months before proposals might be released to industry for bidding.<sup>11</sup> More recently the Washington Post has reported:

The Pentagon has advised Congress that it is working on a secret antisatellite program in an effort to develop an interceptor within the

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<sup>11</sup>"Antisatellite Effort Decision Awaited," Aviation Week and Space Technology, 24 January 1977, p. 19.

next five years that is capable of knocking a Soviet satellite out of orbit.<sup>12</sup>

One must wonder if the Soviets are willing to wait five years in their quest for strategic superiority in space.

Summarizing, it would appear that there are very cogent reasons why we are currently and should remain in the space arena. We believe that the reasons we have discussed, particularly when they are viewed in the aggregate, argue that space is an arena where we may have compelling interests. Therefore, whether or not our historical space policy of "space for peaceful purposes" remains a viable policy alternative is a significant issue that deserves attention at the national policymaking level.

#### What Is the Dependency upon Space?

Some things a country wants it can take, and some things it has it can keep, by sheer strength, skill, and ingenuity . . . . Forcibly a country can repel and expel, penetrate and occupy, seize, exterminate, disarm, disable, confine, deny access, and directly frustrate intrusion or attack. It can, that is, if it has enough strength. "Enough" depends on how much an opponent has.<sup>13</sup>

The previous issue has pointed out that the realities of the space arena may be changing. It also indicates that there are several areas in which we depend upon space to accomplish tasks which we are unable to accomplish in any other manner. These

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<sup>12</sup>"Satellite Interceptor Sought in 5 Years," Washington Post, 30 March 1977, p. 8.

<sup>13</sup>John M. Collins, Grand Strategy: Practice and Principles, p. 177.

conclusions raise the following questions:

How dependent are we upon space assets?

What are the historical trends in space dependency?

Is the historical trend the result of reasoned decisions based upon objective judgments? -- and, most importantly,

How do our trends compare with the trends of the Soviet Union?

Together these questions raise a very significant issue which would appear to be worthy of consideration in our policy-making process.

The proliferation of space systems and tasks which are primarily accomplished in space is well documented and do not require repeating. From numerous books and articles there are comprehensive studies which indicate the upward trends of dependence upon space for commercial activities such as communication systems, broadcasting and the mass media, data acquisition through space systems, meteorology, exploration for mineral resources, and many other areas. Likewise, the trade journals and military publications point out the spiraling dependence upon space as a more efficient and economical way to accomplish a myriad of military tasks. The information which appears to be lacking is just how pervasive is the movement into the space arena.

One frequently sees statements such as Lieutenant General Alton D. Slay, HQ USAF, DCS R&D, made in presentations to the Congress on the FY 1978 Budget Estimates when he said:

United States military forces are becoming increasingly dependent upon space systems for the control of the deployment and employment of general purpose and strategic forces. Three basic reasons for the increased importance of space systems are their uniqueness, economy, and increased functional or force effectiveness . . . . 14

The question which General Slay's statement does not answer, nor do any of the many other statements which we have been able to find on this subject, is "How dependent are we now, and how dependent will we be upon space at some specified date in the future?" It would appear that such information is crucial to enlightened policymaking.

One must also wonder if individual dependencies upon space-related assets may not have a cumulative or even a synergistic effect. Such dependency phenomenon may be particularly applicable to the military use of space in the highly technical and automated environment of modern-day crisis and battle management.

With little imagination, one can conjecture a deteriorating world situation where it appears that a NATO-Warsaw Pact confrontation is likely. As we start the process of deploying and posturing forces to reinforce in Europe, one may speculate that the Soviet Union utilizes its antisatellite capability to negate US surveillance warning satellites, our meteorological satellites, and our space-based communication assets. Not a shot has been fired at US or NATO troops and not a life has been lost; however, one can easily imagine the confusion which would ensue.

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<sup>14</sup>HQ USAF (SAF/OII), Air Force Policy Letter for Commanders, 1 March 1977.

The detailed information on what the enemy was doing would no longer be available. One may question whether satellite data would be decisive in a NATO-Warsaw PACT environment; however, we may safely assume that the sudden loss of the assistance of the various space systems during the peak of a crisis would cause substantial concern among decision-makers.

Confusion during the crisis would also be compounded by the loss of the ability to accomplish the massive data transfers that occur, even routinely during peacetime and exercises, through the negation of the Defense Satellite Communications System and other such space assets. Computer to computer, or command center to command center, communications and data transfer would be severely degraded. Wartime crisis management would have to revert to under-seas cable or to the high frequency radios, neither of which are desirable alternatives for that scenario.

To aggravate the crisis management problem, hundreds of dual-based aircraft would be deploying, along with hundreds of airlift aircraft moving personnel to Europe, all without adequate meteorological data. The gravity of the situation would be compounded by a severely degraded command and control environment and a severe limitation on the knowledge of what actions the enemy might be taking.

Although the previous scenario is hypothetical, it should serve to shed some light on the question of whether space assets may, in fact, be synergistic.

Looking now at the broader question of dependency upon space assets, here again one can perceive some alarming trends. It would appear that the Soviet dependency upon space is also growing at a significant rate. However, many would argue that the Soviet dependency, particularly in the European environment, is growing at a slower rate than is US dependence due to the nature of their problem. The Soviets are separated from the confrontation zone by hundreds of miles of land, whereas the US is separated by thousands of miles of water. This geographic fact allows them to provide different solutions to the problem. Land-based microwave and railroads are an alternative to our Defense Satellite Communication System and to our aircraft. The problems are far from being similar.

Different philosophies concerning the use of material resources are also significant to the space dependency asymmetry. In the US there is a strong tendency to delete equipment from the inventory as soon as the replacement system is in operation. In fact, this has

been the justification for many space-based systems. The argument is that space systems will replace the more costly terrestrial systems and, therefore, offer budgetary economies. The Soviets, to the contrary, tend to continue to retain the older equipment in the operational inventory even when the newer systems are operational. One may argue with considerable logic that the total Soviet dependence upon space systems may be substantially less, although they might utilize an equivalent amount of space assets. If, in fact, they do retain a more adequate back-up for their space-based assets, this would tend to argue that their strategic dependence or vulnerability in space is significantly less than what the US dependence would appear to be.

When one considers all of the various facets of the space equation, it is obvious that both we and the Soviets have a very significant dependence upon space. However, to make quantitative and qualitative assessments of that dependence is beyond the scope of this paper. The disturbing fact is that there has apparently been no comprehensive effort to quantify the degree of the United States dependence upon space, the degree of the Soviet dependence upon space, and to predict where the current trends in dependency are taking us in terms of the strategic balance. It appears that the dependency and trends are issues of national significance and deserve that level of interest.

#### How Vital Are Our Interests in Space?

Before looking at the issue of how vital are our interests in space, it is well to recall some words from John Collins' book,

Grand Strategy. He says:

At the highest levels, national interests comprise the underpinnings of sound strategy. Interests are highly generalized abstractions that reflect each state's basic wants and needs. They sometimes are difficult to identify, since they rarely are clean-cut. Instead, they interlock and overlap. Nearly every interest, for example, bears on national security to one degree or another. . . . The only vital national security interest is survival--survival of the State, with an "acceptable" degree of independence, territorial integrity, traditional life styles, fundamental institutions, values, and honor intact. Nothing else matters if the country is exterminated as a sovereign entity.<sup>16</sup>

It is in this framework that we should examine what our interests are in space.

One may question, "What method does one use to determine what our driving interests are in space?" This is a crucial question for we believe that we can demonstrate that the answer to the question of what our interests are may be dependent upon the approach one takes in coming to grips with the various space issues. If the issues are approached from an economic view, it will drive one to reach one set of conclusions as to our interests in space. Conversely, if the issues are approached from a political perspective, it will drive one to reach different conclusions on the nature of our interests in the space arena.

If, as some argue, space is simply a "medium" or a "place" where we are able to accomplish terrestrially related tasks in a more efficient and economical manner, the principal thrust of that

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<sup>16</sup>Collins, p. 1.

argument would seem to be economics. Using economics as the basis for our space interests, one could argue that the reason for being in space is determined by dollar savings. A given amount of purchasing power will allow us to do more of the things we desire to do if they are done via the medium of space. In the economic context, a billion dollars will purchase more bits per second of communication capability if we utilize space systems than if we use the billion dollars to lay more trans-Atlantic cable. Similarly, certain tasks are only economically feasible when accomplished from space. An example would be the type of products which are generated by a system such as LANDSAT.

To carry the economic argument a step further, it is appropriate to compare the utilization of space to the storage of gold. In a utopian environment one would probably be quite happy to simply store his gold by laying it out in an open field. In utopia it would not be necessary to fear thieves; therefore, the storage cost would be free and the open field would be the most economical solution. However, when we take the same question of gold storage to our present-day world, different conclusions would probably be reached. Should you choose to do so, one could store gold in an open field here in the United States. Unfortunately, in order to have a reasonable degree of assurance that the gold would be retained, one would have to hire a number of guards and take other security precautions or choose to store the gold in a vault. In any case, the cost of safeguarding the gold becomes a cost of ownership, like the cost of insurance protection from loss is a part of the cost of doing business.

To transfer the gold analogy into space, our ability to use space for its economic advantages has essentially been that of gold storage in utopia. Our right to use space has been unchallenged and there was no need to protect or to safeguard the space assets. This assumption may no longer be true. Like the oceans of centuries before, there was no need to arm merchant ships and to build men-of-war until there were others with warships. When conditions changed and protective measures became necessary, the cost of protecting the merchant shipping was added to the cost of international commerce. The decision was probably an unconscious one; nevertheless, it was made.

In space as we transition from utopia to a condition where the politics of earth are the politics of space and some nations acquire a warfighting capability in space, we must make some hard economic choices. The cost of protecting the satellite fleet must be added to the cost of doing business via space and the two-fold increase in the 1978 Budget for space defense indicates that this is in fact taking place. Part of these funds are to be used to "install sensors to warn of imminent or actual attack on U.S. military satellites and to design new satellites for reduced vulnerability to damage."<sup>17</sup> One might equate the reduction of vulnerability to the aforementioned arming of merchant ships and the antisatellite program decision mentioned earlier would be likened to the decision to build men-of-war.

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<sup>17</sup>"Military Satellite Survivability Briefing," Aviation Week and Space Technology, 7 February 1977, p. 22.

If, then, we are utilizing space only because in the utopian environment it offered economic advantages, as we transition to the era where warfare in space becomes a reality, we may find that it is no longer economically feasible to operate from space. This conclusion might become particularly pertinent if the total cost of doing business in space is examined. If we consider all of the possibilities--such as the fact that it is necessary to build in certain degrees of "hardness" to protect our satellites, thus increasing their costs; that satellites may in fact be destroyed; and that it is necessary to field a fleet of antisatellite interceptors for protection through deterrence--it is entirely possible that we may find that operations using space are no longer economically attractive. Therefore, in light of the total national cost of space assets, one could reach the conclusion that there are more attractive alternatives.

Looking now at the political arguments for why we should be in space, we should take on a broader focus than the economic perspective. We should recall that the politics of space are the politics of the major players in space and also that national power and prestige are of very great importance in international politics, and also recalling that a fundamental reason for many of our space programs, particularly the NASA programs and some of the military programs, were to enhance our international power and prestige. We must remember, however, that these decisions were made when space was the utopian environment. Our right to take these actions was not subject to a meaningful challenge.

The earlier quoted words of John Collins,

The only vital national security interest is survival--survival of the State, with an 'acceptable' degree of independence, territorial integrity, traditional life styles, fundamental institutions, values, and honor intact, . . .<sup>18</sup> (emphasis added)

are of significance in a political analysis of space interests.

When one views space from the broader political perspective, the above words are fundamental in determining what our space program should be.

To return to the earlier analogy of space and the sea, historically every major world power has felt the need to either acquire their own naval power to protect their fleet, or to ally themselves with someone who can provide this protection. Free access to traverse the international seas has been a sign of national sovereignty. It has also been a measure of international prestige and stature for two thousand years or more.

One may reasonably assume that the same concepts of strength, prestige, sovereignty, and international stature which apply to the oceans of the world are also applicable in space. The same fundamental issues are involved in either case. We may have a merchant fleet or we may have satellites for commercial reasons; however, there is also a more fundamental reason in that they are part and parcel of those things which determine a nation's standing in the community of nations. When the right of a nation's merchant fleet to sail the seas is jeopardized, that nation acquires some means to

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<sup>18</sup> Collins, p. 1.

protect that sovereign right. Asserting this right to do the things that sovereign nations normally do has then become what one could call a mission for that nation. It follows that asserting the right to access to space is a mission for our nation. It is a mission in that one does it not just for the direct gains that are realized, but it is done because it is one of the tasks or actions which are expected of a superpower.

It would appear that the conclusions to be drawn from a political approach to our interests in space may be fundamentally different than those reached if the issues in space are approached from an economic perspective. In the utopian space environment that we have previously enjoyed, the terrestrial power politics have not been the predominate factor. However, recent trends suggest that the transition is already in progress and that economic justifications for space activities may become increasingly inadequate.

The theoretical arguments as to whether decisions concerning our space programs are made in an economic context or in a political context should not be transposed directly to specific programs. Certainly we may look at commercial programs which had primary economic drivers; an example might be COMSAT, which also had political pay-offs. Conversely, you may find predominate political programs such as Apollo, which had economic benefits. Also, one may find programs where the primary interest is scientific, such as the Viking and Mariner programs. Many programs have a mixture of all three; economic, scientific, and political motivations. The point being that in any case, whether we choose to look at our interests

in space as an economic question where at some point the costs may rise to where it is no longer a feasible option, or whether we take the political approach that we have a mission to protect our national sovereignty in space as well as elsewhere, it should be clear that defining our national interests in space is a substantive issue for national consideration. Sovereignty could prove to be less time-critical than some of the issues raised previously. Ultimately, however, we must make national decisions on our interests in space in order to come to grips with those other issues.

#### Summary of the Issues

Selected issues which we believe are fundamental to providing policy direction to the national space effort have been raised. We are convinced that the space arena has reached a condition where a number of very fundamental decisions must be made. The issues which we have raised are integral to those decisions.

The technological intermeshing of the civil and military space programs was pointed out. Budgetary pressures demand that more efficient utilization be made of resources invested in each sector of the space program. Philosophically as well as operationally the programs diverge in many ways. Still, there appears to be adequate opportunity to make significant savings through a more centralized management of the civil and military space effort.

The environment of the space arena appears to have changed so significantly that one must wonder if our policy of "space for peaceful purposes" remains a viable policy option. The Soviet

antisatellite program appears to raise the specter of space as an arena for combat in the foreseeable future. One must question what our policy approach should be if in fact our previous policy is inadequate.

If it is determined that a change in policy is in order, it would appear that such a decision should be based upon what our dependence upon space is now, what we can project that it will be at some future date, and how our dependency equates to the Soviet dependency. It would seem that only when one is armed with such quantitative and qualitative information can we make objective decisions.

Lastly, and fundamental to any review of space policy and direction, we must clearly establish what our national interests are in the space arena. Until we reach such agreement, it seems unlikely that we will be able to make enlightened decisions on how we proceed as the space arena transitions from the utopian environment to an environment where the politics of space are truly the politics of the major terrestrial players in space. As this transition occurs, the importance of what we do or do not do in space, as well as the likelihood for violent confrontation in space, will probably increase dramatically.

We recognize that this chapter has raised only questions and issues and has provided no solutions. That was as we intended; however, we believe that surfacing these issues of great national significance is the first step toward their resolution by the

national policy-making process. There are some actions which we believe should be taken in order to enhance the resolution of these issues. Recommendations on a course of action are in the next chapter.

## CHAPTER V

### CONCLUSIONS

The previous chapters have raised questions which we believe to be of great significance to the United States of America and to our national space effort. One should recognize that there are strong indications that we may be at, or have already moved beyond, a turning point in the politics of space. If, in fact, the decision has been made by the Soviet Union that they are transitioning away from the utopian environment of "space for peaceful purposes," significant policy decisions are demanded of the United States.

The issues which were previously raised--the convergence of military and civil space programs; does "space for peaceful purposes" remain a viable space policy; how dependent are we on space; and what are our national interests in space?--are questions that must be addressed, now or at some time in the future when the impacts may become more severe. The longer these and other similar issues are ignored, the more likely it becomes that decisions will have to be made in a crisis management environment where the alternatives are constrained by the time remaining in which a course of action can be implemented. Space programs and space technology have, by the nature of the undertaking, long lead times from conception to implementation. Decisions must be made now for major programs which are to be operational in the late 1980s and beyond.

We believe that the time has arrived for the President to sponsor a comprehensive review of our national policy and total effort in the

space arena. We would hope that a review of space policy issues would be included in the policy review which Henry Bradsher speaks of in a recent article in the Washington Star. He indicates that the Carter Administration has begun to reexamine the strategic assumptions underlying our military policy. He also indicates that according to Dr. Samuel Huntington who is making the study for the National Security Council that the administration is going to take a big, fresh look at the world of future foreign policy and military problems.<sup>1</sup> Hopefully, the issues which we have previously raised will be surfaced for NSC study and consideration.

We believe that a comprehensive national study of new policies and direction for our space effort should include a management review, along with resolution of the major political issues raised previously. Such a management review should include such items as:

- \* Do we need an agency of the Government with responsibility for our total national effort in space? If such an agency is appropriate, should it function as a cabinet level agency or should it function in a coordinative or advisory capacity?
- \* What sort of a management mechanism is required in order to assure that our policy making apparatus is able to keep pace with the proliferation of space technology? How do we establish direction and priorities which will assure that the technology sector is fully cognizant of where we are going in space so that they are able to pave the way for us?
- \* How can we best protect our national security from a space threat? Do current Service arrangements within DOD assure that space receives the priority which it deserves? Can

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<sup>1</sup>Henry S. Bradsher, "U.S. Takes New Look at Strategic Assumptions," Washington Star, 30 March 1977, p. 12.

we foresee a time when a "U.S. Space Force" will become essential?

- \* Are existing treaties and agreements adequate to meet current and projected conditions in the space arena? If not, can we negotiate new agreements on space which better protect our interests and the interests of mankind?
- \* How do we encourage other nations to join us in a spirit of international cooperation and to direct their efforts in space toward the "benefit of mankind"?

Although the political and management issues we have listed are far from being all-inclusive, solutions would do much to give order and direction to our fragmented space effort. We are convinced that meaningful and definitive solutions to these kinds of questions will become increasingly critical as we transition more into the era where the politics of space are the politics of the terrestrial super-powers.

There are many indications that the time is overdue for a comprehensive review of our national space effort to be conducted by the highest levels of government. If that review should prove that our concerns are unfounded, we believe the review process would still have been well worth the effort. If, however, the review should document that we have, in fact, passed a turning point in space, the sooner we make that determination and take the appropriate corrective actions, the better it will be for the United States of America and those who are our friends throughout the world.

## BIBLIOGRAPHY

- "Advanced Space System Concepts and Their Orbital Support Needs (1980-2000), "The Aerospace Corporation, Report No. ATR-76 (7365-1, Vol. 1 Revised, December 1976, p. 5.
- Air Force Policy Letter for Commanders. Washington: Hq USAF(SAF/OII), 15 November 1976 and 1 March 1977.
- "Antisatellite Effort Decision Awaited," Aviation Week and Space Technology, Vol. 106, 24 January 1977, p. 19.
- "Backfire: Long Shadow on the Sea-Lanes," United States Naval Institute Proceedings, Vol. 103, March 1977, pp. 26-35.
- Bloomfield, Lincon P. Outer Space: Prospects for Man and Society. New York: Frederick A. Praeger, 1968. (TL790 A43)
- Bradsher, Henry S. "US Takes New Look at Strategic Assumptions." Washington Star, 30 March 1977, p. 12.
- Collins, John M. Grand Strategy: Practice and Principles. Annapolis, MD.: Naval Institute Press, 1973. (UA23 C59)
- Craig, Wilbert F., COL., USAF, and Freytag, James E., LTC, USAF. The Space Shuttle and the DOD: A Perspective. Professional Study. Maxwell AFB, AL.: Air War College, 1975. (TL790 .C75)
- Department of Defense. Defense Policy and Planning Guidance (U). Washington, 4 November 1975. SECRET.
- Erickson, John. Professor at University of Edinburgh. Personal Interview. Carlisle Barracks, PA., 22 March 1977.
- "A Forecast of Space Technology 1980-2000," National Aeronautics and Space Administration, NASA SP-387, January 1976.
- Freedman, Lawrence. "The Soviet Union and Anti-Space Defense," Survival, Vol. XIX, January/February 1977.
- Goodby, James. Bureau of Politico-Military Affairs. Department of State. Personal Interview. Carlisle Barracks, PA., 9 March 1977.
- Horelick, A. L. The Soviet Union and the Political Uses of Outer Space. Rand Report P-2480, November 1961.

- James, Peter N. Soviet Conquest from Space. New Rochelle, N.Y.: Arlington House Publishers, 1974.
- Kintner, William P. "Alternate U.S. Strategies and America's Future," University of Pennsylvania, Foreign Policy Institute, 1964, p. VII-2.
- Lenorovitz, Jeffrey M. "USAF Defining Shuttle Sensor Payload," Aviation Week and Space Technology, 14 March 1977, p. 44.
- Levine, Arthur L. The Future of the US Space Program. New York: Praeger, 1975.
- Logsdon, John M. The Decision to Go to the Moon. Cambridge: The MIT Press, 1970.
- "Military Leaders Clash on Soviet Threat," Aviation Week and Space Technology, 7 February 1977, p. 16.
- "Military Satellite Survivability Briefing," Aviation Week and Space Technology, Vol. 106, 7 February 1977, p. 22.
- Nitze, Paul. Former Deputy Secretary of Defense. Personal Interview. Carlisle Barracks, PA., 23 March 1977.
- Outlook for Space, A Synopsis. Washington: National Aeronautics and Space Administration, January 1976.
- Pikus, Irwin Dr. Office of Technology, Policy and Space Affairs. Department of State. Personal Interview. Washington, 20 December 1976.
- Pipp, Edwin G. "US, Soviets Gear up for Outerspace War," Detroit News, 23 March 1977, p. 7E.
- Possony, Stefan T., and Pournelle, J. E. The Strategy of Technology. Dunellen: University Press of Cambridge, Mass., 1970.
- President's Science Advisory Committee. Introduction to Outer Space. Washington, D.C.: The White House, 1958.
- President's Space Task Group. The Post Apollo Space Program: Directions for the Future. Washington, D.C.: The White House, September 1969.
- Rosenburg, R. A., COL USAF. National Security Council Staff. Personal Interview. Washington, 1 April 1977.
- Sanborn, Morgan H., COL USAF. "National Military Space Doctrine," Air University Review, Jan-Feb 1977, pp. 75-79.

- "Satellite Interceptor Sought in 5 Years," Washington Post, 30 March 1977, p. 8.
- Sloss, Leon; Eimer, Fred, Dr.; Ralph, John E., BG USAF. Arms Control and Disarmament Agency. Personal Interview. Washington, 25 March 1977.
- "Soviet Space Activities in 1976," Air Force Magazine, Vol. 60, March 1977, pp. 72-76.
- "Standard Satellites Under Development," Aviation Week and Space Technology, Vol. 105, 23 August 1976, pp. 50-52.
- "Technological Superiority Required," Aviation Week and Space Technology, 7 February 1977, p. 7.
- US Laws. Public Law 85-568, 85th Cong., July 29, 1958. "National Aeronautics and Space Act of 1958."
- US Congress. Senate. Committee on Aeronautical and Space Sciences. Documents on International Aspects of the Exploration and Use of Outer Space. 88th Cong., 1st Sess., S. Doc. 18. Washington: Government Printing Office, 1963.
- \_\_\_\_\_. \_\_\_\_\_ . Soviet Space Programs 1971-1975, Goals and Purposes, Organization, Resource Allocation, Attitudes Toward International Cooperation and Space Law. Washington: Government Printing Office, 30 August 1976.
- Ulsamer, Edgar. "The USSR's Military Shadow Is Lengthening," Air Force, March 1977, p. 46.
- \_\_\_\_\_. "Will the Soviets Wage War in Space?," Air Force, December 1976, p. 31.
- Verification: The Critical Element of Arms Control. Washington: US Arms Control and Disarmament Agency, March 1976.
- White, Irving L. Decision-Making for Space. West Lafayette, IN.: Purdue University Studies, 1970. (JX5771 W45)

