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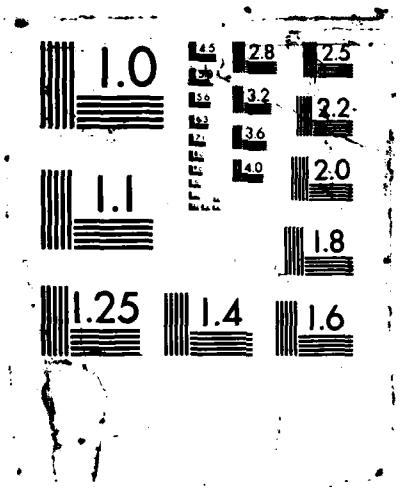
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AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

LAUNCH OPERATIONS TO
SUPPORT FUTURE SPACE FORCES

MAJOR JOHN B. SULLIVAN 88-2520

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AUTHOR(S) MAJOR JOHN B. SULLIVAN, USAF

FACULTY ADVISOR LT COL LARRY G. ROSELAND, ACSC/EDW

SPONSOR COLONEL TED SCHROEDER, AWC/DFX

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Currently, military space launch operations are managed by Air Force Systems Command. The research and development perspective of Air Force Systems Command limits the flexibility and responsiveness of the US's space launch capability. The paper advocates that space launch operations should be managed by Air Force Space Command. The mission-accomplishment perspective of Air Force Space Command will be needed to achieve an operational space launch capability. Military doctrine identifies the need for an operational space launch capability and operational commands manage other weapon systems such as the ballistic missile.

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PREFACE

In the future, the United States will transfer much of the management responsibility for military space launch operations from the Air Force Systems Command to the Air Force Space Command. Transferring the management responsibility will cause major changes in the Air Force organizational structure and space launch support activities. This paper supports these assertions by discussing current developments in military space doctrine and by comparing the management and operations of future space systems with current weapon systems.

Subject to clearance, this paper will be presented to a series of workshops for their review and possible selection for presentation at the Space Issues Symposium at Maxwell Air Force Base, Alabama, to be held in July 1988.

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ABOUT THE AUTHOR

Major John Sullivan was commissioned in 1973 through the AFROTC Program at the University of Portland, where he studied mechanical engineering. Before entering active duty, he took an educational delay to attend graduate school at Northwestern University. He received a Master of Science Degree in Mechanical Engineering in 1975. Upon entering active duty, Major Sullivan served at Grand Forks AFB, North Dakota, as the Mechanical Engineer for the Technical Engineering Branch of the 321st Strategic Missile Wing. He provided technical advice to the Deputy Commander of Maintenance concerning the management and alert status of the Minuteman III weapon system. He also acted as a liaison between the operational missile wing and its engineering support provided by Ogden Air Logistics Center at Hill AFB, Utah. He was then assigned to the Air Force Academy in Colorado Springs, Colorado. There, he taught several courses in the Department of Engineering Mechanics, including dynamics, strength of materials, and aircraft design. His most recent assignment was to the Defense Satellite Communications System (DSCS) Program Office at Los Angeles AFS, California. He was the Chief of the Integration Division, and managed the DSCS launch planning and operations on the Space Shuttle and Titan launch vehicles. He is now attending Air Command and Staff College at Maxwell AFB, Alabama.

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EXECUTIVE SUMMARY

Part of our College mission is distribution of the students' problem solving products to DOD sponsors and other interested agencies to enhance insight into contemporary, defense related issues. While the College has accepted this product as meeting academic requirements for graduation, the views and opinions expressed or implied are solely those of the author and should not be construed as carrying official sanction.

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REPORT NUMBER 88-2520

AUTHOR(S) MAJOR JOHN B. SULLIVAN, USAF

TITLE LAUNCH OPERATIONS TO SUPPORT FUTURE SPACE FORCES

I. Purpose: To support the assertion that control of space launch operations should be transferred from Air Force Systems Command to Air Force Space Command.

II. Problem: The US does not currently have a space launch organization to adequately support future national security needs.

III. Data: Current trends and ideas reflected in military doctrine indicate that space systems will become more commonplace and play increasingly critical roles in national security. Basic aerospace and space doctrine predict that the Air Force must establish an operational capability in space just as it has done in the air. With only minor adjustments, an organizational structure similar to the one that effectively employs ballistic missile systems can be used to employ operational space weapon systems. Air Force Space Command is already assuming some of its operational role in space by taking over orbital operations for several satellite programs. However, it has not assumed a role in space launch operations.

IV. Conclusions: To improve its space launch capability, the US must transfer its military space launch operations from the Air Force Systems Command to an operationally-oriented command.

V. Recommendations: The Air Force should manage and operate space systems through Air Force Space Command, in the same way the Strategic Air Command manages and operates ballistic missile systems today.

Chapter One

INTRODUCTION

One of the most imposing challenges facing the Air Force today is to develop a credible military presence in space. Air Force Space Command expects future military space operations to be conducted at all levels of conflict while supporting simultaneous global operations. (24:2-1) The Air Force does not currently have a space launch capability to serve such demanding expectations. The research and development orientation of the command structure controlling space launch operations seriously constrains the Air Force's space launch capability.

This paper advocates that future military space launch operations should be controlled by Air Force Space Command. Transferring space launch control from Air Force Systems Command to the more operational command structure of Air Force Space Command will be a vital step in accomplishing the Air Force mission in space. Chapter One introduces the problem and explains its importance. Chapter Two will show that recently developed military doctrine requires an operational space launch capability to meet national objectives. A review of current doctrine provides good insight in spite of the inherent uncertainties involved with predicting the future. Chapter Three will support the purpose by asserting that the management of future space systems should be similar to that of current weapon systems. The management of ballistic missile systems presents a good model for future space launch operations. Chapter Four will describe how future space launch operations could be conducted by drawing parallels between the management of current weapon systems and future space launch operations.

Currently, all military space launch operations are managed by organizations under the direction of Air Force Systems Command. Space Division and the Space and Missile Test Organization control all military space launch operations. (1:14-6 - 14-8) Space Division and the National Aeronautics and Space Administration (NASA) cooperate to optimize space launch facilities and services. The space-related organizations within Air Force Systems Command administer research and development programs for the "advancement of technology." (1:14-6) The

limitations imposed upon the US space launch capability by Air Force Systems Command`s research and development perspective have been brought into focus by their response to the recent launch failures.

The failures of the Space Shuttle Challenger, two Titan 34-Ds, an Atlas, and a Delta launch vehicle in 1986 devastated the US space launch capability. (12:16-19) The slow investigation and cautious recovery further constrained the US launch capability. A presidential commission thoroughly investigated the Challenger accident of 28 January 1986 and recommended NASA redesign and retest major components of the Space Shuttle. (14:--) For more than two years, NASA has delayed launches while struggling to improve the Space Shuttle design. (11:18) The Titan 34-D failures caused a 19-month delay in the launch schedule. (12:16-19; 13:24-25) The exhaustive effort to expand the expendable launch vehicle capability is only now beginning to reach critical testing milestones. (10:36-38) The first launch vehicles will be available in 1989, but the full recovery of the US launch capability will not be completed for 10 years. (10:36) Meanwhile, the backlog of military space launches is growing. Between 1989 and 1995, the number of launches required to support national security varies from 20 to 25 per year. (10:36) The US has not attempted 20 space launches in a year since 1980. (10:36; 13:24-25)

In contrast, the Soviet Union has a very responsive operational space launch capability. They have three space launch sites: Plesetsk, Tyuratam, and Kapustin Yar. (27:4) During 1986 they conducted 91 space launches. (27:5) On 25 occasions, they accomplished two launches in less than 24 hours. (27:5) They suffered only one launch failure in 1986, and launched a replacement satellite only 12 days later. (27:6) The Soviet Union`s busy launch schedule, and in particular, their ability to recover quickly from a launch failure, indicate their truly operational space launch capability. To achieve a space launch capability to match the Soviet Union, the US needs an operationally-oriented command structure to control space launch operations. Several senior Air Force leaders have strongly advocated that the US must change its current research and development perspective of space launch operations.

General John L. Piotrowski, Commander of United States Space Command, addressed the Air Force Association Symposium on 30 October 1987, explaining what he thought were the most critical future aerospace requirements the US has today. He stated "Operational space launches. . .are still outside the control of our nation`s operational military structure for space. . ." (28:--) He believed the US must undertake an effort to "normalize" space operations by developing a "combat ready"

space force that is capable of replenishing combat losses as they occur. (28:--) He goes on to explain that US Space Command's mission requires "the ability to launch quickly in response to unexpected demands." (28:--) General Piotrowski's remarks strongly support building a more flexible and responsive space launch capability, controlled by an operationally-oriented command structure.

The command structure that evolves as space launch capabilities expand will be a critical factor in how successfully the US establishes its military presence in space. General Robert T. Herres, Vice Chairman, Joint Chiefs of Staff (JCS), emphasized the importance of command structure in his recent article "The Future of Military Space Forces." He explained that "capability [of people and equipment] is also a function of the effectiveness of the structure that employs them." (8:46) The need for a flexible and responsive space launch capability demands an operational command structure be established. Consequently, the Air Force must transfer much of its space launch responsibility from Air Force Systems Command to Air Force Space Command. The transfer of orbit operations for several satellite programs from Systems Command to Air Force Space Command is already underway. Transferring launch operations is the next logical step.

Chapter Two

AEROSPACE DOCTRINE

An accurate assessment of how the military intends to employ its forces in the future is contained in the requirements and goals stated in current military doctrine. Understanding what doctrine is and how it is used provides the necessary insight to predict future force employment. A great deal can be learned concerning the future use of space and, in particular, space launch operations, by reviewing current aerospace doctrine.

Doctrine provides official beliefs and teachings concerning the best way to conduct military affairs. (6:41) The Joint Chiefs of Staff (JCS) Publication 1 (Pub 1), Dictionary of Military and Associated Terms, defines doctrine as "fundamental principles by which the military forces and elements thereof guide their actions in support of national objectives." (17:118) The opening paragraph of Air Force Manual (AFM) 1-1, Basic Aerospace Doctrine, contains a very comprehensive definition.

> Aerospace doctrine is a statement of officially sanctioned beliefs and warfighting principles which describe and guide the proper use of aerospace forces in military action. The Air Force promulgates and teaches this doctrine as a common frame of reference on the best way to prepare and employ aerospace forces. Accordingly, aerospace doctrine drives how the Air Force organizes, trains, equips, and sustains its forces. (18:v)

The current edition of Basic Aerospace Doctrine places the future employment of space forces in clear perspective. AFM 1-1 devotes an entire chapter to a comprehensive discussion on employing aerospace forces. The chapter "portrays the central beliefs of the Air Force for using aerospace forces to wage war." (18:2-1) The aerospace environment is defined as the expanse beyond the surface of the earth, and the Air Force is given the responsibility to maintain the freedom to act throughout the aerospace medium. (18:2-2) The discussion goes on to explain that "Space, as part of that medium, provides an unlimited potential and opportunity for military operations and a place where the Air Force can perform or support all of its

missions and tasks." (18:2-2) Performing all Air Force missions and tasks, maintaining the freedom to act, and waging war in space demands the US expand its perspective of space systems beyond the limited scope of research and development. These goals are clearly operationally oriented.

Suggesting that the future use of space systems can be foreseen in aerospace doctrine simply because it "drives how the Air Force organizes, trains, equips, and sustains its forces" (18:v) is a bold assertion. There are tremendous technological uncertainties which must be resolved before the Air Force achieves a credible aerospace force, especially in the area of space launch operations. These uncertainties, however, should not completely prohibit the use of military doctrine as a reliable means to foresee how the Air Force intends to employ its future space systems. Military doctrine has provided good insight in the past.

Historically, military doctrine has provided insight into how the military intends to employ its forces. Giulio Douhet, Sir Hugh M. Trenchard, and Billy Mitchell formulated warfighting theories during the 1920s and 1930s that formed a basis for Allied military doctrine immediately prior to World War II. (2:1-42) Allied doctrine clearly foretold that strategic bombing would be employed to defeat the Axis powers. (2:46-55) During the same period of time, Germany formulated a military doctrine based upon the theories of J. F. C. Fuller and Sir B. H. Liddell Hart that emphasized the decisiveness of tank warfare. The German Army formulated a doctrine that clearly called for the blitzkrieg style of warfare it successfully employed against the Allies. (2:58-94) Although the strategic bomber and the tracked armored vehicle were products of very new technologies, fraught with design problems, and never tested to any degree of certainty in a combat environment, the Allies and the German Army developed a military doctrine whose execution depended almost exclusively on the successful employment of these new weapons. In spite of the uncertainties surrounding the new weapons, both of these cases showed that an interpretation of military doctrine could have predicted how military forces were to be employed in the future. Interpreting current space doctrine may have similar benefits.

Careful interpretation of current military space doctrine provides insight into how the US plans to employ its space systems. In particular, the current space doctrine contains accurate descriptions of how the Air Force intends to launch its future space forces. The requirements and goals to achieve a flexible and responsive space launch capability are contained in AFM 1-6, Military Space Doctrine. The manual states "the Air Force will prepare to organize, train, equip, and sustain space forces to conduct [its space support and warfighting operational missions]." (19:8) Within the space support mission is a

requirement that clearly calls for an operationally-oriented space launch capability. The manual states "Space support activities include such functions as providing. . . Launch services for DOD- and NCA-directed space operations. This entails preparing, build-up, loading, launch, and if necessary, retrieval of space systems or payload, as well as the space transporter. . . ." (19:8) The way in which the Air Force will realize an operationally-oriented space launch capability is even clearer in a draft revision of AFM 1-6.

The draft revision identifies several improvements in the space support mission to enhance "flexibility, responsiveness and reliability." (25:15) Several improvements pertain exclusively to launch operations; a simplified ground control, routine checkout and maintenance of spacecraft before launch, and interchangeable payloads and launch vehicles. (25:16) This draft revision of Military Space Doctrine also provides insight into what organization will control future space launch operations. The revision explains the need for a fundamental organizational change in the following manner: "today, the functions of launch and initial checkout are considered research and development activities. . . unlike operational air forces, operational space forces heretofore have not generally transferred system management responsibility away from the developer." (25:13) Transferring system management responsibility strongly suggests that the control of all launch operations will be moved from Air Force Systems Command to the operational arm of Air Force Space Command. Space systems would then be developed and employed much like current air forces; they would be designed, procured, and delivered by Air Force Systems Command, then deployed and operated by Air Force Space Command.

Chapter Three

THE AEROSPACE WEAPON SYSTEM LIFE CYCLE

As space technology matures, and control of the space medium begins to play a more decisive role in national security, the Air Force must begin to manage space systems much like it manages other, more familiar weapon systems. The systems management of the modern ballistic missile is a good case study to apply to space systems. The ballistic missile is procured through the Department of Defense (DOD) systems acquisition process by Air Force Systems Command, then operated and maintained by the Strategic Air Command (SAC). In a similar way, space systems will be procured through the systems acquisition process by Air Force Systems Command, then managed by an operational command. The systems acquisition process is common to ballistic missiles and space systems.

The Air Force Systems Command has used the systems acquisition process very successfully to develop, procure, and deploy effective aerospace weapon systems. The process is a sequence of four carefully planned phases: Concept Development, Demonstration and Validation, Full-Scale Development, and Production. (15:6-7) The sequence is designed to establish the need for a new system, develop the most effective concept, design the best-possible product, and produce the fully operational and supportable system. (3:Ch 1) Throughout the acquisition process Air Force Systems Command orchestrates the preparation to support the new system once it is deployed in the field. The preparation will include: final test and evaluation of the new system, training of operations and maintenance personnel, and the delivery of all support equipment, initial spare parts, and technical publications. (5:Ch 1, 16:--) As the program enters the final phase, Production, the system becomes fully operational. Systems management responsibility is then transferred to the operational command. (3:14)

The modern intercontinental ballistic missile system, such as Peacekeeper, has followed a very typical systems acquisition process and life cycle. The Air Force Systems Command designed, developed, and procured the Peacekeeper system through a four-phased systems acquisition process tailored to meet the need to deploy a new intercontinental ballistic missile system.

(9:31-32) Air Force Systems Command then delivered the system, with all the necessary support equipment and services, to the Strategic Air Command. (7:39) Strategic Air Command presently manages the Peacekeeper system according to several manuals and regulations.

Air Force Regulation 23-12, Strategic Air Command, outlines SAC's major responsibility. It states the "Commander in Chief, SAC. . . exercises full operational command over all strategic offensive forces." (21:1) Among those forces is the Peacekeeper as well as many other weapon systems. SAC provides the manpower and support facilities to maintain and operate the weapon systems. (22:--) SAC-trained Air Force combat crews continually monitor and test the weapon system to ensure its launch readiness. (23:--) SAC-trained Air Force maintenance personnel perform periodic checkout and repair of the weapon and its support equipment. Faulty modules and components are removed and replaced. Each SAC missile wing has base-level repair capabilities for specific components. (24:--) Those components not repairable at base-level are shipped to the Air Logistics Center, operated by Air Force Logistics Command, or to the responsible contractor through Air Force Systems Command for depot-level repair. (4: Ch 13-14) Modern ballistic missile systems, once at the leading edge of technology just as space systems are now, are procured by Air Force Systems Command, and managed with appropriate support by SAC--an operationally-oriented command.

The Air Force Systems Command has developed and procured many effective systems through the systems acquisition process and transferred management responsibility to an operational command. The ballistic missile is a good example. Space systems have also been successfully procured by Air Force Systems Command. However, unlike other common systems with proven designs, space systems management responsibility has not been transferred to an operational command. Space systems are generally one-of-a-kind items, and their design and development has been at the leading edge of technology. In the case of space, Air Force Systems Command has been managing the development of the new technology and has retained management responsibility for nearly all resulting space systems.

In the future, modern space systems should follow a more typical acquisition process and life cycle, just as Peacekeeper has done as a modern ballistic missile system. Air Force Systems Command should continue to procure space systems and then deliver them to an operational organization--Air Force Space Command. As the evolution of space systems continues to follow the ballistic missile systems model, the operational organization, Air Force Space Command, should also take over space launch operations. The management of ballistic missile systems reveals a great deal about how Air Force Space Command should support future space launch operations.

Chapter Four

SPACE LAUNCH OPERATIONS IN THE FUTURE

As shown in the preceding chapters, space launch operations management should be transferred to Air Force Space Command. Recently developed aerospace doctrine identifies the need for an operational space launch capability to achieve national security objectives. Space launch operations management should be transferred to an operational command just as other weapon systems management is transferred to an operational command when their development is complete.

Transferring space launch operations management to Air Force Space Command will result in a more flexible and responsive space launch capability and demonstrate a more credible military presence in space. Air Force Space Command performs the operational support and warfighting missions described in Basic Aerospace Doctrine, not research and development for the "advancement of technology." (19:8; 1:14-6) Air Force Space Command will develop operational support and warfighting capabilities based upon the guidance and principles in Aerospace Operational Doctrine, AFM 2-1. Space systems will be built and operations will be planned with sufficient redundancy to accomplish the mission in spite of delays and minor failures, just as weapon systems are built and operations are planned to perform close air support, counter air, and other criticle Air Force missions. (19:Ch 1-7; 25:--) Air Force Space Command's mission can not tolerate long launch delays, nor would US national security interests wait while a detailed scientific investigation is conducted following a launch failure. Air Force Space Command, responding to its mission, would ensure all contingencies are covered. In the case of a launch failure, a replacement satellite and launch vehicle would be rapidly processed. Precautions would be taken to preclude a second failure, but the primary effort would be focused on mission accomplishment. Putting Air Force Space Command in charge, would place space launch capability on a par with all other operationally-oriented organizations and weapon systems.

SAC's management of modern ballistic missiles provides a good model on how Air Force Space Command could manage space launch operations. The commander of Air Force Space Command could exercise full operational command of all military space

launch facilities and assets, just as the commander of SAC exercises operational command of strategic offensive forces. To do so, Air Force Space Command would need to provide the manpower and support facilities to maintain and operate the space systems. Trained Air Force Space Command personnel would have to monitor and test the spacecraft and launch vehicle systems to ensure their readiness. Air Force Space Command maintenance personnel would need to perform periodic checkout and repair of space systems and support equipment. Base-level repair would be required, as well as depot-level repair through Air Force Logistics and Systems Commands. To respond to an immediate or scheduled need, the appropriate spacecraft and launch vehicle would be prepared, assembled, and launched, by Air Force Space Command. If the launch failed, Air Force Space Command would determine the most appropriate means to satisfy mission objectives even if it meant launching without months of analysis. This is analogous to SAC continuing its mission while accepting the fact that failures occur.

In conclusion, as space systems begin to play more important roles in national security, space launch operations should be controlled by an operationally-oriented command. As explained in the draft revision of AFM 1-6,

> Air Force space systems and personnel make significant contributions to deterrence and the maintenance of the security of the United States and its allies. Space-derived information and capabilities are essential for the accomplishment of all existing Air Force missions and specialized tasks. (25:2)

Air Force operational commands control air-derived information and capabilities to support all missions and tasks. Air Force Space Command should control all space-derived information and capabilities; among them is space launch operations.

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