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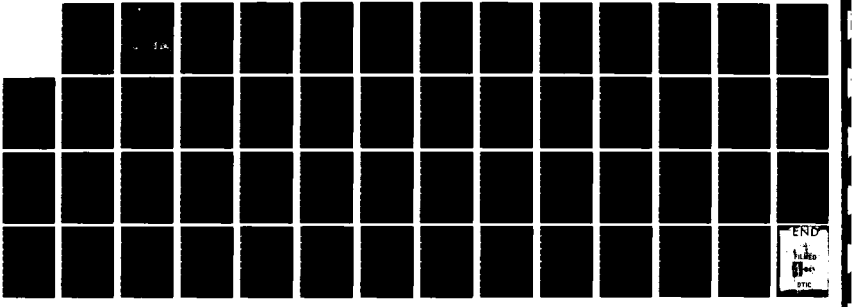

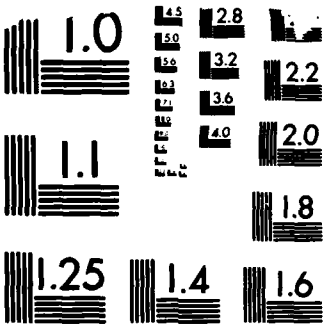

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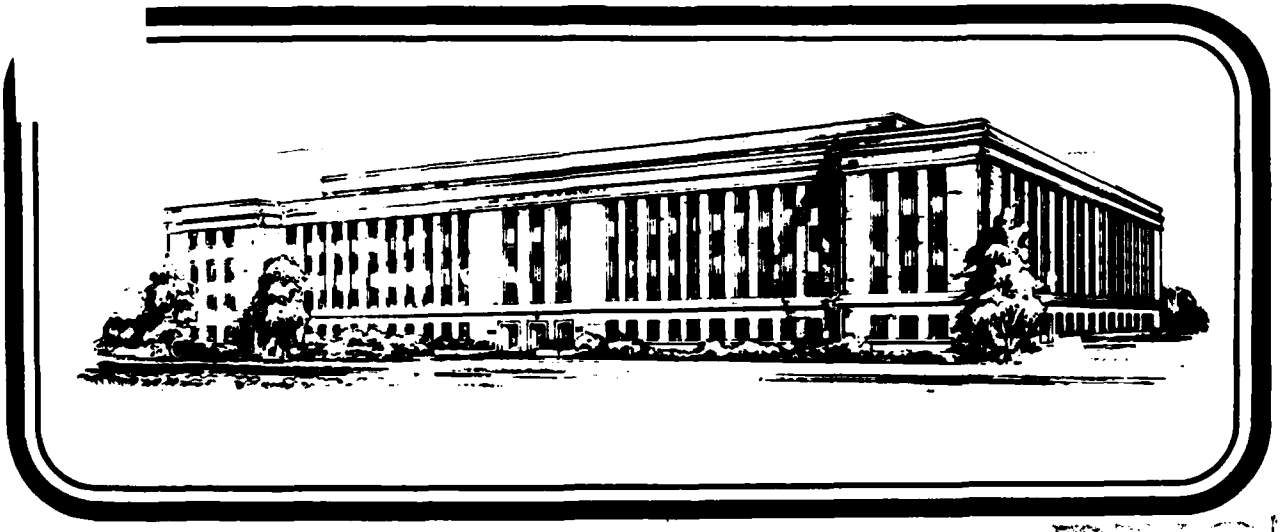
SPACE COMMAND: THE AIR FORCE'S UGLY DUCKLING?



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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NDU/ICAF 83/018	2. GOVT ACCESSION NO. AD-A138 150	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* SPACE COMMAND: THE AIR FORCE'S UGLY DUCKLING		5. TYPE OF REPORT & PERIOD COVERED IR #21, AY 82/83
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) JOHN C. TAIT, LTCOL, USAF ROBERT E. LARNED, LTCOL, USAF		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS INDUSTRIAL COLLEGE OF THE ARMED FORCES FORT LESLEY J. MC NAIR WASHINGTON, DC 20319		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS INDUSTRIAL COLLEGE OF THE ARMED FORCES FORT LESLEY J. MC NAIR WASHINGTON, DC 20319		12. REPORT DATE JUNE 1983 13. NUMBER OF PAGES 45
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)* NATIONAL DEFENSE UNIVERSITY FORT LESLEY J. MC NAIR WASHINGTON, DC 20319		15. SECURITY CLASS. *(of this report)* UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT *(of this Report)* UNLIMITED APPROVAL FOR PUBLIC RELEASE		
17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)* N/A		
18. SUPPLEMENTARY NOTES N/A		
19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)* N/A		

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES
NATIONAL DEFENSE UNIVERSITY

SPACE COMMAND:
THE AIR FORCE'S UGLY DUCKLING?

BY

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A RESEARCH PAPER SUBMITTED TO THE FACULTY

IN

FULFILLMENT OF THE RESEARCH REQUIREMENT

RESEARCH SUPERVISOR: COLONEL ROBERT SIGETHY, USAF

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

JUNE 1983

DISCLAIMER-ABSTAINER

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ABSTRACT OF STUDENT RESEARCH REPORT
INDUSTRIAL COLLEGE OF THE ARMED FORCES

NAME OF RESEARCHER (S)	TITLE OF REPORT
Tait, John C., LtCol, USAF Larned, Robert E., LtCol, USAF	Space Command: The Air Force's Ugly Duckling?
SECURITY CLASSIFICATION OF REPORT Unclassified	**REPORT NUMBER** M

ABSTRACT

Problem Statement:

This paper identifies the principal influences of five groups or organizations on Space Command, and recommends improvements. These five "institutions" include the Unified and Specified Commands, the military services, the research and development establishment, NASA, and the intelligence community.

Conclusions:

Long-range planning for the military use of space needs to be improved. Space Command is in a good position from which to make these improvements, but bureaucratic forces opposed to changes would be considerable.

Nevertheless, as the ultimate military users of space assets, the U&S Commands would benefit from a strong Space Command. The Army and the Marine Corps would as well, but the Navy would have to respond to its challenge for the leadership of space programs of tomorrow.

While the R&D establishment would suffer a near-term loss, it would probably benefit from a strong Space Command in the long run. NASA's relations with Space Command will be the most critical, because of the Shuttle, but overall, the intelligence community probably has the most to contribute to the command's success.

The Secretary of Defense should designate a single military service as the DoD executive agent for space. Follow-on reorganizations within Defense space activities should be delayed for at least two years.

THIS ABSTRACT IS UNCLASSIFIED

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EXECUTIVE SUMMARY

THE PROBLEM

As the newest major Air Force command, Space Command confronts a tough challenge: develop a space program specifically designed to support routine tactical, as well as strategic, military operations. "Tactical" requirements for accessibility and timeliness, and "strategic" requirements for nuclear survivability and post-attack endurability, are stringent and expensive. The implications of "routine" multiple users and high density traffic, and the "military" requirements for reliability and security, will be equally demanding. Space Command's ability to meet this challenge will be strongly influenced by five groups or organizations already involved in space. This paper identifies the principal influences of these other activities on Space Command, and recommends improvements.

THE INSTITUTIONS

The Unified and Specified (U&S) Commands, the first of these groups, are the ultimate military users of space assets. As field commanders have grown increasingly dependent on the capabilities provided by satellites, the need for improvements in survivability, endurability, reliability and accessibility has become more apparent. Reliability has been improving, survivability and endurance will improve with technology, but accessibility needs attention.

The second group includes the military services. While the Army and Marine Corps concentrate on exploiting the capabilities available from space today, there is an aura of competition between the Navy and the Air Force for the leadership of the military space activities of tomorrow. A DoD focal point for space activities needs to be appointed, and a unified command structure for Space Command may be required.

The R&D establishment, the third group, has dominated the development of space activities. Space Command represents a potential threat to the "operational" end of the R&D community's spectrum of activities. Nevertheless, the community would probably be more effective if it could reduce its operational workload, avoid acquiring responsibility for the Space Shuttle, and develop a logistics depot concept for satellites of the future.

NASA and DoD have taken separate paths since the beginning of the U.S. space program. The Shuttle has brought them closer together, however, and bureaucratic pressures to combine the programs persist. Presidential directives have reaffirmed that the national space program will be led by NASA but will consist of two separate, distinct and strongly interacting programs.

Although cloaked in secrecy, intelligence community space programs appear to have been very successful. Space Command is in a good position to ensure the operational utility of intelligence systems, and should work closely with the community to manage similar, and often competing, manpower and funding requirements.

CONCLUSIONS

Long-range planning for the military use of space needs to be improved. Space Command is in a good position from which to make these improvements, but bureaucratic forces opposed to changes will be considerable.

Nevertheless, the U&S Commands will benefit from a strong Space Command, as will the Army and the Marine Corps. The Navy, however, will have to respond to its challenge.

While the R&D establishment would suffer a near-term loss, it would probably benefit from a strong Space Command in the long run. NASA's relations with Space Command will be the most critical, because of the Shuttle, but overall, the intelligence community probably has the most to contribute to the command's success.

The Secretary of Defense should designate a single military service as the DoD executive agent for space. Follow-on reorganizations within Defense space activities should be delayed for at least two years.

CHAPTER I. INTRODUCTION

A. PURPOSE.

On September 1, 1982, the Air Force created a new organization called Space Command. As the newest member of the U.S. space community, this command joins a select group of institutions that have brought the United States to a position of preeminence in space.

Space Command's primary mission is to "manage and operate assigned operational space assets" in support of the Unified and Specified Commands. (1) This paper will identify improvements Space Command can make in its working relationships with other U.S. activities involved in space.

As a new command within the Air Force, Space Command is subject to the same organizational constraints confronting any major command. Externally, policy and funding constraints are imposed by the President, Congress, the Office of Management and Budget, the Secretary of Defense and the Service headquarters. Internally, management policies and procedures are imposed by the commander and his staff. Over the long term, as an organization whose "bread and butter" is operations, Space Command must also anticipate and respond to the rapidly changing spectrum of capabilities offered by new technology. Finally, as a new organization, Space Command must pay particular attention, especially in the near term, to the influences of other organizations.

(1)U.S. Air Force, Program Action Directive 82-1, Establishment of Space Command (Washington: 25 August 1982), p. 2.

These four constraints (policy and funding direction, internal management policies and procedures, technology, and organizational influences) essentially comprise an operational framework for Space Command. In large measure, the command's success at achieving its mission will depend upon how well it can work within this framework.

The command's ability to influence each of these factors is quite diverse. The externally imposed policy and funding constraints are relatively inflexible; Space Command's influence will increase as it is perceived to be the spokesman for Air Force space operations. Internal management procedures, on the other hand, are well within the commander's prerogatives and can vary dramatically with a change of command. Technological constraints are probably the most long-term of all; the most expensive near-term hazard would be to select a technological option today that would foreclose a technological breakthrough sometime in the future. The fourth constraint, organizational influences, probably provides the greatest potential for lasting improvements because working arrangements with other activities have not yet been institutionalized.

The thesis of this paper is that, because of the differences in "elasticity" of these constraints, Space Command has the best chance of making near-term improvements in the U.S. military space program by recognizing and anticipating the influences of the other activities involved with space programs. This paper

looks at those influences, identifies problems and recommends improvements.

There are far too many different governmental and commercial activities involved in space to try to identify each interface with each activity. For convenience, we have grouped the organizations that Space Command will be most involved with into six general categories:

- Unified and Specified (U&S) Commands
- Military Services
- Research and Development (R&D) Activities
- The National Aeronautics and Space Administration (NASA)
- Intelligence Programs
- Commercial Enterprises

This paper addresses the first five of these "institutions." (2) In each case we summarize the role of the institution in space, describe the influence it will have on Space Command, and propose ways to improve the working relationships.

(2) While the military implications of commercial programs are not as direct as the influences of the other five activities are, the national policy is to make Shuttle and other space operations attractive to commercial activities. Accordingly, Space Command is responsible for making military systems more compatible with commercial ventures.

B. THE INSTITUTIONS.

Before we get into detailed discussions of influences, we need to first describe these five other "institutions," or specific groups of key members of the space community.

1. Unified and Specified (U&S) Commands. The most important of these groups consists of the U&S Commands: the truly military "users" of space, and the activities most directly involved in fighting a war in the presence, or absence, of friendly and hostile space systems.

2. Military Services. A second group consists of the military services. The Air Force relies extensively on space systems to support strategic forces. The Navy, another active member of this group, uses space systems for navigation, communications and warning, and is designing systems to provide over-the-horizon targeting. Army and Marine Corps roles are similar but less extensive.

3. Research and Development (R&D) Activities. A group that has been probably the most influential in space so far, is the R&D establishment. R&D activities are largely responsible for making the U.S. dominant in space. The R&D community includes several service laboratories and product divisions, each supported by contractors from within the defense industry.

4. The National Aeronautics and Space Administration. NASA, the DoD's principal partner in the national space program, has overall leadership responsibility for the scientific space

community. As the only U.S. activity with experience in manned activities in space, and the principal U.S. contact with space programs of other countries, NASA will strongly influence Space Command's future.

5. Intelligence Programs. The intelligence community has probably achieved the greatest advances in space technology. As a direct participant in military operations, intelligence programs could be Space Command's most productive partner.

C. THE NEWCOMER.

Following the activation of Space Command on 1 September 1982, the command's 1st Space Wing was activated on 1 January 1983. The 1st Space Wing is responsible for day-to-day management and housekeeping tasks associated with worldwide space tracking and missile warning sensors previously operated by the Strategic Air Command. (3) The new command is also responsible for a variety of other Air Force space operations, including the Defense Support Program, and the Consolidated Space Operations Center when it becomes operational.

From its inception, Space Command was designed to work closely with other Air Force space activities. The command's vice commander is also the commander of Space Division (Air Force Systems Command), and has the newly formed Space Technology Center under his direct control. Space Command's Deputy for Communications and Electronics is also dual-hatted as the

(3)"U.S. Vigilance Over Soviet Space Activities Increased," Aviation Week and Space Technology, 4 October 1982, p. 53.

commander of the Space Communications Division of the Air Force Communications Command. The commander of Space Command is also the commander of the U.S.-Canadian North American Aerospace Defense Command, the Aerospace Defense Command, and the Aerospace Defense Center.

Nevertheless, Space Command is a "press fit" rather than a "best fit" compromise. In spite of all the drama surrounding the new command's creation, the Air Force Systems Command controls all ranges, and space responsibilities on the Air Staff are distributed among at least five different offices...and the list is almost as long for the Navy. This fragmentation leaves Congress still looking for that voice in the wilderness that can present an integrated perspective on the military use of space.

D. THE FAIRY TALE.

The command that resulted in 1982 may have found itself in a similar setting as did the ugly duckling of Hans Christian Andersen's fairy tale. As a fledgling organization, Space Command's operational mission in space could make it look different to the other "ducklings," or members of the space community. Unless it can overcome this perceptual barrier, Space Command may have to depend on a chance meeting with other swans (such as a Soviet breakthrough in space, or a dramatic incident demonstrating Shuttle's military utility) before it is accepted as a member of the space family.

Where this analogy may fall short is that a duck has inherent natural biases that make it difficult to recognize a swan, especially if it has never seen a swan. Institutions, on the other hand, are not necessarily the parochial bodies with natural self-interests that make them act like the ducks in Andersen's fairy tale. These institutions will still influence Space Command, though, and planning for space operations of the future must take such influences into account. Accordingly, the first institution we will look at includes the actual users of the capabilities available from space: the Unified and Specified Commands.

CHAPTER II. THE UNIFIED AND SPECIFIED (U&S) COMMANDS

Military commanders and planners throughout the ages have valued the high ground. From the times of Sun Tzu to the present, he who has owned the high ground has commanded the situation and, most likely, the outcome. As technology has opened new doors, the definition of high ground has expanded. Sun Tzu counselled, "In precipitous ground I must take position on the sunny heights..." (4) During World War II, those sunny heights became the skies over Europe. Many officials now claim that space is the ultimate high ground. (5) Air Force planners are trying to determine how and when the U.S. can use space most effectively. As the principal beneficiaries of these advantages, operational commanders will have a tremendous influence on how successfully Space Command will use space.

The purpose of this chapter is to describe the relationships between operational commanders and Space Command; to summarize the key space-related issues that confront the operational commanders; and to propose ways to improve the growing interdependence.

A. THE PAST.

1. U.S. Progress. Over the past 25 years, the U.S. and the Soviet Union have grown increasingly dependent upon space systems. The U.S. has emphasized combat support missions, many

(4)Sun Tzu, The Art of War, Translated by Samuel P. Griffith (New York: Oxford University Press, 1971), p. 125.
(5)Robert B. Giffen, US Space System Survivability (Washington: National Defense University Press, 1982), p. 5.

of which have become directly applicable to the public. For example, it is hard to imagine a television weather report without pictures from space. The strategic arms limitation treaty (SALT I) and the Nuclear Test Ban treaty were possible only because of satellite verification. Space technology has revolutionized intelligence gathering. Space-based reconnaissance has given commanders new vision, and promises even better capabilities. Satellites transmit over seventy percent of all military communications. (6) The U.S. has made major advances in communications, surveillance, observation, navigation, weather and strategic warning. An admittedly optimistic study, Space 2020, predicts improvements will continue at the same rate for the next twenty years. (7)

2. Soviet Progress. The Soviets have also pursued an aggressive development effort, although not necessarily restricted to force enhancements. In addition to relying heavily on space systems similar to those of the U.S., the Soviet Union has experimented with offensive weapons such as a fractional orbital bombardment system. (8) They have acquired an impressive launch capability, most of which supports military objectives. (9)

(6)James E. Katz, "National Space Policy: The Forgotten Frontier," Policy Studies Journal, March 1982, p. 468.
(7)Robert F. Brodsky and Bernard G. Morais, "Space 2020: The Technology, the Missions Likely 20-40 Years from Now," Astronautics and Aeronautics, 20 May 1982, p. 56.
(8)Dino A. Lorenzini and Charles L. Fox, "2001: A U.S. Space Force," Naval War College Review, March-April 1981, p. 51.
(9)"The Soviet Military Space Program," International Defense Review, 1982, p. 15.

3. The Challenge. To meet this ever-increasing threat and its global commitments, the U.S. is entering a new era in space activities. As William Gregory analyzed in an Aviation Week editorial, "America is moving toward a war fighting capability in space, but with more disagreement, uncertainty and hesitation than policy pronouncements imply." (10)

B. THE TIES.

1. Today's Star Wars. Space may someday become a battleground itself, but it has already created two hotly contested issues back here on earth. One is the technological debate over which systems to emphasize: those using successful, proven, off-the-shelf technology, or other candidates promising more exotic capabilities but waiting for technological breakthroughs. The second issue is the role of the U.S. in space: what should national long-range objectives be, and where do the necessary funds come from? (11) Regardless of the direction eventually chosen, any effort to establish military capabilities in space must have financial support as well as the support of operational commanders. Unfortunately, the operational commanders all too often remain ambivalent toward many space programs: willing to support requirements for new capabilities, but reluctant to volunteer the necessary funds.

(10)William H. Gregory, "Military Power in Space," Aviation Week & Space Technology, 18 October 1982, p. 7.
(11)Ibid.

2. Operational Deterrents. To convert a customer into an advocate, Space Command will have to provide systems that work (reliability); that last as long as they are needed, including in a transition or post-attack environment (endurability); that will resist attack (survivability); and that will respond to command (accessibility). Reliability and endurance are essentially technical problems. Recent advancements, especially in micro-electronics technology, have dramatically improved the reliability and some aspects of the endurability of U.S. space systems, giving the U.S. a significant lead over the Soviets in these areas. Questions remain, however, as to how much should be spent to gain small increases in reliability, and at what point to stop tinkering with a system. Space Division is developing a computer model to enhance this decision process. This model will provide a technological reference base and help identify issues and requirements. (12) In addition, the Shuttle's potential capability to retrieve and repair satellites should enhance the growing perception that U.S. satellites and their associated support systems are reliable. Survivability, endurability and accessibility, however, are much tougher problems to solve. Endurance is especially difficult through the transition and post-attack phases.

3. Survivability. Survivability is the ability to perform

(12)Bruce A. Smith, "New Satellite Systems Designed for Survivability," Aviation Week & Space Technology, 8 March 1982, p. 83.

throughout an appropriate level of conflict. (13) The policy directives of Presidents Carter and Reagan both specifically call for "...an aggressive, long-term program...to provide more assured survivability and endurance." (14) The Air Force dedicated 18% of its FY 1983 (increasing to 30% of its FY 1987) space hardware budget to survivability. (15) Programming funds and identifying survivability as a key issue are steps in the right direction. However, survivability entails more than improving technical capabilities. One must also decide which systems need to be protected, define the most probable threat, and then select the best method or mix of strategies to counter that threat. Survivability options such as hardening, mobility, maneuver, autonomy, orbit selection, proliferation, deception and reconstitution should all be considered. (16)

This difficult decision process is further complicated by the scope of space systems. Space systems are exactly what the name implies: systems. Each of the three major elements -- the ground support complex, the satellite itself, and the command, control and communications link -- has vulnerabilities that must be considered.

(13)Robert B. Giffen, US Space System Survivability (Washington: National Defense University Press, 1982), p. 2.
(14)"United States Space Policy," Weekly Compilation of Presidential Documents, 12 July 1982, p. 875.
(15)Jasper A. Welch, Prepared Remarks for Presentation to the AIAA Annual Meeting, Baltimore, Md.: 27 May 1982, p. 26.
(16)Robert B. Giffen, US Space System Survivability (Washington: National Defense University Press, 1982), p. 50.

Primary mission capability is frequently more important than improved survivability, and a consensus on priorities and survivability strategies might not be attainable. Nevertheless, close interaction between Space Command (the provider of services) and the U&S commands (the customers) is vital and should be institutionalized. The overall goal is to operate "space systems and a support structure that are reliable and efficient in peacetime and are more survivable in conflict thus increasing the confidence of our operational commanders in their continued availability." (17)

4. Accessibility. Accessibility remains a difficult issue to resolve. Commanders quite naturally do not want to wait for "their turn" to gain access to a critical system as they deploy their forces. When airpower gained its ground-support capability during the years between the World Wars, for example, Army doctrine placed air units directly under the operational field commanders. The North African campaign, the first combat test of this organizational structure, showed that this organization was inappropriate. The ebb and flow of combat did not always match the availability of air resources. The units that needed more air support due to the intensity of the conflict could not get it from other units who "saved" their air units for future use. Eventually, tactical air units were assigned to the theater commander to allocate as the situation dictated.

(17) Jasper A. Welch, Prepared Remarks for Presentation to the AIAA Annual Meeting, Baltimore, Md.: 27 May 1982, p. 27.

The problems of allocating space resources are similar. The location and accessibility of satellites may not match the specific requirements of a situation. Operational commanders are naturally reluctant to give up direct control of space systems that have become critical to the success of their missions. While these commanders have been assured that "operational control of some spacecraft...has not been affected at all by the reorganization which formed SPACECOM," the extent to which Space Command is seen to be improving accessibility will be key in securing their support. (18)

C. THE FUTURE.

1. Improve Accessibility. For the future, a high priority task will be to resolve the accessibility issue, particularly since one of the major goals of the DoD space program is "enhancing the contribution of our space systems to operational military commanders." (19) One way to gain support from these commanders is to solve the accessibility issue. Reliability is good now and endurance should continue to improve as technology advances. Survivability has been singled out as a major problem area and DoD has dedicated resources to improve this aspect of operational requirements. However, the most difficult obstacle, accessibility, has not received enough attention. Access can be improved by designing a system that can be used by all at any time without delays, such as the Global Positioning System.

(18)Edward C. Aldridge, Jr., "Space Command: Defense in the Fourth Medium," Defense 83, January 1983, pp. 8-9.
(19)Ibid., p. 7.

Unfortunately, many expensive satellites are required in order to provide the necessary worldwide coverage for this navigational system. Any "cost-saving" reduction in coverage would naturally concern an operational commander. If he had programmed, trained for and become totally dependent upon this system, for example, and the next war is in an area of limited coverage, he has put his troops at a distinct disadvantage.

Many systems cannot be designed to satisfy all customers at all times and, therefore, a priority system is necessary. Tactical reconnaissance systems use such priorities. The battlefield commander needs his information on the location of enemy forces on a timely and almost continuous basis. If another battle requires the same service, but in a different location, some agency must decide who gets the information first. If an operational commander does not control that agency or is not satisfied with its ability, he will probably not be an enthusiastic supporter of that system.

2. Improve Coordination. In either case, a close linkage between the customer (operational commander) and the operator (Space Command) will be necessary in order to resolve the accessibility issue. Other support commands have elaborate systems to ensure close coordination. The Air Force Air Weather Service and the Air Force Communications Command have detachments on every major Air Force base. They provide direct support and advice on capabilities, while maintaining personal contact with each commander. Although they use resources not under the direct

control of the commander they are supporting, they prioritize the operations in order to give the desired accessibility. If things go wrong, the operational commander has someone close at hand to turn to for advice and support.

Currently, any linkage between Space Command and a customer is through a dual-hatted position or a specific project office. Dual-hatting is typically found at higher echelons of command and does not necessarily provide the close interaction desired at lower levels. Specific project offices are excellent contacts during the planning stages, but become less effective as projects proliferate and daily operations become more commonplace. As more space-based systems come into the inventory, everyone will need to be more familiar with the capabilities and limitations of space.

Accordingly, Space Command has begun to train and educate its customers. It could also provide liaison officers at the appropriate staff level, or provide orientation and training courses to acquaint functional staff officers with the peculiarities of space systems. A wing intelligence or operations officer of the future will have to have a good working knowledge of a variety of space systems. More importantly, an active, routine liaison with each user will be a vital part of any future organizational structure.

CHAPTER III: THE MILITARY SERVICES

The purpose of this chapter is to review the roles the four services play in space, describe how the services will influence Space Command in the future, and recommend ways to improve these working arrangements.

A. THE PAST.

1. The Army. Initially one of the leaders in the development of launch vehicles, the Army concentrates its interests in space today on military utility of the benefits from space. Communications, navigation and reconnaissance capabilities are exploited through Army TENCAP (Tactical Exploitation of National CAPabilities) offices.

2. The Navy. The Navy's interest in an active role in space was encouraged as early as 1959, when the Chief of Naval Operations (CNO) approved the report of the Connolly Committee (an ad hoc committee on astronautics). The CNO's approval "recommended that the Navy use space to accomplish its objectives; that it participate fully in space technology; and that astronautics have high priority in overall research and development." (20) While there may be a difference of opinion from the Air Force, at least one senior Navy official is

(20)Roy A. Grossnick, "The Navy's Role in Space," Naval Aviation News, November 1982, p. 38.

convinced that the Navy "has been the leader in space." (21)

In any event, the Navy has been one of the most active military services in encouraging its TENCAP offices to apply space capabilities to tactical requirements. The worldwide availability of space systems to deployed ships provides unparalleled advantages in communications, navigation, intelligence and over-the-horizon targeting. While it is likely that Air Force and Navy strategic nuclear requirements for space capabilities would be critical in wartime, Navy communications and navigation requirements could be the most demanding of any of the services in peacetime and possibly even in a conventional engagement.

3. The Marine Corps. As a component of the Navy, Marine Corps units can use Navy space assets while shipborne. As a deployed fighting element, however, the Marines have continued to restrict their interest in space to those capabilities that meet validated military requirements. The Marine Corps' TENCAP office is closely linked to other DoD space-related programs.

4. The Air Force. The critical nature of the strategic nuclear forces is probably the single biggest factor behind the Air Force's strong interest in space. The Strategic Air Command relies on the Defense Support Program for missile warning, on the Air Force Satellite Communications program for critical communications, on the Defense Meteorological Satellite Program

(21) LuAnne K. Levens and Benjamin F. Schemmer, "An Exclusive AFJ Interview with RADM George B. Shick, Jr.," Armed Forces Journal, February 1983, p. 49.

for providing up-to-date weather information for bomber attack corridors, on the Defense Satellite Communications System for communicating with squadrons deployed overseas. In the future, the Global Positioning System will provide precision navigation for high speed aircraft as well as for land and sea forces. Indeed, space systems are already being thought of as "the fourth element in our strategic arsenal." (22)

The Air Force is also interested in using space to fulfill tactical navigation, intelligence and communication requirements. Air Force TENCAP offices have strongly supported the use of space for tactical purposes, and have sponsored extensive efforts to incorporate space applications in operational exercises.

B. THE TIES.

1. Executive Agent. The Navy and the Air Force have long disagreed over who should be the DoD focal point for space activities. Although the Air Force was generally recognized in the 1960s as the executive agent for military space programs, the issue was supposed to have been resolved with the release of a revised directive (DODD 5160.32). That revision has yet to see the light of day. As an Air Force activity dedicated to space operations, Space Command poses a potential threat to continued Navy control of Navy space assets.

(22)Richard C. Henry, "Military Space Systems and National Security," Air Force Policy Letter for Commanders: Supplement, June 1981, p. 27.

2. High Costs. In spite of the potentially dramatic operational military improvements promised by space systems and their advocates, all services have been reluctant to commit funds because of the large costs of space programs. The advent of Space Command could take some of the pressure off the other services if the new command acquires some of their responsibilities, but funding requirements on the Air Force would just become that much more severe.

C. THE FUTURE.

1. Fly-before-Buy. One way to improve the military services' acceptance of space capabilities is to give them a sample of what can be done, before asking them for funding commitments. The Navy, for example, was very impressed with the navigational accuracy provided by a pre-production, Air Force-funded four-satellite Global Positioning System. The Air Force itself has conducted extensive testing with the same system and has already achieved significant improvements in bombing accuracy. The Strategic Air Command is far more willing to support weather and missile warning satellites today than it was during the development of either, and is now only reluctantly transferring responsibility for them to Space Command. Other satellites have been used to vector fighter aircraft to intercept potentially hostile bombers. Seeing is indeed believing, and future demonstrations of improved capabilities, if properly exploited, could be very influential when looking for additional funding.

2. Unified Space Command. As mentioned earlier, Navy support for Space Command could be less than enthusiastic because of the potential threat Space Command poses to continued Navy control of Navy space systems. One way to overcome that reluctance would be to make Space Command a unified command. A recent Unified Command Plan revision to incorporate B-52 aircraft in the Navy's sea lane control mission may be an appropriate model upon which to structure a unified command arrangement between Navy and Air Force space activities.

Nevertheless, the possibility of a unified Space Command is a long-term project at best. Frequent reorganizations are costly in terms of the time required to adjust to new structures, so the Air Force would be wise to at least let the dust settle before starting the next reorganization. In addition, the Navy would have a difficult time identifying a "component" that would be assigned to a unified Space Command. A more appropriate intermediate step, then, may be to work toward a Specified Command status for Space Command, perhaps even with a Navy officer in a senior command position. Once the success of the change is demonstrated, the Navy may be more willing to make the necessary organizational changes in order to achieve operational improvements.

Regardless of the approach selected, we recommend that the Air Force delay any additional reorganizations for at least two years, so that Space Command can stabilize its operations and

determine its long-term objectives from a position of reason rather than in undue haste.

CHAPTER IV: THE RESEARCH AND DEVELOPMENT (R&D) ESTABLISHMENT

The purpose of this chapter is to review the dramatic growth of the U.S. R&D program in space, show how the R&D community will influence Space Command, and recommend ways to improve these working arrangements. The R&D community has essentially driven the entire U.S. space program since its inception. Space Command represents a potential threat to the "operational" end of the R&D community's spectrum of activities, and a clear distinction between R&D and operations would improve Space Command's ability to provide wartime-useful capabilities from space.

A. THE PAST.

The R&D community in the United States has dominated the development of space capabilities. The most active groups within the R&D community today are managed by the Air Force, the Navy, and NASA. Within these organizations, three activities have been responsible for the bulk of the space-related R&D.

1. Space Division. Located in Los Angeles, California, the Air Force Space Division dates back to 1979, when its predecessor, the Air Force Space and Missile Systems Organization, was separated into two organizations: Space Division was given the responsibility for orbital space programs, and the Ballistic Systems Division was given responsibility for MX. Recently, Space Division was tied into the Space Command structure, as described in Chapter I.

2. Naval Research Laboratory (NRL). Navy scientists at NRL have been very active in space, and were the first to orbit an operational space system. Because of the Navy's worldwide operations, scientists and engineers at NRL have concentrated on using space for navigation and communications. As technology has made other capabilities possible, the Navy has applied space systems to warning missions, and is now developing systems for over-the-horizon targeting applications.

3. NASA. The role of NASA in the exploitation of space has been so noteworthy as to warrant a separate chapter (Chapter V).

B. THE TIES.

1. Supportability. Space Division is responsible for the design, development, production, test, deployment and operation of most Air Force satellites. A few of the more mature programs (for example, the Defense Satellite Communications System, the Defense Meteorological Satellite Program, and the Defense Support Program) have been turned over to other commands, but there is room for debate as to how smoothly these transitions have taken place. One of the reasons these transitions may not be as effective as they could be is that satellites are not treated the same as other operational Air Force hardware. While management of aircraft, missiles and other equipment must be transferred from the developing command (normally Air Force Systems Command) to the supporting command (normally the Air Force Logistics Command), there is no clearly defined milestone for transferring responsibility of a satellite. In the past, logistic

supportability requirements for a satellite were minimal, and little supportability was required once the satellite was in orbit. With the advent of the Shuttle and the inevitable transition to retrievable and refurbishable spacecraft, supportability will soon become more important. The Air Force needs to begin planning for improvements in the supportability of satellites. Expanded involvement of the Air Force Logistics Command, and implementation of the Program Management Responsibility Transfer concept, could facilitate those improvements.

2. The Navy. The Navy appears to have been more successful at integrating its space support activities with fleet operations. One reason for this success could be the Navy's absolute requirement for worldwide communications, navigation and intelligence support. The Navy's success has been qualified, however, by charges that the Navy "has been remiss in not devising a space strategy for its naval missions, in improving the survivability of its satellites, and in developing the space weapon systems that would defend its satellites from space-based attack." (23)

C. THE FUTURE.

1. Divestiture. Space Command cannot integrate space operations if it is not responsible for all operational space activities. Similarly, Space Division cannot maintain a proper

(23)CAPT John E. Lacouture (USN Ret), "Space Race," Proceedings, February 1983, pp. 51-52.

emphasis on advancing space technology if it has to divert funds to routine space operations, logistics and supportability. Accordingly, we recommend that operational responsibilities being performed by Space Division be transferred to Space Command and, as described above, that the Air Force Logistics Command assume greater responsibilities in space systems supportability.

2. Launch Responsibility. As the U.S. transitions to the Shuttle as its primary launch vehicle, the question of who should be responsible for operating the Shuttle becomes even more important. NASA, or a separate agency derived from NASA's operations, is a likely candidate because of NASA's experience in manned space programs, and because the Shuttle represents a significant share of NASA's business, as described in Chapter V. Although military space testing and development could be done on the Shuttle, Space Division is a less likely candidate because the military potential of the Shuttle would appear to dominate its commercial and scientific applications. On the surface, Space Command would seem to be a reasonable choice for operating the Shuttle, since the command will be responsible for controlling all military Shuttle flights once its Shuttle Operations and Planning Complex is operational. Space Command, however, is probably the least likely candidate, for two reasons. The duration of each Shuttle flight is so short, and the launch preparations are so extensive,that the Shuttle itself would probably not be very useful for conducting routine, long-term operational missions. Second, operational satellites launched from the Shuttle would normally use the Shuttle simply as a means

of delivery. Thus, Space Command should have more interest in the cargo than in the Shuttle itself, at least in the near term.

CHAPTER V: NASA

Military and civilian space programs have been separated since the beginning of U.S. involvement in space. Continually under bureaucratic pressure to combine programs, NASA and the DoD maintain distinctly separate space programs. Recently, however, joint dependence on the Shuttle has created new dimensions to interrelationships that have been evolving since 1958. This development has been a mixed blessing for both agencies. The Shuttle has claimed about three-fourths of NASA's resources, diverting funds and attention from other projects. (24) In addition, charges of militarization have tarnished the agency's reputation, since the Shuttle is the first vehicle NASA has developed with a specified military mission, and some facilities are being altered to meet more stringent security requirements associated with national security missions. (25) Space Command, in turn, will have to work much more closely with NASA, since one of the command's missions is to operate military Shuttle flights once the Shuttle Operations and Planning Complex is operational. Air Force controllers and mission specialists are now being trained by NASA at Johnson Space Center. Much of Space Command's future development depends on the direction of the national space effort, in which NASA plays a major role. More joint ventures such as the Shuttle mean policies and practices of one agency will have an even greater impact on the other.

(24)Jerry Adler, John Carey, Mary Hager and Jeff B. Copeland, "In Space to Stay," Newsweek, 27 April 1981, p. 35.
(25)Trudy Bell, "America's Other Space Program," The Sciences, December 1979, pp. 49-53.

The purpose of this chapter is to outline the development of NASA's space program, to review the national space policy which has determined its interrelationships with the DoD space program, and to speculate about future roles each agency is likely to assume.

A. THE PAST.

1. Separateness. The National Aeronautics and Space Act (Public Law 85-568) of 1958 divided the national space effort into two programs. The National Aeronautics and Space Administration, an outgrowth of the National Advisory Committee on Aeronautics, was given the lead. DoD was given the right to conduct national security missions, as well as the necessary research and development for such missions. Some DoD resources were consolidated under NASA: the Army's Redstone program, the Navy's Vanguard program, and the Jet Propulsion Laboratory at the California Institute of Technology. (26) As described in Chapter IV, the Air Force was recognized as DoD's executive agent for space, and the coordination between NASA and DoD was accomplished through committees and boards. One of these committees, the Civilian-Military Liaison Committee, lasted only until 1965. Another, the Aeronautics and Astronautics Coordinating Board (AACB), was formed to resolve technical issues, but has since evolved into a policy forum.

(26)U.S. Congress, House, Committee on Science and Technology. Subcommittee on Space Science and Applications, United States Civilian Space Programs, 1958-1978. Report prepared for the Subcommittee by the Science Policy Research Division of the Congressional Research Service of the Library of Congress (Washington: U.S. Govt. Print. Off., January 1978), serial D, vol. 1, p. 563.

2. Togetherness. During the first decade of the national space program, NASA and DoD had relatively little formal interaction, although the agencies worked closely together on specific projects. Air Force crews were responsible for the Mercury, Gemini and Titan launches, for example, and the Defense Department operated the national ranges. However, as the national space effort moved into the post-Apollo era, formal interactions between NASA and DoD increased as Shuttle development progressed. Deliberations in the AACB soon centered on NASA's progress with the Shuttle, DoD's requirements, and the interrelationships between launch vehicles. (27) Another joint body, the Space Transportation System Committee, was established to coordinate day-to-day operations of the Shuttle. Although NASA was the primary manager, DoD had a significant impact on the design and development of the Shuttle. The payload bay was enlarged to meet DoD requirements, and a delta wing, added to meet a DoD requirement for increased cross-range capability, increased development costs by 10%. (28) Although DoD became a major customer, buying about a third of the launches, it did not participate in development funding. The Air Force reasoned that other priorities needed DoD money (e.g., F-15 and B-1) and that joint administration and funding of such large projects are inefficient. (29) By 1975, the roles of each element needed more formal definition and a memorandum of understanding (MOU) was prepared.

(27) Ibid., p. 566.
(28) Ibid., p. 567.
(29) Ibid., p. 568.

This MOU reflected the cooperative effort that pervaded the organizations at all levels, from the MACR down to individual project offices. Air Force personnel participated directly in change boards, design review committees, contractor activities, and technical panels, and an intricate interrelationship between NASA and the Air Force had evolved.

3. Reorganizations. As the military became more and more dependent on space systems, and as the operational possibilities grew with the Shuttle's development, NASA reorganized to more effectively manage Shuttle operations. Historically an R&D-oriented body, NASA studied different options and in '979 established a separate program office for Shuttle operations. (30) Headed by an Associate Administrator, the new management was tasked to establish a longer term perspective toward managing the Shuttle, and to delegate day-to-day operational problems. By focusing on major long-term issues, the new look helped retard growing discontent created by cost overruns and program delays.

B. THE TIES.

1. Carter Initiatives. Sensing that the national program was at the threshold of change and that there existed greater potential for conflict between the two elements. President

(30)The most influential study was conducted by the National Academy of Public Administration (NAPA) which recommended NASA retain operational control of the Shuttle for the near term. However, "any decision to run the operational STS [Shuttle] by NASA should be subject to continued review because future events may dictate a change in structure." (Ibid., p. 65)

Carter directed an extensive review of national space policy. (31) The resultant presidential directive (PD/NSC-37) reaffirmed the direction of the 1958 Space Act:

> "The United States will maintain current responsibility and management relationships among the various space programs, and, as such, close coordination and information exchange will be maintained among the space sectors to avoid unnecessary duplication and to allow maximum cross-utilization of all capabilities."
>
> The STS [Shuttle] will service all space users but give priority to "...national security missions while recognizing the essentially open character of the civil space program."
>
> DoD will investigate integrating "...civil and commercial resources into military operations during national emergencies."
>
> "Space-related products and technology shall be afforded lower or no classification where possible to permit wider use of our total national space capability." (32)

The formal coordinating body was elevated to a National Security Council Policy Review Committee (Space) chaired by the Director of the Office of Science and Technology, then Dr. Frank Press, who had also chaired the study group.

President Carter's comprehensive policy directive and the organizational restructuring reflected the changing nature of space policy in the late 1970s. DoD's program was rapidly overtaking NASA's, finally passing NASA's budget outlays in 1981. Shuttle operations were showing the promise of routine space flight as missions were becoming more operationally oriented and

(31) U.S. Congress, Senate, Committee on Commerce, Science, and Transportation, Space Law, Committee Print (Washington: U.S. Govt. Print. Off., December 1978), p. 558.
(32) Ibid., pp. 559-560.

less designed for R&D. Issues of economics continued the pressure to combine resources and make all systems more effective. These influences persisted throughout President Carter's administration, and President Reagan, upon taking office, ordered another comprehensive review of the U.S. space program.

2. Reagan Initiatives. On July 4, 1982, President Reagan reemphasized the U.S. space effort. Although reiterating much of President Carter's NSC/PD-37, he stressed the differences between NASA and DoD activities, saying that there will be "...two separate, distinct and strongly interacting programs." The Shuttle would be the prime launch vehicle with NASA operationally controlling civil missions and the DoD controlling national security missions. While the programs would be closely coordinated and would emphasize technology transfer, they would be separate if "differing needs of the program dictate." He also elevated the coordinating body another level. A Senior Interagency Group for space, chaired by the Assistant to the President for National Security Affairs, was established. [33]

C. THE FUTURE.

1. Muddy Water. The different approaches to space policy taken over the past few years suggest many uncertainties remain. President Reagan echoed previous concerns to leave room for future developments when he stipulated that, "As the STS [Shuttle] operations mature, the flexibility to transition to a

(33)"United States Space Policy," Weekly Compilation of Presidential Documents, 12 July 1982, pp. [illegible].

different institutional structure will be maintained." (34)

Routine Shuttle operations are just around the corner, and the entire national space program is rapidly taking on a more commonplace look. The upcoming debate over President Reagan's space defense initiatives, the manned space station and a permanent manned presence in space should clarify the direction of the national effort in this new era.

2. Mission Incompatibility. Many of the discussions concerning military and civil use and operation of the Shuttle also apply to the space station, as well as to any new organizational structure. To make a system economical (cost-effective) the tendency is to combine efforts and consolidate resources. However, if the missions of each element differ significantly, this process is counter-productive and the combination usually becomes an expensive, frustrating compromise.

NASA, with its R&D orientation, wants to conduct experiments in space. Its main concerns are reliability and endurance. A low earth orbit at or near the equator is normally adequate. On the other hand, the DoD needs worldwide coverage with survivable, secure systems. Operational mission requirements frequently dictate polar orbits at higher altitudes using more secure communications. A compromise between such missions, in general, would reduce the number of NASA's R&D experiments and limit DoD's mission capability, rendering both operations less effective. For the near term, differing missions and existing capabilities

(34) Ibid., p. 874.

dictate separate programs. Whether the U.S. can manage separate programs when both are dependent on the Shuttle will have a tremendous impact on the future of Space Command and the direction of the U.S. space program.

3. Civilian Control. The Shuttle should remain under civilian control because a major tenet of national space policy is the use of space for peaceful purposes and increased commercialization. Accordingly, the Shuttle needs a non-DoD manager to promote the international role of the U.S. as a leader in using space for peaceful uses, and to encourage other agencies, companies, or joint ventures to participate in the development of space.

Although the DoD is the most active U.S. agency in space, it should resist any temptation to direct the Shuttle program. In addition, the non-aggressive use of space should be emphasized. Military use of space is necessary and appropriate, and is not the opposite of peaceful use. Militarization of space does not necessarily mean aggressive, destructive use. Therefore, an even more open interchange of ideas, technology, and resources between DoD and NASA is imperative in the coming era.

CHAPTER VI: THE INTELLIGENCE COMMUNITY

The purpose of this chapter is to review the unique characteristics of the intelligence community's activities in space that separate them from other U.S. space activities; identify ties which will affect how Space Command does its business; and recommend ways to improve those ties.

A. THE PAST.

The evolution of the intelligence community's space program can be characterized in terms of two parameters: secrecy and results.

1. Secrecy. Official information on the intelligence community's space program is simply not available at the unclassified level. Accordingly, we have relied on non-DoD and other unclassified references, in an attempt to determine how the intelligence community will influence Space Command's operations.

2. Results. The intelligence community has achieved dramatic successes in space. (35) These achievements can probably best be attributed to a high sense of purpose within the community, essentially stable budgets over a long period of time, and streamlined management procedures made possible by a cloak of secrecy.

(35) Cecil B. Jones, Jr., "Photographic Satellite Reconnaissance," Proceedings, June 1980, p. 44.

B. THE TIES.

There is little information available to the public on the interfaces between Space Command and the intelligence community. In any event, the bottom line comes back to resources: people and money.

1. People. Probably the most important interface is at the working level, not only though sharing technical information but also by rotating personnel between programs. The intelligence program has long had the ability to pull the talent that it needs into its organization, and the results have been evident. Over the last year, Space Command has shown the same drawing power. In the future, however, competition for similar resources may create more conflicts as Space Command's operations grow.

2. Money. As the intelligence community's striking successes have continued, there has been a change in attitude by the programs' overseers. In the past, the mission was more important and there was less concern with cost. As capabilities have grown and requirements have become more sophisticated, the costs have grown as well. The difference this time, however, is that the ground rules have changed. The essentially stable budgets associated with other high interest Defense programs of the past, such as Polaris, Atlas and Minuteman, are no longer available. For a variety of reasons, Congress and other oversight activities have become more concerned with costs, and the community has been tasked to strike a better balance between

costs and performance. In the past, these decisions would have been made in utmost secrecy, but today we can read about them in the next day's Washington Post. (36) The message is that costs will affect the intelligence community more in the future than they have before. This new constraint may make it harder to continue to improve reconnaissance technology, and Space Command must be prepared to respond appropriately.

C. THE FUTURE.

1. Behind the Green Door. The importance of making current intelligence available to operational military users is almost as critical as developing new systems within cost constraints. Space Command is in a good position to ensure the operational utility of intelligence systems, since it can tie military requirements more closely to intelligence capabilities.

(36) Jack Anderson, "Lack of Funds is Hampering U.S. Intelligence," The Washington Post, 14 December 1982, p. C27.

CHAPTER VII: CONCLUSIONS

A. THE STATUS QUO IS INADEQUATE.

Space Command's overarching responsibilities are to exploit the advantages space offers in ensuring national security, to counter Soviet aggression in space, and to reduce U.S. dependence on vulnerable space systems.

We believe that Space Command can, in fact, support long-term national security objectives and develop a space program specifically designed to support routine tactical, as well as strategic, military operations. We recognize that "tactical" requirements for accessibility and timeliness, and the "strategic" requirement for nuclear survivability, are stringent and expensive. At the same time, the implications of "routine" multiple users and high density traffic, and the "military" requirements for reliability and security, will be equally demanding. We are convinced, however, that Space Command will be able to satisfy these requirements by working closely with other activities involved in space.

B. BUREAUCRATIC FORCES ARE CONSIDERABLE.

Space Command itself is subject to its own share of internal problems. Simply creating Space Command by fiat will not necessarily result in a "real" space command. Many of those who were charter members of Space Command had specialized in tactical

warning and attack assessment rather than space operations. (37) In spite of the recent influx of space operations-oriented personnel, there could be a resistance to change within Space Command simply because many of the people themselves have not changed. Space Command's immediate internal problem, then, is to expand its awareness to include its new charter.

In any event, the fact that space activities are still so fragmented within the Air Force is resounding evidence of the strength of the bureaucratic forces at work. Organizational inertia, bureaucratic resistance to change, vested interests, and institutional parochialism are all powerful factors that must be anticipated and managed in any organization.

In looking for solutions, then, what is most apparent is the need for strong leadership and top-down support. Nevertheless, Space Command still represents a stronger player in the DoD space arena, one who can compete for funds and represent the whole space community before Congress. These advantages alone should generate supporters and proponents.

C. THE U&S COMMANDS WILL BENEFIT FROM A STRONG SPACE COMMAND.

The U&S commands have the most to gain from an effective, user-oriented, operations-minded Space Command. Coincidentally, the command will benefit from improved customer relations with the U&S Commands. Minor structural revisions in the operating

(37) Neal E. Lamping and Richard P. MacLeod, "Space--A National Security Dilemma: Key Years of Decision," Unpublished Student Research Paper, National Defense University, Washington, D.C.: June 1979, pp. 43-45.

commands, however, would make it easier for Space Command to provide real-time capabilities.

Space Command needs closer ties to its major customers, the operational commanders. A comprehensive education process will probably be necessary as more space systems become operational. A more formal communications network should be developed to adequately support all systems because the current project-oriented structure is likely to become inadequate as space systems become more commonplace. Satellite accessibility, however, will remain a substantial obstacle to operational utility.

D. THE R&D ESTABLISHMENT WILL SUFFER A NEAR-TERM LOSS, BUT WILL BENEFIT IN THE LONG RUN, FROM A STRONG SPACE COMMAND.

The R&D community has essentially driven the entire U.S. space program since its inception. Space Command represents a potential threat to the "operational" end of the R&D community's spectrum of activities, and a clear distinction between R&D and operations would improve Space Command's ability to provide wartime-useful capabilities from space.

We believe that by giving up activities that ought to be outside its charter as a product development division, Space Division stands to lose the most from the standpoint of acquired operational responsibilities. We contend, however, that a clearer distinction between development and operation of space systems would be more productive in the long run.

E. THE ARMY AND THE MARINE CORPS WILL BENEFIT FROM A STRONG SPACE COMMAND; THE NAVY WILL HAVE TO RESPOND TO ITS CHALLENGE.

Continued Navy-Air Force competition in space is probably constructive, although costly, but Army and Marine Corps interests in space would be better served by the rapid introduction of an operations-oriented Space Command to the space community.

While the Navy will probably retain control of its operational space assets in the near term, it could find it increasingly difficult to do so as Space Command begins to perform full-up operations. In the long run, some kind of cooperative operational structure, whether a unified command or a specified command with joint participation, may be the most effective structure as seen from a national viewpoint.

F. NASA'S RELATIONS WITH SPACE COMMAND WILL BE THE MOST CRITICAL.

NASA is the most important partner with Space Command in the era of the Shuttle. A close relationship will be essential and will be affected by future decisions on a manned space station. NASA should be anticipating DoD consolidations in space programs, but we believe making the DoD responsible for all Shuttle operations would not be in the national interest.

Further, we support the continuation of separate NASA and DoD space programs, because of the profound differences in their missions. At the same time, national space policies need to be

further debated in order to clarify specific roles and missions as we enter the next era in space operations. The control of and responsibility for a fully operational Shuttle, and for future launch vehicles as well, should be key issues in this debate.

G. THE INTELLIGENCE COMMUNITY HAS THE MOST TO CONTRIBUTE TO A STRONG SPACE COMMAND.

Space Command can benefit from the community's operational experience, management expertise, and technological capabilities. The intelligence community has taken dramatic strides in the use of space, and these improvements could be extremely useful to the operational military community if they were made available. While the high degree of secrecy pervading the intelligence community's space program effectively blocks such transfer of technology, the military advantages of applying intelligence systems to operational problems appear to outweigh the disadvantages associated with making such capabilities available. Therefore, changes to improve the transition ought to be made, and Space Command would be an appropriate vehicle for taking on such a responsibility.

H. THE SECRETARY OF DEFENSE SHOULD APPOINT AN EXECUTIVE AGENT FOR SPACE.

In our opinion, the advantages accruing from the Air Force and Navy vying with each other for the lead role in space do not outweigh the costs of duplication and overlap. DODD [illegible] should be revised and released.

I. FOLLOW-ON REORGANIZATIONS SHOULD BE DELAYED.

The current operational structure of U.S. military activities in space should be allowed to mature for at least two years before any decision is made to reorganize Space Command into a unified or specified command.

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☆ U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 425-560 (10)

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