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A Thesis
Presented to the Faculty
of
The Fletcher School of Law and Diplomacy
by

PETER L. HAYS

In Partial Fulfillment of the requirements for the
Degree of Doctor of Philosophy

May 1994

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In closing, let me emphasize that any errors of fact or analysis in this text are solely my responsibility. Additionally, the views presented below are my personal opinions and do not reflect the official positions of the Department of Political Science at the Air Force Academy or the United States Air Force.

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LIST OF ABBREVIATIONS

AAF	Army Air Force
ABMA	Army Ballistic Missile Agency
ABMT	Anti-Ballistic Missile Treaty
ACDA	Arms Control and Disarmament Agency
ACTS	Air Corps Tactical School
ADC	Air (and Aerospace) Defense Command
AFA	Air Force Association
AFB	Air Force Base
AFBMD	Air Force Ballistic Missile Division
AFM	Air Force Magazine
AFM 1-1	Air Force Manual 1-1
AFM 1-6	Air Force Manual 1-6
AF MIS	Air Force Man-In-Space
AFS	Air Force Station
AFSATCOM	Air Force Satellite Communications System
AFSC	Air Force Systems Command
AFSCF	Air Force Satellite Control Facility
AF/SD	Air Force/Space Digest

AFSPACECOM	Air Force Space Command
ALMV	Air-Launched Miniature Vehicle
ALS	Advanced Launch System
APVO	Aviation of Air Defense (Soviet Union)
ARDC	Air Research and Development Command
ARPA	Advanced Research Projects Agency
ASAT	Anti-Satellite
ASTP	Apollo-Soyuz Test Project
AUCADRE	Air University Center for Aerospace Doctrine, Research, and Education
AUQR	Air University Quarterly Review
AUR	Air University Review
AWPD	Air War Plans Division
BMEWS	Ballistic Missile Early Warning System
BMD	Ballistic Missile Defense
BoB	Bureau of the Budget
BSTS	Boost Surveillance and Tracking System
CCD	Charged Coupled Device
CELV	Complementary Expendable Launch Vehicle
CEP	Circular Error Probable
CIA	Central Intelligence Agency
CJCS	Chairman of the Joint Chiefs of Staff
CNO	Chief of Naval Operations

COMINT	Communications Intelligence
COPOUS	Committee on the Peaceful Uses of Outer Space (United Nations)
CSOC	Consolidated Space Operations Center
DAB	Defense Acquisition Board (DoD)
DARPA	Defense Advanced Research Projects Agency
DCI	Director of Central Intelligence
DCSO	Deputy Commander for Space Operations (Space Division)
DEW	Directed Energy Weapon
DDRE	Director of Defense Research and Engineering (DoD)
DDS&T	Deputy Director for Science and Technology (CIA)
DIA	Defense Intelligence Agency
DoD	Department of Defense
DMSP	Defense Meteorological Satellite Program
DSB	Defense Science Board (DoD)
DSCS	Defense Satellite Communications System
DSP	Defense Support Program
Dynasoar	Dynamic Soaring
EAM	Emergency Action Message
ELINT	Electronic Intelligence
ELV	Expendable Launch Vehicle
EOP	Executive Office of the President
EORSAT	ELINT Ocean Reconnaissance Satellite (Soviet Union)

ETR	Eastern Test Range
FLTSATCOM	Fleet Satellite Communications System
FOBS	Fractional Orbital Bombardment System
FRUS	Foreign Relations of the United States
FY	Fiscal Year
GAO	General Accounting Office
GBMD	Global Ballistic Missile Defense
GEODSS	Ground-Based Electro-Optical Deep Space Surveillance System
G-PALS	Global Protection Against Limited Strikes
GPO	Government Printing Office
GPS	Global Positioning System
GSO	Geostationary Orbit
GUSM	General Staff Directorate for Strategic Deception (Soviet Union)
HASC	House Armed Services Committee
HOE	Homing Overlay Experiment
HQ	Headquarters
IA	Interim Agreement (SALT I)
ICBM	Intercontinental Ballistic Missile
IGY	International Geophysical Year
INF	Intermediate-Range Nuclear Forces
IOC	Initial Operational Capability
IRBM	Intermediate-Range Ballistic Missile

IUS	Interim (and inertial) Upper Stage
JCS	Joint Chiefs of Staff
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KEW	Kinetic Energy Weapon
KH	Keyhole
KSC	Kennedy Space Center
LPAR	Large Phased-Array Radar
LCI	Legally Correct Interpretation (of ABMT)
LEO	Low Earth Orbit
LTBT	Limited Test Ban Treaty
MAD	Mutual Assured Destruction
MHV	Miniature Homing Vehicle (ASAT)
MIDAS	Missile Detection and Alarm System
MIRV	Multiple Independently Targetable Reentry Vehicle
MOL	Manned Orbital Laboratory
MOU	Memorandum of Understanding
MSI	Multi-Spectral Imaging
NACA	National Advisory Committee on Aeronautics
NASA	National Aeronautics and Space Administration
NASC	National Aeronautics and Space Council
NASP	National Aerospace Plane

NCA	National Command Authority
NDS	Nuclear Detonation Detection System
NIE	National Intelligence Estimate
NORAD	North American Air Defense Command
NRO	National Reconnaissance Office
NSAM	National Security Action Memorandum
NSC	National Security Council
NSDD	National Security Decision Directive
NSDM	National Security Decision Memorandum
NSSD	National Security Study Directive
NTMV	National Technical Means of Verification
OMB	Office of Management and Budget
OPP	Other Physical Principles
OSD	Office of the Secretary of Defense
OSI	On-Site Inspection
OST	Outer Space Treaty
OSTP	Office of Science and Technology Policy
PD	Presidential Directive
PRC	Policy Review Committee
PRM	Presidential Review Memorandum
PSAC	President's Science Advisory Committee
R & D	Research and Development

RORSAT	Radar Ocean Reconnaissance Satellite (Soviet Union)
RV	Reentry Vehicle
SAC	Strategic Air Command
SAFSP	Secretary of the Air Force Special Projects
SAINT	Satellite Inspector
SALT	Strategic Arms Limitation Talks (and Treaty)
SAMSO	Space and Missile Systems Organization
SASC	Senate Armed Services Committee
SBR	Space-Based Radar
SDI	Strategic Defense Initiative
SDIO	Strategic Defense Initiative Organization
SFRC	Senate Foreign Relations Committee
SIG	Senior Interagency Group
SIGINT	Signals Intelligence
SLC	Space Launch Complex
SOPC	Shuttle Operations and Planning Complex
SPADOC	Space Defense Operations Center
SSTS	Space Surveillance and Tracking System
STG	Space Task Group
STP	Space Test Program
STS	Space Transportation System
TCP	Technological Capabilities Panel

TELINT	Telemetry Intelligence
TENCAP	Tactical Exploitation of National Space Capabilities
UDRE	Under Secretary of Defense for Research and Engineering
UN	United Nations
UNGA	United Nations General Assembly
USA	United States Army
USAF	United States Air Force
USAFA	United States Air Force Academy
USCINCSPACE	Commander-in-Chief, United States Space Command
USD(A)	Under Secretary of Defense for Acquisition
USN	United States Navy
VAFB	Vandenberg Air Force Base
WDD	Western Development Division
XOS	Directorate for Space Operations

ABSTRACT

This study examines the evolution of U.S. military thinking about how outer space might contribute to U.S. national security during the cold war era. It divides the cold war era into four periods: 1945-*Sputnik* I, *Sputnik* I-1963, 1964-1978, and 1979-1989. The study develops a comprehensive definition of the concept of doctrine and a model for doctrine development. Parts of the model for this study were derived from theoretical insights on doctrine found in Barry R. Posen, The Sources of Military Doctrine and David E. Lupton, On Space Warfare. The model of doctrine development is used to derive hypotheses concerning the evolution of U.S. military space doctrine. The model, together with these hypotheses, forms a comparative framework for evaluating how U.S. military space doctrine evolved. Four research questions guide this study: 1) Were national security considerations or organizational behavior inputs more important in the development of U.S. military space doctrine during the cold war? 2) What were the most prominent U.S. military doctrinal beliefs during each period of the cold war and how did these doctrinal beliefs relate to overall U.S. space policy at these times? 3) What were the specific interrelationships between individual U.S. military space organizations and particular military space doctrine beliefs? and 4) Did the developmental path for spacepower during the cold war era follow a course similar to the airpower developmental path which led to the creation of an independent Air Force in 1947? The comparative framework and these research questions guide an analysis of developments in various issue-areas during the four periods of the cold war era. Primary sources include the U.S. Military Uses of Space, 1945-1991 microfiche document set and the space-related NSC documents at the National Archives.

The major findings of this study indicate: national security considerations generally were more important than organizational behavior inputs in conditioning

military space doctrine outcomes during the cold war; doctrinal issues conditioned the creation and preferences of military space organizations in significant ways; and the airpower development historical analogy is not very appropriate for describing the actual evolution of spacepower development during the cold war era.

CHAPTER ONE: INTRODUCTION, OVERVIEW, METHODS

For millennia man has pondered his relationship with the cosmos. But it has only been within the last century or so that man really started dreaming in earnest and actually building some of the tools needed to "leave the cradle." Individuals such as H.G. Wells, Jules Verne, Konstantin Tsiolkovsky, Robert Goddard, Sergei Korolev, Wernher von Braun, and Eugen Sanger helped to lay the theoretical and practical foundations of spaceflight. The dreams and visions of these and countless others came to fruition with the launch of *Sputnik* I on 4 October 1957. The opening of the space age forever changed man's view of himself and his relationship with the cosmos. Man's visions of space and of his role and purpose in the cosmos are as varied as individuals themselves and include ideas as extreme and diametrically opposed as universal peace and total domination. At the opening of the space age it was unclear what form these visions would take and today it remains unclear how man's entry into space will ultimately impact life on earth.

The interrelationships between outer space and national security concerns on earth have been a particularly salient feature of the space age to date. Indeed, the cold war rivalry between the United States and Soviet Union was the primary factor in motivating much of man's space activity during the first thirty years of the space age while, at the same time, this space competition itself also helped to shape aspects of the cold war in fundamental and subtle ways.[1] Each superpower saw space as an important strategic

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[1]The best broad treatment of the political ramifications of the opening of the space age is Walter A. McDougall's Pulitzer Prize winning history _... the Heavens and the_

arena and attempted to build security and enhance prestige through space activities but each also feared being beaten by the other side in the various space races of the cold war. The high-level and multifaceted security considerations generated by the space age demanded a great deal of attention from the top-level national security decision-makers of the superpowers from *Sputnik* to the Strategic Defense Initiative (SDI).

Lower-level military programs and organizational choices also drove many of the space activities of the superpowers during the cold war. Improvements in space technology steadily increased the capabilities of military space systems and multiplied their ability to enhance terrestrial forces. Moreover, these improvements in technology also opened the door for the possible development of significant space-to-space and space-to-earth force applications. The military Services and military leaders grappled with these improvements and sought to build organizations and doctrine which reflected these changes. Thus, the space component of the strategic relationship between the superpowers during the cold war was a reflection not only of high-level, top-down national security considerations but also of lower-level, bottom-up organizational behavior considerations.

This dissertation helps to explain the space component of the strategic relationship between the superpowers by examining in detail developments related to the evolution of U.S. military space doctrine during the cold war. Four basic research questions guide this study. The first two questions focus on ways to categorize the space doctrine developments of the cold war era: 1) What factors exerted the most significant influence on the evolution of U.S. military space doctrine during the cold war? and 2) What were the most prominent U.S. military space doctrinal beliefs during various periods of the cold war and how did these doctrinal beliefs relate to overall U.S. space policy at these times? The first question is examined by using the model for doctrinal development which is presented in chapter two. The model focuses on five primary sources for

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Earth: A Political History of the Space Age (New York: Basic Books, 1985). McDougall's major theme is that the U.S. embraced technocracy in many fields in order to compete more successfully with the Soviets in the space race.

doctrinal development: national security considerations, civilian leadership, technology, military leadership, and organizational behavior. The model and a set of hypotheses are used to create a comparative framework. The comparative framework will help us to answer question number one more explicitly by providing a tool for evaluating whether national security considerations or organizational behavior considerations were more important in the evolution of U.S. military space doctrine beliefs during the cold war. The second question is examined in detail by studying the evolution of major U.S. military space doctrine beliefs and tracing the most important relationships between these beliefs and the doctrinally-related portions of U.S. national space policy while moving chronologically through the cold war.

Doctrine was chosen as the focus of this study because it is a key concept in shaping the relationship between military forces and the strategic environment. Military space doctrine also seems to be a promising line of inquiry since it is a relatively unexplored area which is somewhat less convoluted and better bounded than overall space policy. Unfortunately, however, as will become apparent from the analysis in the chapters below, during many periods of the cold war there was little consensus on military space doctrine and many doctrinal issues remained unresolved by the end of the cold war era. Moreover, the concept of doctrine itself is quite amorphous and complex; this concept is examined in greater detail in chapter two. For our purposes now it is enough to say that this dissertation is a study of how the U.S. military developed perspectives on the relationships between space and national security and then created plans, systems, and organizations designed to use space to enhance national security during the cold war.

From a broader perspective, this is also a study on the role of doctrine in strategy and military thought. Doctrine orients a military. Doctrine is the set of beliefs which attempts to translate national security strategies and policies into specific military objectives; to develop the most effective military strategies for accomplishing these objectives; and to create appropriate military organizations, systems, and tactics for obtaining these objectives. Thus, doctrine functions at both the conceptual and the operational levels. This study helps to illustrate the conceptual level of doctrine by showing how doctrine is formulated and what types of factors seem to influence doctrinal development most directly. The study also helps to highlight the application level of doctrine by examining the development of major U.S. military space systems and the military's employment plans for operational space missions. The iterative nature of doctrinal development and the feedback loop involved in this cycle is also shown by examining the relationships between doctrine and hardware while moving through the cold war period. All of these factors contribute to the concept of doctrine. Clearly, we must understand the role of doctrine in military thought to understand how the military views space and to examine the interrelationships between space and national security.

The emphasis on doctrine in this study also helps to highlight the inherent interrelationships between doctrine and organizations. These relationships flow in both directions: organizations are likely to promote doctrines which build upon and expand their roles while doctrine may indicate that organizations should be expanded, reduced, or that new organizations should be created. These two-way links between doctrine and organization lead to the third basic research question for this study: 3) What were the specific interrelationships between individual U.S. military space organizations and particular military space doctrine beliefs during the cold war? Space doctrine was an important consideration in motivating the creation of several important new space-related organizations during the cold war such as: the National Aeronautics and Space Administration (NASA), the National Reconnaissance Office (NRO), Air Force Space Command (AFSPACECOM), and U.S. Space Command (USSPACECOM). At the same time, almost all major space-related organizations developed specific doctrinal outlooks and preferences which generally attempted to advance their bureaucratic interests.

Within the U.S. military, the Air Force usually has had the lead in defining the relationships between space and national security and in developing plans and systems to use space to enhance national security. The analysis of how the Air Force maneuvered to become the dominant Service for space and maintained its position of preeminence in space operations within the Department of Defense (DoD) is a major part of the story related to space doctrine evolution presented in the chapters below. Thus, the study will also focus on the links between organizations both within the Air Force and outside the

Air Force as they relate to space doctrine. As we shall see, the many different perspectives on and types of concerns with U.S. military space doctrine emphasized by separate actors and organizations have often led to a lack of coherence and consistency within this doctrine and can make space doctrine a difficult body of thought to embrace and analyze.

The fourth basic research question for this study is motivated by the fact that many analysts who look at military space issues draw an historical analogy between the developmental paths of the technologies, doctrines, and organizations created to exploit the military potential of the air and space mediums.[2] This study highlights when space policy analysts or space doctrine-makers use the course of airpower development as an analogy to explain or predict the course of spacepower development. More specifically, the final research question asks: 4) Did the developmental path for U.S. military spacepower during the cold war era follow a course similar to the airpower developmental path which led to the creation of an independent Air Force in 1947? This dissertation will not undertake a review of the technologies, doctrine, or organizations related to the development of airpower. Rather, three critical steps in the development of U.S. airpower are identified and are used as milestones to examine whether comparable spacepower developments took place during the cold war. Briefly, three critical airpower development steps along the road to the creation of the independent Air Force were: the demonstration of a new type of force application via airpower, the development of a refined and accepted airpower doctrine centered on force application via airpower, and significant calls for the creation of an independent air force from within the military. These three critical steps in the development of U.S. airpower are discussed in greater

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[2]See, for example, Thomas Karas, The New High Ground: Systems and Weapons of Space Age War (New York: Simon & Schuster, 1983), 9-37; and John M. Collins, Military Space Forces: The Next 50 Years (Washington: Pergamon-Brassey's, 1989), 81-83. Karas indicates that in the early 1980s some observers (even within the Air Force) felt that the Air Force was taking the same obstructionist role against military spacepower development as was taken by the Army and Navy against the airpower development championed by Brigadier General William (Billy) Mitchell and others in the interwar period.

detail in chapter two. The course of the evolution of spacepower is inherently related to the raison d'etre, core values, and future of the Air Force. It would certainly be ironic if the Air Force, which is itself the product of the doctrine developed to exploit the military potential of the air medium, is institutionally inhibited from thinking in innovative ways about doctrines designed to exploit the military potential of the space medium.

Finally, the end of the cold war creates important motivations for this study. The end of the cold war provides a unique vantage point from which to conduct a more balanced and dispassionate survey of the developments related to the evolution of U.S. military space doctrine than would have been possible previously. Many of the developments discussed below were, at the time, highly charged politically and were the object of intense passions which now largely seem quaintly anachronistic. Most of the earlier studies on military space developments are overly colored by one of the dichotomous views on the military utility of space.[3] Undertaking this study close to the

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[3]For the perspective of those opposed to the "militarization" of space, see, for example, Paul B. Stares, The Militarization of Space: U.S. Policy 1945-1984 (Ithaca: Cornell University Press, 1985); Jack Manno, Arming the Heavens: The Hidden Military Agenda for Space, 1945-1995 (New York: Dodd, Mead & Co., 1984); and Karas, The New High Ground. Stares' work is considered by many to be a definitive work in U.S. military space policy and his descriptions of U.S. ASAT developments are the most complete of any single source. However, his arms control bias and space as sanctuary perspective colors his analysis to the point where he creates the impression that throughout the cold war U.S. ASAT developments were fueling a major arms race in space and that the U.S. MHV ASAT system developed beginning in the late 1970s had no legitimate strategic purpose. Major works on the other side of this debate include: Lieutenant General Daniel O. Graham, USA, (Ret.) High Frontier: A New National Strategy (Washington: High Frontier, 1982); Colin S. Gray, American Military Space Policy: Information Systems, Weapons Systems and Arms Control (Cambridge, MA: Abt Books, 1982); Keith B. Payne, ed., Laser Weapons in Space: Policy and Doctrine (Boulder: Westview Press, 1983); and Angelo M. Codevilla, While Others Build: The Commonsense Approach to the Strategic Defense Initiative (New York: Free Press, 1988). Of course, my biases also color this study. Let me therefore state at the outset that I subscribe to the *realpolitik* view of international relations. I believe that potential military space applications should be approached like potential military applications in any other medium; they should be investigated as quickly as possible and developed as rapidly as required by national security considerations. I also believe that, generally, this

end of the cold war has also allowed me to include subtle details with which I am personally familiar. More importantly, because space doctrine has been and will be instrumental in opening and closing the avenues by which the U.S. military conceptualizes the relationships between space and national security and is a key element of institutional identity, space doctrine is an especially important concept to study as we enter the post cold war era. The structure of space organizations as well as the role of and proportion of military resources allocated to space forces are critical issues which the U.S. must now confront as we attempt to reorient the military to the security challenges of the post cold war era.

Overview of Study

The study is divided into seven chapters. This first chapter provides a blueprint of the entire dissertation and also discusses the scope and methods for the study. Chapter two provides definitions for the most important concepts used in the study. Chapter two also develops a model for analyzing doctrinal evolution and derives a comparative framework from this model for use in analyzing U.S. military space doctrine outcomes during the cold war.[4] Chapters three through six use the model to guide a chronological analysis of the major developments related to U.S. military space doctrine during the cold war. Each of these chapters also use the comparative framework to evaluate the relative strength of national security considerations and organizational behavior in conditioning the major doctrinal outcomes for that period. The final chapter summarizes the results from applying the comparative framework in chapters three through six and also presents the overall conclusions and implications of the study. A more detailed overview of the

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investigation of the military potential of space did not take place as fully or quickly as it should have during the cold war.

[4]As described in greater detail in chapter two, parts of the model for doctrinal analysis in this study are derived from Barry R. Posen, The Sources of Military Doctrine: France, Britain, and Germany Between the Wars (Ithaca: Cornell University Press, 1984); and from Lieutenant Colonel David E. Lupton, USAF, (Ret.) On Space Warfare: A Space Power Doctrine (Maxwell Air Force Base, AL: Air University Press, June 1988).

chronological portion of the study (chapters three through six) is outlined below.

In analyzing the development of U.S. military space doctrine during the cold war, chapters three through six examine the roots and evolution of the major schools of thought on military space doctrine which emerged during this period. According to David E. Lupton's important 1988 work in this field, On Space Warfare: A Space Power Doctrine, the four primary schools of thought on the interrelationships between space and security during the cold war era were organized around the major concepts of: sanctuary, survivability, control, and high ground.[5] Briefly described, the sanctuary school underscores the critical stabilizing functions played by space systems and emphasizes that space should be free from weapons, the survivability school stresses the need for protected and redundant space system capabilities, the control school is analogous to the concepts of sea or air control and calls for the ability to engage and destroy enemy space assets as required to protect one's own forces and capabilities or to deny the enemy the free use of space, and the high ground school emphasizes the potential of space to decisively impact terrestrial conflict through space-to-space and space-to-earth weapons. The concepts within these four schools are more fully developed in chapter two and the evolution of these concepts is explored in greater detail and illustrated by developments related to U.S. military space doctrine.

Chapter three, "Squandered Inheritance," discusses the period from 1945 through the launch of *Sputnik* I. During the earliest portions of this period, U.S. military space doctrine and military space programs were practically nonexistent despite the fact that the U.S. had captured the majority of the German V-2 missile team under Wernher von Braun. Indifference towards ballistic missiles and disdain for the idea of satellites amongst most U.S. scientific and military leaders caused the U.S. essentially to abandon any space efforts until after the Korean War. After the Eisenhower administration came into office, strong top-down advocacy helped to accelerate U.S. ballistic missile and spy

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[5]Lupton puts his major emphasis on developing the theoretical basis for these four primary schools of thought on military space doctrine and less emphasis on linking specific developments to specific schools of thought. The emphasis in this study is on the latter.

satellite development efforts significantly. Just as importantly, the top-level leadership within the Eisenhower administration also developed a set of coherent, but highly secret, national space policy objectives. The primary U.S. objectives were to create spy satellites to help open up the closed Soviet state *and*, simultaneously, to attempt to protect these spy satellites by helping to create a new international legal regime which would legitimize this activity by making space a sanctuary from which to conduct intelligence collection operations. None of the Services had developed military space doctrines at this time but each saw ballistic missile development as a springboard for its entry into space. This was also a period marked by significant interservice rivalry over space-related roles and missions, especially between the Army and the Air Force over the development of intermediate range ballistic missiles (IRBMs).

Chapter four, "Clash of the Titans," covers the period from the launch of *Sputnik* I through the end of 1963. Although this is the shortest of the cold war periods categorized by this study, in many ways it is the most important and most dynamic. Space-related tensions between both the Eisenhower and Kennedy administrations and the military were pronounced at this time due to the strong sanctuary outlook of these administrations and the strong desire of the military to investigate high ground military space applications. Immediately after *Sputnik*, the Air Force asserted that it should be responsible for the "aerospace" medium above the earth's surface and aggressively moved to gain control over the U.S. national space program and responsibility for manned space flight. The Air Force generally was successful in asserting its primacy over space within DoD. However, following the creation of the National Aeronautics and Space Administration (NASA) in October 1958, NASA came to control more and more of the national space program and the Air Force fell far short of its initial high hopes in space. Air Force hopes were revived with the advent of the Kennedy administration, but Kennedy soon revealed his civil space preference with his moon landing challenge of 25 May 1961. Worse still from the perspective of the Air Force, Secretary of Defense Robert S. McNamara showed increasing opposition to nearly all major military space plans. The conceptual break marking the end of this period came when McNamara severely curtailed the possibility for operational manned Air Force spaceflight by canceling the Air Force's X-20 Dynamic Soaring (Dynasoar) program in December 1963.

As might be expected, the period from 1964 through 1978, entitled "Sanctuary Supreme" and the subject of chapter five in this study, stood in stark contrast to the previous period and was in many ways one of the least dynamic periods of the cold war in terms of the development of U.S. military space doctrine. The primary strategic concept underpinning the development of U.S. military space doctrine during this period was the Mutual Assured Destruction (MAD) paradigm and its associated emphasis on space as a sanctuary for national technical means of verification (NTMV). MAD was the conceptual basis for the Strategic Arms Limitation Talks (SALT) I agreements of June 1972 and NTMV allowed these agreements to be implemented without the previous stumbling block of on-site inspection (OSI). The critical enabling role of NTMV in SALT I was indirectly recognized by these agreements when they further legitimized spy satellites and, for the first time, officially codified that neither superpower would interfere with the NTMV of the other. The Outer Space Treaty (OST) of 1967 was also an important development during this period which indicated that the superpowers were willing to foreclose military options with limited utility in return for public relations benefits and similar restraints on all other signatories. Both the U.S. and the U.S.S.R. deployed a very limited number of anti-satellite (ASAT) weapons during this period, an indication that political pressures and technological advances would make the preservation of space as a sanctuary increasingly difficult. For much of this period, the U.S. military was preoccupied with the war in Vietnam and devoted little attention or effort to space.

The final chapter on the development of U.S. military space doctrine and space systems during the cold war is entitled "Increasing Militarization and Possible Weaponization" and covers the period from 1979 through 1989. Marking a specific time for the beginning of this period is difficult but by 1979 several factors had converged to spark a renewed interest in a slightly more aggressive military space doctrine within the Air Force and elsewhere. Some of these major factors include: the breakdown of detente, the weakening of the MAD paradigm for U.S. strategic planning, the development of significant space-based force enhancement capabilities by both superpowers, and accelerated testing of the Soviet nonnuclear co-orbital ASAT system.

These pressures and others were instrumental in moving the Air Force to create a new major command to consolidate and emphasize Air Force space efforts; Air Force Space Command (AFSPACECOM) was activated in September 1982. Some of these same pressures prompted President Reagan to make his paradigm shattering "star wars" speech of 23 March 1983; this speech completely reordered nearly all perspectives on the military implications of space for the remainder of this period. While the military had very little input into the initiation of the SDI program and generally maintained an arms-length relationship with the Strategic Defense Initiative Organization (SDIO), some elements within the Air Force and Army came to embrace the program and its space-related implications. In recognition of the growing importance of space for all Services, the unified U.S. Space Command (USSPACECOM) was established in September 1985. Following the *Challenger* disaster of January 1986, the Air Force's termination of its F-15 launched miniature homing vehicle (MHV) ASAT in March 1988, and the gradual improvements in U.S.-Soviet relations on the road to the end of the cold war, U.S. military space doctrinal beliefs were again left somewhat adrift and without sharp focus by the late 1980s.

Scope, Sources, and Methods

Before developing the definitions and the model for doctrine analysis or beginning the chronology on the evolution of U.S. military space doctrine during the cold war, a few comments about issues related to the scope, sources and methods for this study are in order. The scope for this study is broad. During much of the cold war, there was little consensus on military space doctrinal beliefs and the concept of U.S. military space doctrine itself was vague and undefined. Official U.S. military space doctrine per se was not promulgated until the 1980s. These official military space doctrine statements of the 1980s are, of course, analyzed and evaluated in detail but they are far too limited in time and scope to capture the full essence of U.S. military space doctrinal developments during the entire cold war period. Accordingly, this study is guided by a broad, politically-based definition of doctrine which, for now, may be succinctly summarized as "what is officially believed and taught about the best way to conduct military affairs[.]" and will analyze various other developments, statements, and space hardware evolution as evidence of doctrine.[6] At the same time, I use the model and selective judgement to help narrow and focus the scope of the study onto the most relevant issue-areas related to doctrinal development.

Conceptually, the scope of this study places it between the doctrinal analysis approaches of Futrell and Lupton. Robert F. Futrell's two volumes entitled Ideas, Concepts, Doctrine provide an extremely detailed chronological presentation of basic Air Force thinking in relation to almost all issue-areas from the earliest days of flight.[7] Futrell is virtually a primary source and delivers his doctrinal history with a minimum of interpretation and without imposing an overall theoretical framework. Lupton, by contrast, emphasizes the conceptual content of his four doctrinal schools and discusses actual doctrinal developments only to the extent necessary to illustrate this conceptual framework.[8] Additionally, Lupton is very direct in advancing the space control school as his preferred doctrinal outcome. In taking the middle ground between these two approaches, this study uses a theoretical framework but is not explicitly advancing any space doctrine school and is not conceptually bound to Lupton's four schools. At the same time, this middle ground approach provides a theoretically driven method for studying the developments related to the evolution of military space doctrine which is more focused than Futrell's detailed chronological approach. Of course, since this study deals with developments related to space doctrine only, it is far more detailed than Futrell in this one area.

Through this middle ground approach, in the course of this study the reader will

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[6]This broad-ranging but pithy definition of doctrine was developed by Duke University historian and retired USAF Reserve Major General I.B. Holley. It is quoted in Lieutenant Colonel Dennis M. Drew, "Of Leaves and Trees: A New View of Doctrine," Air University Review 33 (January-February 1982): 41.

[7]Robert Frank Futrell, Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907-1964 (Maxwell AFB, AL: Air University Press, 1971; reprint, New York: Arno Press, 1980); and Futrell, Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1961-1984, Vol. II, (Maxwell AFB, AL: Air University Press, December 1989).

[8]Lupton, On Space Warfare.

have the opportunity to use a comparative framework to evaluate whether national security considerations or organizational behavior considerations were more important in the development of space doctrinal beliefs. Moreover, the reader also will become familiar with the most important developments related to the evolution of military space doctrine during the cold war and will be introduced to the space doctrine thinking of the individuals who most strongly influenced developments related to U.S. military space doctrine at various times during this era including:

> Presidents Dwight D. Eisenhower, John F. Kennedy, Lyndon B. Johnson, James E. Carter, Jr., and Ronald W. Reagan;
>
> Science Advisors James F. Killian, Jr., George Kistiakowsky, Jerome B. Wisner, and George A. Keyworth II;
>
> Secretaries of Defense Neil H. McElroy, Robert S. McNamara, and Caspar W. Weinberger;
>
> Air Force Secretaries Hans M. Mark, and Edward C. Aldridge, Jr.;
>
> and Generals Bernard A. Schriever, John B. Medaris, Thomas D. White, Daniel O. Graham, James A. Abrahamson, Richard C. Henry, Robert T. Herres, and John L. Piotrowski.

In sum, this middle ground approach both guides the reader conceptually and provides enough detail for the reader to draw his own conclusions regarding the development of U.S. military space doctrine during the cold war.

One major problem in approaching this research topic is that there is often a lack of research material which addresses this subject at a level of analysis deep enough to reveal the motivations behind various doctrinally-related developments in the evolution of U.S. military space doctrine during the cold war. Specific problems related to the data available on this topic include: The strict classification levels surrounding not only many of the military space systems themselves but also many of the processes by which these systems were proposed, funded, developed, and employed. The highly personalized, parochial, or informal decision-making structures often involved in developments related to military space doctrine. And the broad, vague, and multidimensional context in which space doctrine is developed and operates. Thus, while a comparative analysis of the various motivations behind the evolution of military space doctrine is an overall goal of this study, analysis at this level is not always possible. At times, we must be content with understanding just the major developments related to space doctrine evolution themselves rather than always finding the motivations behind these developments. These difficulties in assessing directly the motivations behind the development of U.S. military space doctrine underscore the need for extra care in evaluating the available data on the part of both the author and the reader.

Another issue relates to the nature of some of the data which *is* available on U.S. military space doctrine. Because the period in question is recent history, there has been only a limited amount of analysis thus far and this analysis may have been swayed by the politics of the moment. Likewise, the limited number of open accounts by military space doctrine makers may be skewed or self-serving in various ways.[9] Unfortunately, these problems with the amount and quality of available data are greatly exacerbated by the strict security classifications surrounding much of the most relevant data in this area. Very often, there is no unclassified documentary record available for cross reference. Therefore, the analyst must constantly challenge the validity of allegedly classified data which appears in open sources and attempt, whenever possible, to determine various plausible individual or organizational motives behind making this data public. A more complete and clear understanding of the development of U.S. military space doctrine during the cold war period will only be possible in the future after more basic analysis takes place and more of the classified documentary record is released.

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[9]The major accounts of developments related to military space doctrine written by top decision-makers include: James R. Killian, Jr., <u>Sputnik, Scientists, and Eisenhower: A Memoir of the First Special Assistant to the President for Science and Technology</u> (Cambridge: MIT Press, 1977); Herbert York, <u>Race to Oblivion: A Participant's View of the Arms Race</u> (New York: Simon & Schuster, 1970); Major General John B. Medaris, USA, (Ret.) <u>Countdown For Decision</u> (New York: G.P. Putnam's Sons, 1960); George Kistiakowsky, <u>A Scientist at the White House: The Private Diary of President Eisenhower's Special Assistant for Science and Technology</u> (Cambridge: Harvard University Press, 1976); and Hans Mark, <u>The Space Station: A Personal Journey</u> (Durham: Duke University Press, 1987). It is clear from this listing that the Eisenhower administration is well represented but that, other than Mark's book, there are no subsequent major works by top decision-makers in this area.

In light of the problems just discussed, wherever possible this study focuses upon officially released data rather than upon other published sources which speculate about classified data and systems. I did not consult any classified sources for this stu we shall see, the documentary record for the 1940s, 1950s, and early substantially more complete than for the subsequent periods but security deletio official records are a significant barrier to research even for these earliest periods.

Major primary sources for this study include: the U.S. Military Uses of Space, 1945-1991 microfiche document set prepared by the National Security Archive;[10] the National Security Council (NSC) documents at the National Archives; public official space policy statements; open Congressional testimony; and other government reports and statements. Numerous secondary sources including books, journal and magazine articles, and newspaper articles were also consulted for this study.

A very important set of secondary sources are associated directly with the Air Force: Air University Quarterly Review, Air University Review, Airpower Journal, Air Force Magazine, and Space Digest.[11] Virtually every major space related article during the cold war from these two specialized Air Force sources was examined for this study. Cumulatively, these articles provide an important window through which to view the public side of the development of Air Force space doctrine and they are cited extensively

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[10]U.S. Military Uses of Space, 1945-1991: Guide and Index (Washington: The National Security Archive and Alexandria, VA: Chadwyck-Healey, Inc., 1991).

[11]Between 1947 and 1989 there were three versions of the official professional journal of the Air Force published by the Air University: Air University Quarterly Review from Spring 1947 until Summer 1963, Air University Review from September-October 1963 through January-March 1987, and Airpower Journal from Summer 1987 through the present. The official publication of the Air Force Association, the primary nongovernment airpower advocacy group in the U.S., underwent more significant transformations during this period: The magazine was first published in 1947 under the title Air Force. In June 1959 Air Force became Air Force/Space Digest where Space Digest comprised the second half of each issue and was virtually an independent publication. In February 1971 the magazine marked the de-emphasis of space issues within the Air Force by ending publication of Space Digest and becoming Air Force Magazine.

in the remainder of the study.

Finally, this study is guided by the view that the details surrounding individual developments or events related to doctrinal evolution are often linked in important ways and should be studied together as one issue-area. This approach means that developments and events are not always examined in strict chronological sequence. Organizing the periods of the cold war by issue-areas provides a sequential approach to related developments and allows a greater emphasis on the interrelationships between developments within one issue-area. Moreover, this approach provides a detailed analysis of what happened within a given issue-area before attempting to assess the doctrinal significance of these developments. On the other hand, this approach may also underemphasize contemporaneous developments in related but separate issue-areas. It is hoped that the division of the cold war era into discrete periods, each with its own predominate doctrinal flavor, will help to mitigate against any problems with tracing or understanding the relationships between individual developments within separate issue-areas.

This introductory chapter has addressed why military space doctrine is important, explained the four basic research questions which will be examined by this study, and indicated the research design for the remainder of the study. The next chapter provides definitions for the major concepts used in the study. It also develops the model for doctrinal analysis and the comparative framework which will be used in the subsequent chapters. This framework will help us evaluate whether national security considerations or organizational behavior considerations were more important in the development of U.S. military space doctrine during the cold war. The struggle to understand the development of U.S. military space doctrine during the cold war now begins.

CHAPTER TWO: DEFINITIONS, MODEL, AND HYPOTHESES

Basic Definitions

In chapter one several references are made to the cold war period and the post cold war era. For the focus of this study it will not be necessary to trace all of the details of the subtle changes in U.S.-Soviet relations during the post war period. However, this study design does require that we note the major developments and trends in U.S.-Soviet relations. A basic understanding of the broad trends in U.S.-Soviet relations is required because the doctrine development model presented below posits that leaders' perceptions of the state of U.S.-Soviet relations impacts their likelihood to intervene in the doctrine development cycle and to exert more influence on doctrinal outputs. Examining the origins of the cold war, the precise state of relations at various times during the cold war, or tracing the gradual improvements in superpower relations during the late 1980s and early 1990s leading to the definitive end of the cold war would be interesting but is not specifically relevant to this study. Therefore, for the purposes of this study, the cold war is defined as the period from 1945 through 1989 and the post cold war era encompasses 1990 to the present. These somewhat arbitrary and sharp distinctions are simplifying assumptions which do not correspond to the complex reality of the period but will serve our purposes well enough for this study. These simplifying assumptions will help us to focus more clearly on the development of U.S. military space doctrine between 1945 and 1989 without becoming bogged down in the debates over the origins of the cold war or in attempts to explain and precisely mark the end of the cold war.

Another important operational term for this study which deserves some further explanation is the concept of space itself. Unlike other theaters of military operations which usually can be clearly and distinctly defined, there are no such hard and fast definitions for space. There is no generally agreed upon definition for space or clear line of demarcation between the atmosphere and space. Early in the space age, both superpowers did recognize that objects in sustained orbit were *ipso facto* in space and were no longer covered by the airspace legal regime but neither side sought to codify more precisely the parameters of being in space or, especially, to establish legal definitions for the means by which objects would enter or leave space.[1]

As with so much else related to the opening of the space age, this desire on the part of the superpowers to avoid precise definitions of where space begins and ends related directly to the evolving legal regime for satellite reconnaissance. In this context, the differences between the two distinct legal regimes which pertain to airspace and outer space are of critical importance: Most importantly, states retain sovereignty over their airspace and have often asserted their legal right to shoot down aircraft which violate their airspace but, since orbital mechanics dictate that overflight is an inherent characteristic of almost all orbit types, states have not retained sovereignty over the space above their territory or maintained a legal right to shoot down spacecraft which overfly their territory during peacetime.[2] The distinct legal regime for space began to evolve following the flight of *Sputnik* I and was further codified by United Nations (UN)

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[1]Walter A. McDougall, . . . the Heavens and the Earth: A Political History of the Space Age (New York: Basic Books, 1985), 180, 259. See also the discussion of the defining characteristics of air law as contrasted with space law in F. Kenneth Schwetje and Donald E. Walsh, "Hypersonic Flight: The Need for a New Legal Regime," IEEE AES Magazine 4 (May 1989): 32-36.

[2]All low-Earth orbits (LEO) overfly the territories of states on Earth in varying amounts depending upon their orbital characteristics (primarily their inclination). Polar orbits are designed to overfly all territories. Geostationary Earth orbit (GSO) is located 22,300 miles above the equator, a position where the satellite's orbital velocity matches the Earth's rotational rate and the satellite appears relatively motionless at a point above the equator. The first GSO orbit was not achieved until 1963.

resolutions in 1963 and the Outer Space Treaty of 1967.[3] Establishing the precedent of the legality of space overflight so as to exploit space as a sanctuary for reconnaissance was a primary concern of the Eisenhower administration's space policy.[4] As discussed in chapter four below in greater detail, the Air Force took advantage of this lack of definition and conceptual ambiguity about space by coining the word "aerospace" and asserting that the Air Force should have primary responsibility for missions within what it considered to be the one operational medium above the surface of the earth.[5]

With this appreciation of why precise lines of demarcation between air and space were not desired early in the space age and would continue to lack political utility today, this study adopts the functional definition that objects in sustained orbit are considered in space and rejects the call for a more exact line of demarcation. As discussed below, international law is still far from clear concerning precisely what types of activities are allowed or prohibited within the realm of outer space regardless of where space is considered to begin. In particular, the legal regime covering the status of objects transiting to or from space or capable of sustained trans-atmospheric flight remains very unclear and will not be delved into here.[6]

Another, related, conceptual difficulty surrounds the issue of what constitutes a *military* space system. For this study, a space system is defined as the space hardware plus the software, facilities, and personnel required to launch and perform on orbit tracking, telemetry, and control from ground stations. Conceptual ambiguities between civilian and military uses of space have been with us since the beginning of the space age

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[3]The process and policy implications of the evolution of this distinct legal regime for outer space is discussed in greater detail in chapters three, four, and five below.

[4]McDougall, Heavens and Earth, chapter eight.

[5]On the evolution of the aerospace concept, see Lieutenant Colonel Frank W. Jennings, USAF Reserve, (Ret.) "Doctrinal Conflict Over the Word Aerospace," Airpower Journal 4 (Fall 1990): 46-58.

[6]See Schwetje and Walsh, "Hypersonic Flight," on the problems of defining the legal regime for transatmospheric flight.

and seem to be an inherent characteristic of the medium. The proliferation of space systems and continuous improvements in their capabilities has led to civilian systems with significant military potential and civilian reliance on military systems while further blurring any distinctions between the two. Conceptual ambiguities related to the term military space system arise primarily due to difficulties in making distinctions in three major categories: between civilian and military data flows from space systems, between military and civilian space hardware, and between space systems and non-space systems.

The most difficult of these distinctions to draw relates to the character of data flows from space systems. Data flows for functions such as navigation, communications, weather surveillance, geodesy, and remote sensing are not strictly civilian or military in character and civilian or military users may be provided data from the same space system.[7] While not wishing to minimize the severity and growth of problems in this area, this study considers military-related data flows from any space source, especially military space systems, to be within our purview and will not attempt to distinguish further between types of data flows.

Likewise, in practice there have been and are many overlaps not just in function but also sometimes in actual hardware between military and civilian space systems. Space systems may be explicitly designed for dual use or individual military or civilian components may piggyback onto payloads designed primarily for other uses. Many overlaps also exist in the manufacturing capabilities, launch facilities, and tracking infrastructure which provide for space support. Thus, drawing distinctions in the real

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[7]Perhaps the best example of problems encountered in civilian and military use of the same data flow is provided by the Air Force's NAVSTAR Global Positioning System (GPS). GPS signals are available to all users worldwide and provide highly accurate locational fixes. Because of the potential for hostile military forces to exploit this system, the DoD asserts its right to deliberately degrade these navigational signals to all users who do not have secret military codes under a program known as selective availability (SA). The right of the DoD to employ SA as well as to control and operate the GPS system currently is being challenged by members of Congress, user groups, and the Department of Transportation. See, for example, Scott Pace, "GPS: Challenged by Success," Space News, 30 August-5 September 1993, 15; and Donald Latham, "The GPS War," Space News, 12-18 July 1993, 15.

world may be very difficult. For this study, however, the focus is primarily on strictly military systems -- generally those developed, funded, launched, and operated by the military.

The final distinction, between space and non-space systems, might appear trivial and obvious at first but may be more difficult to make in practice. The crux of this issue is whether an ICBM or IRBM should be considered a space system. Conceptual difficulties in this area were most pronounced in the earliest days of the space age when the military dreamed of using its boosters to conduct significant manned military missions in space. For example, the actual hardware differences between an Atlas ICBM and the Atlas booster which carried astronaut John Glenn into orbit were minimal but their missions were obviously quite different. Accordingly, this study examines in some detail the military's development of early U.S. missiles which were designed primarily as ICBMs or IRBMs because the Services initially hoped that these systems might help them gain significant military man-in-space missions and because many of these boosters went on to form the backbone of our early space launch capability. During later periods of the cold war the study does not look at the military's development of ICBMs and IRBMs because technical developments and more clear distinctions between civilian and military roles in space made the use of these systems in space missions unlikely. Thus, for the purpose of this study, ICBMs and IRBMs are not considered space systems.[8]

Definitions of the Four Space Doctrine Schools

This section further explains and develops the concepts behind the four schools of thought on the military uses of space which were briefly introduced in chapter one. The approach of using four viewpoints to describe most of the mainstream perspectives on the military utility of space was first developed by Air Force Lieutenant Colonel

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[8]For the opposite view on this distinction from the then-Commander of USSPACECOM, see General Robert T. Herres, "The Future of Military Space Forces," Air University Review 38 (January-March 1987): 40-47. Herres indicates that "[b]allistic missiles *are* space systems; about 98 percent of the ballistic trajectory occurs in space." Moreover, he argues that "[b]y any definition, the postboost vehicles [the "bus" and reentry vehicles] of ICBMs *are* spacecraft." Page 42, emphasis in original.

David E. Lupton in 1983 and was the basis of his 1988 book, On Space Warfare.[9] Lupton refers to these four ways of looking at military space potential as "doctrines;" I have chosen to use the term "schools of thought" in this study to emphasize the often inchoate, non-distinct, and conceptually incomplete nature of the perspectives within these four areas. The discussion of the major military space developments during the cold war in the chapters below illustrates how these four schools of thought developed and evolved. The major concepts within each of these schools as they will be used in this study are described below. Most portions of the definitions below were derived directly from Lupton's four part conceptual framework; however, some aspects of Lupton's definitions have been modified or further developed for greater conceptual clarity.

The sanctuary school of thought posits that the most useful military applications of space are for systems which enhance strategic stability and facilitate strategic arms control. Spy satellites perform both of these critical functions by monitoring the strategic forces of potential enemies and providing NTMV for arms control agreements. Early warning satellites, such as the U.S. Defense Support Program (DSP) system, also strengthen strategic stability by providing the worldwide surveillance of ballistic missile launches which enhances the survivability of and control over retaliatory strategic forces. Other military space systems, particularly communications satellites, may also contribute to strategic stability. The sanctuary school clearly fits very closely with the MAD paradigm for strategic deterrence. Because of the critical importance of the stabilizing functions performed by spacecraft, proponents of the sanctuary school believe that space must be kept free of weapons and they are especially concerned with prohibiting ASAT weapons which threaten spacecraft performing these vital functions.[10] Critics of this school charge that it attempts to ignore the reality of dedicated ASAT systems and

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[9]Lieutenant Colonel David E. Lupton, USAF, (Ret.) "Space Doctrines," Strategic Review 11 (Fall 1983): 36-47; and Lupton, On Space Warfare: A Space Power Doctrine (Maxwell AFB, AL: Air University Press, June 1988).

[10]For a detailed discussion of the concepts behind the sanctuary school, see Lupton, On Space Warfare, chapter four. Lupton describes the basic tenet of this school as "space surveillance systems make nuclear wars less likely," page 52.

residual ASAT capabilities and that it fosters a space environment conducive to the development of very threatening and destabilizing space systems.[11]

The survivability school is in some ways the least well defined of the four schools of thought about the military utility of space. The survivability school is clearly related to the sanctuary school in that it also sees the ability of spacecraft to enhance stability as their most important function. However, the survivability school represents an evolution away from the sanctuary school because it indicates that technological developments mean that space can no longer be maintained as a sanctuary and, moreover, it recognizes that space systems deployed to promote stability also have significant potential for enhancing the military effectiveness of terrestrial forces. This school also emphasizes and derives its name from the idea that space systems are inherently less reliable, supportable, and survivable than are terrestrial forces and must therefore specifically be designed to enhance their survivability. The survivability school can thus be seen as a type of conceptual half-way house between the sanctuary and control schools which cautions against relying too heavily upon inherently vulnerable space assets for either stabilizing functions or terrestrial force enhancement in conflict scenarios. Critics of the survivability school question whether space systems are inherently more vulnerable than other types of military systems and oppose the restrained approach to military space advocated by this school.[12]

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[11]Difficulties in distinguishing between stabilizing and destabilizing space systems is a major conceptual challenge for the sanctuary school. Ashton Carter identifies this conceptual problem and the inverse relationship between ASATs and threatening spacecraft as "the basic paradox of ASAT arms control: to the extent that ASAT development is suppressed and the vulnerability of spacecraft masked, the superpowers will be more and more tempted to deploy threatening spacecraft. And to the extent that they do so, pressures will in turn build to set aside the treaty and deploy ASATs." See Ashton B. Carter, "Satellites and Anti-Satellites: The Limits of the Possible," International Security 10 (Spring 1986): 68.

[12]The concepts behind the survivability school as well as the vulnerabilities of satellites to various types of weapons are discussed in detail in Lupton, On Space Warfare, chapter five. Lupton finds that the case for the vulnerability of space systems is overstated by this school. Another major discussion of the range of threats to military

The third major school of thought on space holds that space should be considered in a manner similar to other military theaters of operation and that the primary initial military objective in space should be to attempt to gain control over the space environment. In this regard, analogies are often drawn from the concepts of sea control or air superiority to discuss the space control school. The space control school also posits that both offensive and defensive operations are likely to be conducted in space. The space control school provides less focus on defining what specific purpose(s) are served through space control. Thus, while space control can be considered independently, this concept is often linked with its role in helping to accomplish military missions from space such as reconnaissance, force enhancement, and force application or could also be linked with non-military functions such as exploration and commercial exploitation of space. Critics of the space control approach charge that this school encourages an expensive and unnecessary arms race in space which they believe would not enhance security on earth.[13]

The final major school of thought on the military utility of space holds that space clearly has the potential to be the decisive theater of combat operations. Reasoning by historical analogy, the high ground school posits that just as holding the high ground is often the decisive factor in a land battle or as airpower often predominates over land and sea forces, in the future, space forces will predominate over terrestrial forces. Lupton, along with most other analysts in the 1980s, links the high ground school directly with President Reagan's "star wars" speech and the concept of space-based ballistic missile defense (BMD). Accordingly, the high ground school is also clearly linked with the

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space systems which emphasizes the limits of survivability is found in Colonel Robert B. Giffen, USAF, US Space System Survivability: Strategic Alternatives for the 1990s (Washington: National Defense University Press, 1982).

[13]See Lupton, On Space Warfare, chapters seven and eight for more detail on the space control school. Lupton's primary purpose in his book is to advance the space control school as the most appropriate space strategy for the U.S. In so doing, however, his discussion of the basic tenets and broad critiques of the space control school is even more limited than for the other schools.

concepts of warfighting and defense for strategic deterrence and diametrically opposed to the sanctuary school and the MAD paradigm for strategic deterrence. Conceptually, however, the high ground school is broader than current strategic debates and envisions force application missions from space for more than just BMD. As the widespread debate over SDI indicated, many oppose these high ground concepts for several reasons including: the destructive impact on MAD (the putative basis for strategic stability); the alleged extreme expense and technological barriers involved; and the likelihood of stimulating a wide-open arms race in space.[14]

These basic attributes of the four schools of thought on the military utility of space are consolidated and presented in table one below. Table one also contains brief descriptions of space system characteristics and employment strategies which derive from each of the doctrinal schools. Next, likely combat missions for space forces operating in accordance with each of these schools are listed. Finally, the types of military organizations for space operations and advocacy usually desired by the proponents of each school are also listed. The basic concepts behind this table were derived from Lupton's descriptions in On Space Warfare but these basic definitions were modified in accordance with the definitions above and were extended into different areas in this table in order to present a more complete and useful typology for this study.

The Airpower Development Analogy and Three Critical Steps in Airpower Development

This section briefly shows why the development of airpower is often used as an historical analogy for the development of spacepower, describes three critical steps in the development of U.S. airpower, and explain how this study will look for comparable steps in the development of spacepower. At least superficially, there are numerous similarities between the development of military airpower and spacepower. Both deal with the conceptually difficult topic of how best to exploit the military potential of a new and fundamentally different military medium. Both are highly dependent upon current and projected technological developments. And in both cases the doctrinal preferences of powerful military organizations have been an integral part of the developmental paths of

[14]See Lupton, On Space Warfare, chapter six for more on the high ground school.

TABLE 1 : ATTRIBUTES OF MILITARY SPACE DOCTRINE SCHOOLS

Doctrinal Schools	Doctrinal Attributes: Primary Value and Functions of Military Space Forces	Space System Characteristics and Employment Strategies	Conflict Missions of Space Forces	Desired Military Organizations for Operations and Advocacy
Sanctuary	Enhance Strategic Stability Facilitate Arms Control	Limited Numbers Fragile Systems Vulnerable Orbits Optimize for NTMV	Limited	None
Survivability	Above functions plus: Limited Force Enhancement		Limited Force Enhancement Degrade Gracefully	Major Command or Unified Command
Control	Control Space Significant Force Enhancement	Redundancy Hardening On-Orbit Spares Crosslinks Maneuver Less Vulnerable Orbits Stealth Reconstitution Capacity Defense Convoy	Control Space Significant Force Enhancement Defend Friendly Space Systems Deny Enemy Use of Space	Unified Command or Space Force
High Ground	Above functions plus: Decisive Impact on Terrestrial Conflict BMD		Above Missions plus: Decisive Space-to-Space and Space-to-Earth Force Application BMD	Space Force

airpower and spacepower.

More specific developmental similarities can also be drawn. The first military use of these two new mediums was for observation and reconnaissance. Initially, both the air and the space mediums were treated as separate from the combat environment but tactical, technological, and political developments soon eroded this distinction. In both cases, as military technologies improved, the military uses of these mediums expanded greatly. Thus, the military uses of airpower rapidly evolved from reconnaissance to force application and air control. The continuing evolution of spacepower technologies creates the potential for spacepower to develop similar military applications. The most powerful early doctrines developed for both airpower and spacepower emphasized the war-winning potential of strategic applications of force from these new combat mediums. Organizationally, airpower advocates along with technological evolution and doctrinal developments were responsible for pushing an incremental series of organizational changes within the structure of the U.S. military. These factors prompted the Army to reorganize its air component several times as airpower developed and became more important. The changes led from the Air Service to the Air Corps to the Army Air Forces and finally to the independent Air Force. The emergence of AFSPACECOM and USSPACECOM may be similar organizational steps towards the eventual creation of an independent space force.

Of course, not all aspects of the development of airpower and spacepower are similar. While aspects of early airpower technologies were certainly very challenging technologically, these problems do not match the scale and complexity of the technological challenges of spacepower development. The development of spacepower technologies has required sustained large-scale governmental investments; unlike airpower developments, breakthroughs in spacepower technologies are unlikely to emerge from some individual's home workshop. These differences in technological complexity and expense between spacepower development and airpower development along with the extreme hostility of the space environment has meant that spaceflight is orders of magnitude less frequent than flight. More specifically, the role of military man in these two mediums has been markedly different so far. Pilots were an integral part of the development of airpower. By contrast, the vast majority of space systems are unmanned, astronauts have been explicitly demilitarized, and thus far these individuals have contributed little to the development of military space doctrine. Finally, force enhancement, the primary military mission of space forces throughout the cold war, has developed in a militarily unique way to the extent that there are no comparable force enhancement functions performed by airpower.

In retrospect, three critical steps stand out from the developmental path of U.S. airpower towards an independent air force.[15] The first of these steps came when Brigadier General William (Billy) Mitchell and other airpower advocates demonstrated a new and different type of force application through airpower. On 18 and 21 July 1921 Mitchell led a brigade of Martin MB-2 aircraft which bombed and sank the captured German cruiser *Frankfort* and battleship *Ostfriesland* while anchored. Following this successful airpower demonstration, in his characteristic hyperbolic style, Mitchell declared that "the problem of the destruction of seacraft by Air Forces had been solved and is finished."[16] While this claim was wildly overstated, Mitchell's important demonstration

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[15]There is a large body of literature which discusses the development of airpower technologies, doctrine, and organizations prior to the creation of the independent Air Force. See, for example, Robert Frank Futrell, Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907-1964 (Maxwell AFB, AL: Air University Press, 1971; reprint, New York: Arno Press, 1980); Michael S. Sherry, The Rise of American Air Power: The Creation of Armageddon (New Haven: Yale University Press, 1987); and DeWitt S. Copp, A Few Great Captains: The Men and Events that Shaped the Development of U.S. Air Power (Garden City, NY: Doubleday & Company, 1980). On specific links between airpower doctrine and military space doctrine with an emphasis on the role of the ACTS in developing airpower doctrine, see Major Peter A. Swan, ed., The Great Frontier -- Military Space Doctrine: A Book of Readings for the United States Air Force Academy Military Space Doctrine Symposium, 1-3 April 1981 (Colorado Springs: USAF Academy, 1981), especially the papers by Major Charles D. Friedenstein, "A Concept: The USAF Space Operations School," Vol. II, 544-53; Major Robert L. Swedenberg, "In Search of an Environment for the Growth of Space Doctrine," Vol. III, 582-613; and Second Lieutenant Michael A. Syiek, "The Air Force and the Space Force: The Role of the Air Corps Tactical School in the Development of Air Power," Vol. II, 554-81.

[16]Futrell, Doctrine, Vol. I, 21 (page references are to reprint edition).

did provide paradigm-challenging evidence that the U.S. military's coastal and hemispheric defense missions might be performed by aircraft. The second critical step in the development of U.S. airpower came when the doctrine of unescorted daylight precision strategic bombardment was developed by the Air Corps Tactical School (ACTS). This doctrine was the basis of Air War Plans Division (AWPD)-1, the strategic air war plan of the U.S. Army Air Forces (AAF) entering World War II. AWPD-1 reflected a strategic force application doctrine which was intellectually supported by the AAF and backed by a significant amount of hardware designed around this doctrine. The final critical step was less discrete and evolved over time. This step involved the evolution of the belief *within* the U.S. military that an independent air force was needed to exploit fully the unique combat potential of the air medium. The first strong support for the concept of an independent air force coalesced around Mitchell's outspoken advocacy of this idea in the 1920s. Operationally supported, more deeply held, and far more widespread doctrinal belief in the need for an independent air force developed during and after World War II. The airpower lessons of World War II indicated the need for a separate Air Force due to the major strategic and tactical impact of force application from the air on the course of the conflict and because the operational costs of applying airpower piecemeal or subordinating air operations to ground commanders were illustrated during the conflict.

Comparisons between these three critical steps from the development of U.S. airpower and developments during the evolution of U.S. spacepower during the cold war era can help us assess more specifically whether spacepower developments followed a similar path to airpower developments. In chapters three through six below, the major developments related to the evolution of U.S. military space doctrine during each period of the cold war will be compared with these three critical steps. In this way, this study assesses and evaluates important specific links between the developmental paths of airpower and spacepower. This conceptual framework is not designed as a means for asserting that spacepower should develop in accordance with these three specific steps or that these particular steps are required prior to the potential creation of an independent space force in the future. Rather, this framework is designed to test whether U.S.

military airpower development is an appropriate historical analogy for U.S. military spacepower development during the cold war.

Concepts Related to and Definitions for Doctrine

Next, we must turn and attempt to define and explain the most complex of the basic terms related to the object of this study, namely the concept of military doctrine. The concept of doctrine is clearly broad, ambiguous, and elusive as the following section illustrates. Often, it is not clear what range of concepts should be addressed under the heading of doctrine or what topics should be emphasized within an agreed upon scope for doctrine. According to the official DoD definition, doctrine consists of the "fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgement in application."[17] While this definition provides a good starting point, it is too narrow and sterile to give much substance to the concept.

Within the Air Force, there remains a good deal of controversy over the basic nature and scope of doctrine generally and over the fundamental tenets of air power doctrine specifically. Some Air Force officers emphasize that doctrine should consist of fundamental principles and then apply this logic to define the concept of doctrine narrowly:

> Air Force doctrine is the body of enduring principles, the general truths and accepted assumptions, which provide guidance and a sense of direction on the most effective way to develop, deploy, and employ air power. It should not encompass either political influences or specific instructions on the execution of these principles.[18]

Others in the Air Force emphasize that doctrine must be conceived of more broadly and be linked to the political influences which guide the application of military force "as a

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[17]Department of Defense, Joint Chiefs of Staff, JCS Publication 1: Department of Defense Dictionary of Military and Associated Terms (Washington: Joint Chiefs of Staff, 1 April 1984), 119.

[18]Major Robert C. Ehrhart, "Some Thoughts on Air Force Doctrine," Air University Review 31 (March-April 1980): 30.

part of a holistic approach to war . . ."[19] Outside of the military, many take this broader approach to doctrine:

> I use the term "military doctrine" for the subcomponent of grand strategy that deals explicitly with military means. Two questions are important: *What* means shall be employed? and *How* shall they be employed? Priorities must be set among the various types of military forces available to the modern state. A set of prescriptions must be generated specifying how military forces should be structured and employed to respond to recognized threats and opportunities. Ideally, modes of cooperation between different types of forces should be specified.[20]

As there is at present no authoritative demarcation of the boundary concerning the proper scope of military doctrine, we are free to adopt the broader, more political view of doctrine and are better served in this study by this wider scope for inquiry.[21]

Other conceptual difficulties related to military doctrine center on the proper focus for inquiry within the concept of doctrine itself. Here, a primary issue is whether doctrine should consist of fundamental principles of war applicable across different military branches, different states, and different times or whether doctrine should be more narrowly crafted to apply to a specific Service within a specific state at a specific time. A second set of similar issues relates to the role of the organization in formulating doctrine and the role of doctrine in organizational change.

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[19]Colonel Clifford R. Krieger, "USAF Doctrine: An Enduring Challenge," Air University Review 36 (September-October 1984): 17.

[20]Barry R. Posen, The Sources of Military Doctrine: France, Britain, and Germany Between the Wars (Ithaca: Cornell University Press, 1984), 13. Emphasis in original.

[21]Note also, however, that several analysts convincingly argue that space doctrine should, at this early stage in its evolution, be developed apart from inevitable political constraints so that the military potential of space can be studied more directly and completely. This point is examined in greater detail in the military space doctrine statements section of chapter six below. See Lieutenant Colonel Dino A. Lorenzini, "Space Power Doctrine," Air University Review 33 (July-August 1982): 16-21; and Lieutenant Colonel Charles D. Friedenstein, "The Uniqueness of Space Doctrine," Air University Review 37 (November-December 1985): 16. Then-Major Friedenstein was the Director of the April 1981 USAF Academy Military Space Doctrine Symposium which is discussed in detail in chapter six below.

The metaphor of a doctrine tree developed by Dennis Drew may be helpful in addressing the first set of issues.[22] Drew posits that the different ideas within the concept of doctrine can best be thought of as parts of a tree where the roots represent the historical lessons from which doctrine is drawn, the trunk fundamental doctrine, the branches environmental doctrine, and the leaves organizational doctrine. He defines fundamental doctrine as relatively abstract concepts such as "beliefs about the purposes of the military, the nature of war, [and] the relationship of military force to other power instruments . . ."[23] Drew also emphasizes the "timeless" nature of fundamental doctrine and indicates that it "is relatively insensitive to political philosophy or technical change."[24] Environmental doctrine "is a compilation of beliefs about the employment of military forces within a particular operating medium."[25] Moreover, environmental doctrine

> is clearly narrower in scope than fundamental doctrine because it deals with the exercise of military power in a particular medium. Second, environmental doctrine is significantly influenced by factors such as geography and technology.[26]

Finally, organizational doctrine "is best defined as basic beliefs about the operation of a *particular* military organization or group of closely linked military organizations."[27] Drew indicates that organizational doctrine "is *very* narrow in scope[.]" and that it "tends

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[22]Lieutenant Colonel Dennis M. Drew, "Of Leaves and Trees: A New View of Doctrine," Air University Review 33 (January-February 1982): 40-48. While at the Air University Center for Aerospace Doctrine, Research, and Education (AUCADRE) Colonel Drew also wrote the latest version of Air Force's basic doctrine manual. See Department of the Air Force, HQ USAF, Air Force Manual 1-1: Basic Aerospace Doctrine of the United States Air Force (Washington: GPO, March 1992).

[23]Drew, "Of Leaves and Trees," 43.

[24]Ibid., 44.

[25]Ibid.

[26]Ibid.

[27]Ibid., 45. Emphasis in original.

to change relatively frequently in order to remain 'current'."[28] Drew's tree metaphor also serves to illustrate the interrelationships between the different forms of doctrine: a sturdy trunk of fundamental doctrine must be developed before environmental doctrine branches or organizational doctrine leaves can grow. Similarly, leaves blow in the wind and fall off as a normal part of the life cycle of the tree but a disease in the roots or the lower levels of the tree will impact the growth at higher levels.

Drew's tree analogy indicates that doctrine must grow from universally applicable fundamental principles of war to create environmental or organizational doctrine specially adapted to specific applications. This point is made explicitly in reference to space doctrine by Charles Friedenstein.[29] Friedenstein argues that because the Air Force has not yet developed a coherent environmental doctrine for space, attempts to develop Air Force organizational space doctrine such as those embodied in Air Force Manual (AFM) 1-6 are analogous to attempting to grow leaves without a supporting branch.[30] Friedenstein thus identified a central problem in attempts to build U.S. military space doctrine near the end of the cold war and conceptually located this weak aspect of military space doctrine development with reference to Drew's doctrine tree model. On a broader level, while Drew's tree analogy is certainly useful in illustrating the synergistic interrelationships between types of doctrine and in providing a model of how doctrine should be developed, it may also be misleading to the extent that it is self-contained and doctrine-centric and seems to underemphasize the higher links between military doctrine and national strategy and the lower links between doctrine and military missions and tactics.

A related but separate set of issues associated with doctrine involves the interrelationships between doctrine and organizations. In theory, a doctrine could exist without and be logically prior to an organization for implementing the doctrine but in

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[28]Ibid. Emphasis in original.

[29]Friedenstein, "The Uniqueness of Space Doctrine," 13-23.

[30]Ibid., 22. This point is discussed in detail in the doctrine statements section of chapter six below.

practice doctrine and organizations are woven together. While most organizations are likely to promote doctrines which build upon and expand their turf, doctrine may indicate that organizations need to be expanded, reduced, or that new organizations should be created. Unfortunately, because of their hierarchical structures and heightened senses of duty and tradition due to the process of self-selection, most militaries are far from ideal organizations for thinking in innovative ways about new doctrine or responding to doctrinal changes.

Three outstanding examples of this interdependence between doctrine and military organizations in the twentieth century serve to illustrate this characteristic of doctrine: The first is the remarkable longevity of the doctrinally supported horse cavalry in the face of radically changed technologies for warfare.[31] The image of Polish cavalry units charging Panzer divisions in 1939 is an object lesson in the power of doctrine in military thinking. The second example relates to the role of the doctrine of strategic bombardment in helping to create a separate air force organized around this doctrine within many countries.[32] For the leadership of the U.S. Army Air Force during World War II, the mission of unescorted daylight precision strategic bombardment of Nazi Europe was not only a way to validate the air power concepts of Giulio Douhet and Billy Mitchell but also a way to become a separate Service. Consider finally the different doctrinal and organizational preferences reflected by the dissimilar organizations with the operational responsibility for ICBMs and strategic defense missions within the U.S. and the former Soviet Union's force structures: the Strategic Air Command (SAC) (now a part of U.S. Strategic Command) and NORAD (the North American Air Defense

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[31]Edward L. Katzenbach, Jr., "The Horse Cavalry in the Twentieth Century: A Study in Policy Response," in John E. Endicott and Roy W. Stafford, Jr., eds., American Defense Policy, Fourth Edition (Baltimore: Johns Hopkins University Press, 1977), 360-373.

[32]An excellent analysis of the interrelationships between the doctrine of strategic bombardment and the creation of the U.S. Air Force is Perry M. Smith, The Air Force Plans for Peace: 1943-1945 (Baltimore: Johns Hopkins University Press, 1970). See also Smith's article, "The Role of Doctrine," in Endicott and Stafford, American Defense Policy, 403-10.

Command) versus the Strategic Rocket Forces (SRF) and the Aviation of Air Defense Forces (APVO).[33] The interactions between doctrine and organizations can clearly make a great difference in peacetime military structures and in military performance during war.

A final common approach to defining doctrine builds upon these inherent links between organizations and doctrine. Duke University historian I.B. Holley, Jr. emphasizes these links in his concise definition of doctrine as "what is officially believed and taught about the best way to conduct military affairs."[34] Drew emphasizes four aspects of Holley's definition: 1) the importance of doctrine connoted by the word "best," 2) the use of the broad term "military affairs" to indicate doctrine's many applications other than on the battlefield, 3) the importance of teaching doctrine to the Service, and 4) the critical need for competitive adaptation and continuing doctrinal development indicated by the word "believed."[35] Of course, Holley's definition is also quite tautological, and fails, as do the other definitions of doctrine listed above, to provide much insight on the critical issues of how doctrines are developed, how they become officially adopted, and their interrelationships with organizations. Thus, we need to look more closely at some of these issues and attempt to build a better theoretical understanding of the concept of doctrine before continuing with our analysis.

One of the greatest difficulties in defining the concept of doctrine stems from the

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[33]Note that the SRF was explicitly made the top service among the five major branches within the Soviet military and that the APVO was an independent branch completely separate from and above other types of missions performed by aircraft. See S.A. Tyuskevich, The Soviet Armed Forces: A History of Their Organizational Development (Moscow, 1978), published under the auspices of the U.S. Air Force, Soviet Military Thought Series, No. 19 (Washington: GPO, n.d.). For more on the general perspectives, organizational ethos, and doctrinal preferences of each of the U.S. Services, see Carl H. Builder, The Masks of War: American Military Styles in Strategy and Analysis (Baltimore: Johns Hopkins University Press, 1989).

[34]Quoted in Drew, "Of Leaves and Trees," 41. See also I.B. Holley, Jr., "An Enduring Challenge: The Problem of Air Force Doctrine," The Harmon Memorial Lecture Series in Military History, No. 16 (Colorado Springs: USAF Academy, 1974).

[35]Drew, "Of Leaves and Trees," 41

fact that many of the most important works on the art of war and military strategy both in the past and in the present have been oddly reticent in directly addressing this issue. Traditionally, most great thinkers on military matters have focused on the issues of strategy and the actual conduct of war. Sun Tzu, von Clausewitz, and Liddell Hart as well as most other prominent military strategists have generally sought to uncover the underlying, fundamental principles related to the conduct of war rather than attempting to analyze the theory and operation of doctrine. Of course, the basic strategic principles uncovered by military strategists can help to inform fundamental doctrine under Drew's doctrine tree model but it is interesting that most notable strategists have in the past seemed to neglect the role of the organization and its doctrine in their strategic thinking.

What is more remarkable, in light of the emergence of organizational theory and the recognition of the growing importance of modern military organizations and technology, is the general continuing lack of attention to doctrinal issues in major modern works on the military art. The field of security studies still lacks a major theoretical treatment of the relationships between doctrine, strategy, organizations, and technology. For example, the classic Makers of Modern Strategy has almost nothing specific to say on the relationships between doctrine and strategy, Russell Weigley's The American Way of War traces the institutional ethos of the U.S. military but does not focus on U.S. military doctrine, Martin van Creveld's Technology and War fails to develop many significant links between technology and doctrine, and Edward Luttwak's Strategy almost completely bypasses the subject of doctrine.[36]

What accounts for this lack of attention to doctrine and does this lack of emphasis imply that doctrine should not be systematically studied? Part of the explanation for this lack of attention to doctrine relates to the broad conceptual overlap between strategy and

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[36]Peter Paret, ed., The Makers of Modern Strategy: From Machiavelli to the Nuclear Age (Princeton: Princeton University Press, 1986). Russell F. Weigley, The American Way of War: A History of United States Military Strategy and Policy (Bloomington: Indiana University Press, 1973). Martin van Creveld, Technology and War: From 2000 B.C. to the Present (New York: Free Press, 1989). Edward N. Luttwak, Strategy: The Logic of War and Peace (Cambridge: Harvard University Press, Belknap Press, 1987).

doctrine and the general ambiguity of many strategic concepts.[37] Many of the classic and modern works on the military art do at least obliquely address the issues related to doctrine even if they do not use the term directly. No doubt the lack of attention to doctrine also reflects a general desire on the part of most strategists to address what they consider to be enduring, underlying principles of war rather than being drawn into a more limited analysis of missions and organizations. None of this should, however, imply that doctrine is not important or is not a suitable object of study in its own right. If anything, this lack of concentration on doctrine only makes efforts to study doctrine systematically more useful and necessary.

Clearly, the available literature on the nature and theory of doctrine is not sufficiently developed for our purposes at this point. Many of the available definitions appear to favor logical rigor and conceptual clarity but thereby become too narrow and neglect many of the most important and most interesting concepts which seem to be related to the idea of doctrine. Let us now, therefore, turn to develop the more full and explicit concept of doctrine as it is used in this study. The central conceptual location of doctrine and its constitution as a theory are both fundamental elements of doctrine as it is defined for this study.

The central conceptual location of doctrine refers to its pivotal yet somewhat amorphous location along several axes which are all related to security in its broadest definition. In other words, doctrine is near the conceptual center of many concepts related to how states attempt to provide for their security and prepare for conflict in the international system. (See figure one.) The first of these axes is concerned with the ordering and categorization of concepts related to how the state prepares for its security

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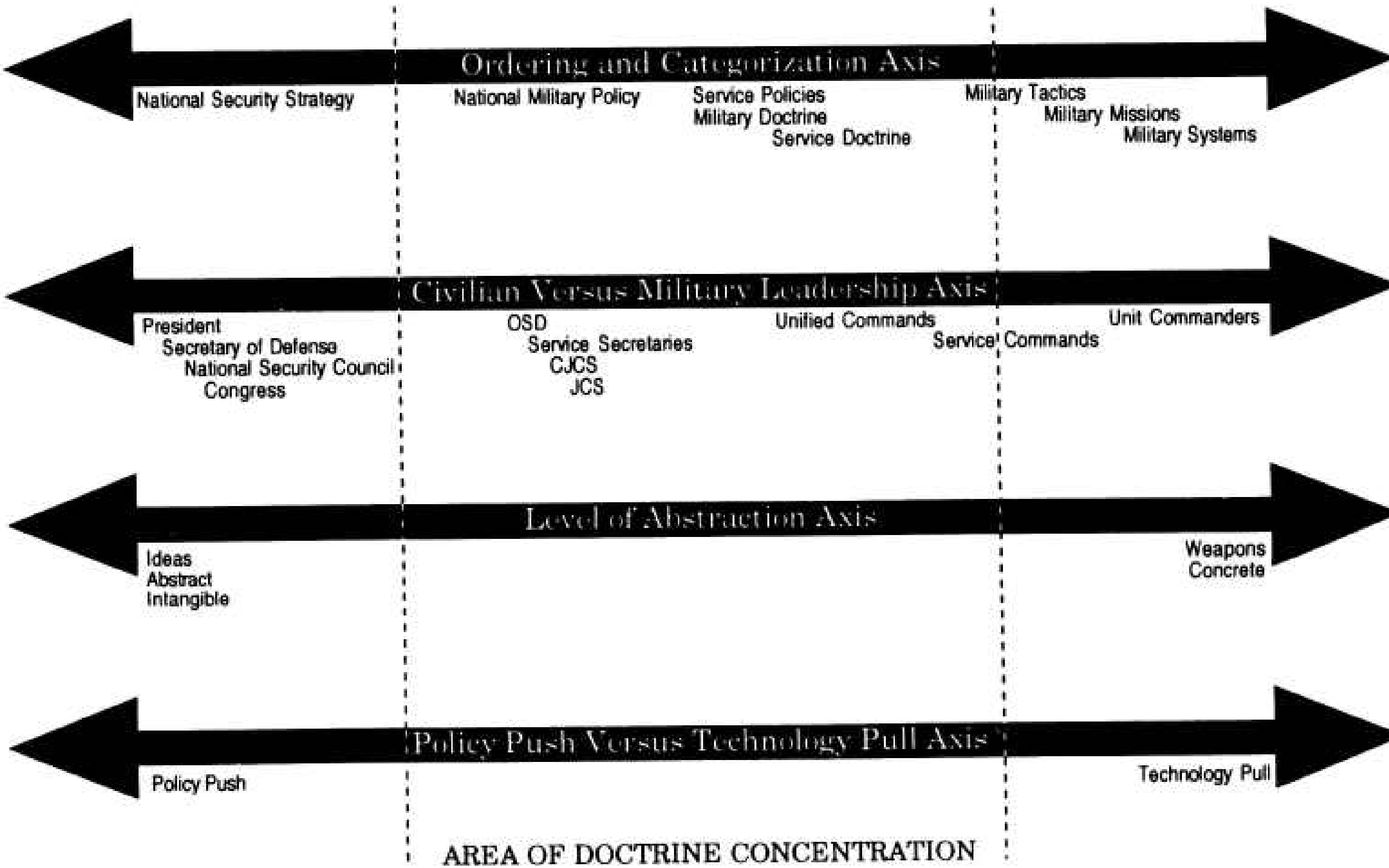
[37]On the non-consistent usage of basic strategic terms and the conceptual overlap within many of these areas, see Todd I. Stewart, Richard V. Badalamente, and Charles R. Margenthaler, "Understanding the Nature of Doctrine: An Essential First Step," in Major Peter A. Swan, ed., <u>Military Space Doctrine -- The Great Frontier: A Book of Readings for the United States Air Force Academy Military Space Doctrine Symposium, 1-3 April 1981</u>, Vol. I (Colorado Springs: USAF Academy, 1981), 43-74. Stewart, Badalamente, and Margenthaler indicate that doctrine consists of the principles that link together facts, predictions, assumptions, and goals.

FIGURE 1 : THE CENTRAL CONCEPTUAL LOCATION OF DOCTRINE



from the highest to the lowest level. While there is much disagreement over the exact definition of or location of concepts along this ordering and categorization axis, there is no question that all states must, either explicitly or implicitly, consider their security needs in at least some of these ways. There is also little question that doctrine falls somewhere between the highest and lowest levels of the concepts related to security on this axis.

The highest level on this ordering and categorization axis is usually referred to as grand strategy or national security strategy. This highest level of strategy attempts to create an integrative plan by which a state can use all of its different forms of power to seek its desired objectives. The National Security Strategy of the United States is an example of a comprehensive and explicit grand strategy.[38] Of necessity, most of the objectives and the strategies discussed in a national security strategy are broad and general. These objectives and strategies come into sharper focus when moving down the axis into the area of policies for specific portions of national power such as national military policies. These policies are still quite broad and general but they do focus on one area of nat[illegible] pow[illegible] begi[illegible]pecific functions to specific organizations. Continuing do[illegible] organizations have their own strategies to achieve their assigned objectives. It is in this conceptual area where doctrine begins to operate. The overall military doctrine of the U.S. and the doctrines of the individual Services help them organize their thoughts on how they might best achieve their assigned objectives. Below the level of doctrine are specific missions assigned to the military and the individual military systems used to carry out these missions. At this lowest level of military missions and military systems the concepts of military tactics and mission planning come into play. Many other different rungs with different names could be added to this axis but they would not change the basic fact that doctrine occupies an important central position within this continuum of security concepts.

Doctrine also occupies a central location on the axis related to the distinctions

[38]The latest example of this document is The White House, National Security Strategy of the United States (Washington: GPO, January 1993).

between civilian leadership versus military leadership in formulating concepts and carrying out actions related to security. In most states, including the U.S., the highest level security concepts such as grand strategy are formulated almost exclusively by civilian leadership (perhaps with inputs from the top military leadership) while the formulation of the lower level concepts such as tactics and the actual performance of security related actions are almost exclusively the domain of the military. In the U.S., the president as Commander-in-Chief of the armed forces has the authority to intercede at any level of military activity but this is an authority which is seldom exercised at the lower conceptual levels. Doctrine occupies a difficult central position along this civilian versus military leadership axis. The position of doctrine is difficult in this regard because while doctrine is generally the creation of and the domain of the military, it is also the conceptual level at which the most direct and sustained civilian-military interfaces are likely to occur. Thus, doctrine must be clear and convincing enough that civilians understand and approve of the military's vision of how it should engage in conflict. If civilians have difficulties with the military's concepts of war, they may order changes in strategy, missions, or tactics which could also require a rethinking of doctrinal issues. In this way, doctrine provides an essential bridge between the military and the civilian leadership.

Another axis along which the concept of doctrine occupies an important central location relates to the distinction between higher and lower levels of abstraction. The highest national strategies of the state are also the most abstract and intangible while individual weapons systems and tactics are concrete and tangible. The central position of doctrine along this axis means that it must play the dominant role in the difficult process of translating ideas into actual weapons and in formulating ideas to exploit the full military potential of weapons systems and new technologies. Doctrine is largely responsible for not only insuring a close match between the ideas of grand strategy and the hardware necessary to implement these ideas but is also needed to change these ideas as required based upon changing technology. Thus, once again, doctrine faces the difficult task of interfacing between two different bodies of conceptual thought and must provide the bridge between the different worlds of ideas and weapons.

A final related conceptual axis also finds doctrine in a center position between differing sources of pressures for changes in strategic thinking. The concepts along this axis are mostly within the realm of ideas but differ as to the source of the ideas and can be thought of as the "policy push" versus "technology pull" axis. At the higher end of this axis, civilian decision makers may direct military missions or actions which seem to have very little to do with military logic but which may fulfill political functions which they consider to be more important. Military doctrine must be flexible and responsive enough to support these types of policy push initiatives from civilian leadership. From the other direction, military doctrine and even grand strategy can also be strongly influenced by the changing technologies available for warfare. In this regard, doctrine must remain both flexible and adaptable in responding to technological pull. Again, the central position of doctrine between these two opposing pressures is a defining characteristic of the body of thought known as military doctrine.

Unfortunately, even with these additional insights provided by the ideas associated with the central conceptual location of doctrine, some aspects of the concept of doctrine remain unclear and not fully defined. These difficulties with doctrine are most pronounced with respect to doctrine's interrelationships with organizations and the issues of how doctrines evolve, how they are officially adopted, and how they become accepted by the rank and file. Undoubtedly, these issues could be illuminated at least somewhat better through the study of theories from behavioral sciences and organization theory. This behavioral science approach is not a major emphasis in this dissertation although it is hoped that the detailed analysis of U.S. military space doctrine and the use of the organizational behavior inputs within the model for doctrinal analysis will be at least somewhat helpful in better explaining the behavioral science side of doctrine.

In the final analysis, doctrine, like strategy itself, should be thought of as theory. Good doctrine will perform the dual roles of any theory: explanation and prediction. Doctrine explains how military forces should be structured, what weapons they should procure, and how the forces and weapons systems should be employed in combat. It also predicts the most likely types of threats the military will face and that the military will have the best chances for success in wartime operations against these threats if its precepts are followed. Like all theories, it is based upon assumptions; doctrinal assumptions cover areas such as the state of technology and likely operating environments, the structure of the international system, and the nature of the domestic political context in which it operates. The assumptions underlying doctrine cannot be proven or disproven nor is the doctrine itself amenable to outright falsification even after its application in warfare provides a test of its validity.[39]

Viewing doctrine as theory also invites the use of two major philosophical constructs designed to evaluate the process by which theories are created and knowledge advanced. First, we can use the model developed by Thomas Kuhn in The Structure of Scientific Revolutions to help us view the process of doctrinal development as a series of paradigm shifts as new paradigms are developed and gain potency within the military community.[40] The Kuhnian model emphasizes the psychological aspects of the communal structures in which paradigms are developed and shift (thus science is what scientists say that it is) and his model bears a striking resemblance to Holley's definition of doctrine as "what is officially believed and taught about the best way to conduct military affairs."

Imre Lakatos, by contrast, takes a less tautological and psychological approach to the process by which knowledge might be accumulated.[41] The Lakatosian model

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[39]The concept of designing tests with the potential to falsify theory is most closely associated with Karl Popper, see, for example, chapter one by his student Imre Lakatos in The Methodology of Scientific Research Programs (Cambridge: Cambridge University Press, 1978). However, the falsification approach to theory development has been abandoned by the two leading schools of thought on the philosophy of science today which are organized around the concepts of Thomas Kuhn and Imre Lakatos, respectively. The tenacity of doctrine, even when confronted with significant shortcomings uncovered by wartime operations is a prime example of one of the difficulties in employing falsification techniques for advancing knowledge.

[40]Thomas S. Kuhn, The Structure of Scientific Revolutions (Chicago: University of Chicago Press, 1970). Kuhn defines paradigms as scientific achievements which are "sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific study" and simultaneously "sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve." Page 10.

[41]Lakatos, Methodology of Research Programs, chapter one.

indicates that scientific progress is possible within a research program when this research program produces theories which explain and predict the behavior of the phenomena being studied better than other hypotheses within the same research program and better than hypotheses from rival alternative research programs. The Lakatosian model indicates the need to embed military doctrine within a larger "research program" concerned with strategy, the art of warfare, and other means by which states can provide for their security. His model also highlights the need to continuously seek rival alternative hypotheses which might explain and predict better than the doctrine at hand. By viewing doctrine as a theory and blending together the most important aspects of the Kuhnian and Lakatosian models of the philosophy of science, we can view doctrine in a more complete way and are more ready to analyze doctrine in practice.

Before continuing, let us briefly recap the most important aspects of the definition of military doctrine which is used throughout the remainder of the study. First, this definition is broader and more politically oriented than the official JCS definition and wider than the definitions generally advanced within the Air Force. This study uses the fundamental, environmental, and organizational doctrine categories developed in Drew's doctrine tree model while keeping in mind that his model is somewhat too self-contained for our purposes. The importance of the two-way interrelationships between doctrine and organizations is a distinguishing feature of the definition of doctrine for this study. This study also highlights that doctrine holds an important central conceptual location along many axes related to how states plan for their security. Finally, this study defines doctrine as theory and notes that the methodological tools available to assess theory are suitable to analyze doctrine as well.

Model, Hypotheses, and Comparative Framework for Analyzing Doctrinal Development

Having completed the comprehensive definition of doctrine above, we must now build a model which may help us better understand doctrinal development. Ideally, this study would build or use a general theory of doctrinal development that explains and predicts how doctrines develop. This theory could be applied to explain the development of U.S. military space doctrine during the cold war and then to predict the shape of U.S. military space doctrine for the post cold war era. Unfortunately, however, due to the lack of extensive and rigorous previous work in the area of doctrinal development, it will not be possible to create a formal theory in this study because currently there is not a developed research program on doctrinal analysis with which to interface. This section therefore describes a model for doctrinal development and derives hypotheses and a comparative framework from this model for use in analyzing the development of U.S. military space doctrine during the cold war. This model of doctrinal development could evolve into a theory if it becomes embedded within a significant research program on doctrinal analysis and seems to explain and predict better than alternative rival hypotheses.

The model of doctrinal development created for this study was derived from the model for doctrinal development found in Barry Posen's The Sources of Military Doctrine and also employs the four major schools of thought on military space applications described above which were based on David Lupton's On Space Warfare.[42] The model was designed with the broad definition of doctrine presented above in mind and was tailored specifically to look at U.S. military space doctrine during the cold war rather than to examine doctrinal development more generally or in different periods. However, with minor modifications, this model could also be applied to different types of doctrine and to different periods. The doctrine development cycle presented in the model describes the process in terms of doctrinal inputs and outputs. The model also helps us to hypothesize that certain types of outputs are more likely given certain inputs and certain circumstances. A set of specific hypotheses derived from the model is presented below. These hypotheses will be tested against the actual development of U.S. military

[42]Posen, Sources of Military Doctrine, chapters one and two; Lupton, On Space Warfare, chapters three through seven. There are no specific models for doctrinal development such as presented in figure two below in either Posen or Lupton. The emphasis on and components of national security considerations and organizational behavior for the model in this study are derived from Posen and his sources (Waltz and Allison). Posen is also the source for many of the hypotheses concerning doctrinal outcomes as well as for the innovative/less innovative and well integrated/less well integrated categories of doctrinal outcomes. Lupton is the source for the four doctrinal schools used as doctrinal outcomes in the model for this study.

space doctrine during each period of the cold war and analyzed in the final chapter of this study.

The doctrine development cycle in the model for this study begins with five inputs: national security, civilian leadership, technology, military leadership, and organizational behavior. (See figure two.) Individuals and organizations (the actors) move doctrine through the cycle. The national security and organizational behavior inputs are the most important and influential of the input variables because they provide the rationale or justification for the actors to advance certain types of doctrine. The national security inputs consist of broad strategic and political considerations which vary with and reflect the state of international relations and are imposed on the doctrinal development cycle from the top-down. The organizational behavior inputs consist of more narrow organizational preferences and military considerations which are more independent of the state of international relations and are thrust into the doctrine development cycle from the bottom-up. The leadership and technology inputs are not necessarily top-down or bottom-up in character and each can be colored by the national security and/or the organizational behavior inputs. The national security and organizational behavior inputs are more distinct and do not generally influence one another directly. However, it is also usually the case that both national security and organizational behavior inputs are operative simultaneously to different degrees in relation to specific doctrinal issues.[43]

The theoretical basis for including each of these five input variables in this doctrine development model needs to be explained in greater detail. Unfortunately, as we have seen, to date there has not been a sufficient amount of theoretical examination and development of the relationships between leadership or technology and doctrine within the disciplines of security studies or international relations. Thus, there are no major theoretical treatments of the impact of these variables on which to build and they

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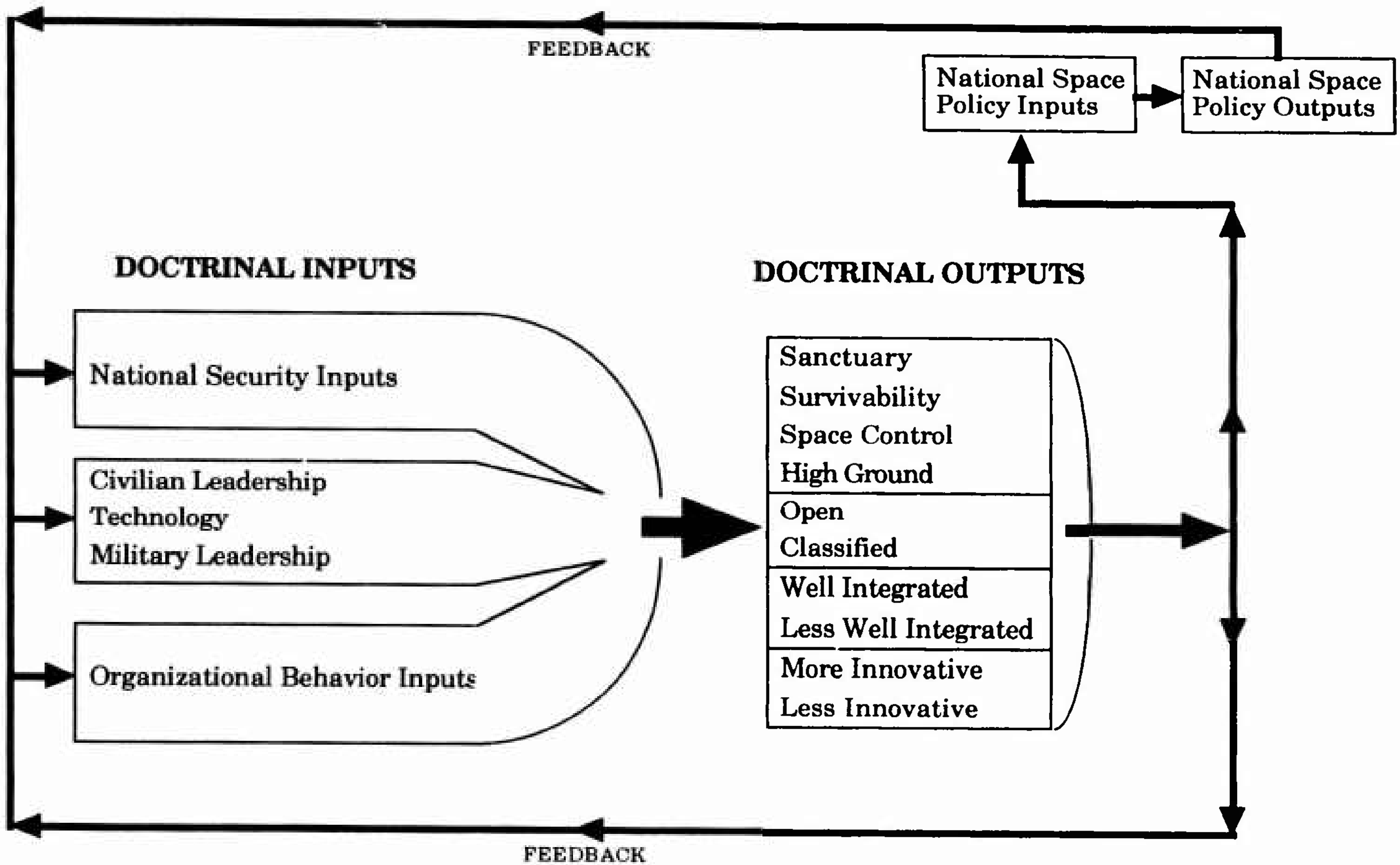
[43]The conceptual inability to isolate one variable for analysis is an inherent methodological handicap for the social sciences. See, for example, the discussion of the tendency of sociological variables to be "block-booked" in Morris Rosenberg, <u>The Logic of Survey Analysis</u> (New York: Basic Books, 1968), 26-27.

FIGURE 2 : MODEL FOR DOCTRINAL DEVELOPMENT



are included in this model on the basis of deductive logic. This study provides empirical evidence of the importance of these inputs to doctrinal development within the theoretical context provided by the model for doctrinal development.

By contrast, balance of power theory (the basis for the national security inputs in the model) and organizational theory (the basis for the organizational behavior inputs in the model) are among the most important and best developed research programs within international relations. Thus, this model allows us to compare the relative explanatory power of two of the most developed theoretical constructs within the discipline of international relations as we study the development of U.S. military space doctrine during the cold war. Let us now look very briefly at the most important foundations for these major research programs within international relations.

The national security inputs for this model are linked directly to the balance of power theory derived from Kenneth Waltz's three images in Man, the State, and War and Waltz's Theory of International Politics.[44] Man, the State, and War is a theoretical analysis of why warfare has been and continues to be endemic throughout human history. Waltz' first, second, and third images address the problem of war from the perspective of human nature, the different internal structures of states, and the anarchic international environment, respectively. Waltz finds that while each of his images provides important reasons why wars occur, the third image of the anarchic international environment is the most important factor in conditioning and enabling war.[45] Waltz' Theory of International Politics posits that the structure of the international system is defined by anarchy and an uneven distribution of capabilities across units.[46] He argues that balance of power theory "begins with assumptions about states: They are unitary actors who, at a minimum, seek their own preservation and, at a maximum, drive for universal

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[44]Kenneth N. Waltz, Man, the State, and War: A Theoretical Analysis (New York: Columbia University Press, 1954); and Waltz, Theory of International Politics (Reading, MA: Addison-Wesley Publishing, 1979).

[45]Waltz, Man, the State, and War, chapter eight.

[46]Waltz, Theory of International Politics, 100-101.

domination."[47] Waltz also finds that "[b]alance-of-power politics prevail wherever two, and only two, requirements are met: that the order be anarchic and that it be populated by units wishing to survive."[48]

In drawing from Waltz's concepts, this study emphasizes the anarchic nature of the international environment as the rationale behind the external focus of the national security inputs. The national security inputs in this study are also built upon rationality and an ability to understand the capabilities of one's potential adversaries. While the basic response to the anarchic international security system consists of a self-help program for building and guarding power, the exact way in which these functions are carried out varies tremendously from state to state and is critically dependent upon the perceptions of the international security system held by top decision-makers. As emphasized by Arnold Wolfers, there is no agreed, objective measure for national security and various factors are filtered by different decision-makers in different ways in reaching judgements about national security.[49] As we shall see, different decision-makers may judge that U.S. national security considerations require actions which are diametrically opposed to one another in response to the same stimulus. Thus, under this study design, very different doctrine and policy recommendations may be categorized together as being motivated by national security considerations -- the important distinction is not the recommendation itself but the externally-focused motivation behind the recommendation. By developing the national security variable for use in my model in this way, I make external factors a basic input into the domestic policy-making cycle and explicitly open the black box of the state as a unitary actor in contrast to Waltz's theoretical assumptions about states as unitary actors.

General organization theory is multidisciplinary and quite fragmented; the organizational behavior input for this study is based on the Organizational Process Model

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[47]Ibid., 118.

[48]Ibid., 121.

[49]Arnold Wolfers, "National Security As an Ambiguous Symbol," Political Science Quarterly 67 (December 1952): 481-502.

and the Governmental Politics Model (Models II and III) from Graham Allison's Essence of Decision.[50] Allison's Organizational Process Model characterizes governmental behavior as the "*outputs* of large organizations functioning according to standard patterns of behavior."[51] The parochial outlook and standard operating procedures of each organization within the government play large roles in determining the shape of governmental action under this model. Allison's Governmental (or Bureaucratic) Politics Model emphasizes the role which individuals play in the decision making process and characterizes governmental action as the result of political give-and-take between specific individuals.[52]

By combining Allison's Models II and III into the organizational behavior inputs, this study uses a single variable to emphasize the importance of people, purpose, organizations, and internal environment for decision making.[53] The bureaucratic or inwardly focused aspects of each of these factors within the organizational behavior variable is a defining characteristic of this input. Personal and organizational preferences dominate this input. Organizations are seldom able to advance their agendas by simply or explicitly stating this as their objective -- rather organizational objectives are generally camouflaged within national security or other broadly appealing rationales. Analysis in this area therefore requires discernment as to the true motivations behind proposed courses of action. Posen notes that doctrine and standard operating procedures are roughly analogous in what is probably the closest link between the concepts of Allison and Posen within the area of doctrine development.[54]

As the analysis in the chapters below illustrates, the actual process of doctrine

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[50]Graham T. Allison, Essence of Decision: Explaining the Cuban Missile Crisis (Boston: Little, Brown & Co, 1971), 67-244.

[51]Ibid., 67. Emphasis in original.

[52]Ibid., 144-47.

[53]The is the same approach taken by Posen in Sources of Military Doctrine, 43.

[54]Ibid., 44.

development is too complex and varied to be easily modeled within the confines of a simple cycle. Different actors and organizations are dominant during different periods and there may be little continuity or consistency in decision-making structures between periods. Moreover, these complex interactions between different actors and organizations may follow many different and non-linear paths at different times. Therefore, rather than attempting to simplify this most complex process, the model in this study moves past this area and next looks at the outputs of the doctrine development cycle.

The model in this study categorizes doctrinal outputs in four different ways. Accordingly, U.S. military space doctrine outputs may be: well or poorly integrated with U.S. national security strategy; innovative or stagnant; open or classified, and based upon the sanctuary, survivability, space control, or high ground schools of thought. The first distinction, between well integrated and less well integrated doctrines, is probably the most normative. As Posen points out, doctrine may actually

> harm the security interests of the state if it is not *integrated* with the political objectives of the state's grand strategy -- if it fails to provide the statesman with the tools suitable for the pursuit of those objectives.[55]

The second distinction, between innovative and stagnant doctrine is generally biased towards innovation, although change for the wrong reasons or at the wrong time can spell disaster. The third distinction, the degree to which space doctrine is publicly developed and promulgated or secretly developed and exercised, relates both to the first distinction between integrated and less well integrated doctrines and to organizational preferences. A perceived need for secrecy may flow from national security strategy and the type of doctrine chosen or from organizational preferences. The final distinction, between the four schools of thought on space doctrine, also relates to both the first distinction and to organizational preferences because any of these four schools may be appropriate depending upon the grand strategy of the state or organizational considerations.

The outputs from the doctrine development cycle proceed into another cycle which determines the broader U.S. national space policy. Various different inputs such as space

[55]Ibid., 16. Emphasis in original.

science and exploration goals, economic cooperation and competition factors, and international cooperation are added to the mix in this national space policy-making cycle. This dissertation does not attempt to analyze or model the national space policy-making cycle in any detail. However, to the extent possible, this study will compare the outputs from the doctrine development cycle with the outputs from the national space policy development cycle to note what types of interrelationships may have developed between space doctrine outputs and national space policy outputs.

Two feedback loops are an essential part of the model for this study. The first is a part of the doctrine development cycle and flows directly from the doctrinal outputs of this cycle back into the five inputs for doctrine development. This feedback loop illustrates the iterative and cyclical nature of the doctrine development process. The second feedback loop flows from the outputs of the national space policy-making cycle back to the inputs for the doctrine development cycle. This type of feedback ties the doctrine development cycle to the national space policy development cycle and illustrates that the development of space doctrine is just one part of this larger national space policy development cycle.

The final function of the doctrine development model is its ability to help generate hypotheses concerning the doctrine development cycle. Applying deductive logic to the model helps to produce basic hypotheses about the operation of the doctrine development cycle. The starting point for these basic hypotheses is the perceptions of the organizations and the civilian and military leadership (the actors) which drive doctrine through the development cycle. Three basic hypotheses initially flow from the operation of the doctrine development cycle: 1) Under balance of power theory, if the actors perceive that space doctrine could have a large impact on the balance of power because of the effect of space systems and/or weapons, then they are more likely to intervene more strongly in the doctrine development cycle. 2) Under organizational theory, if the actors perceive that space doctrine will have a large impact on their personal bureaucratic standing or on the standing of the organization then they are more likely to intervene more strongly in the doctrine development cycle. 3) Whenever the actors intervene more strongly in the doctrine development cycle, the doctrinal outputs are more likely to be more innovative than they otherwise would have been. However, increased intervention by different types of actors is likely to produce different levels of innovation: Increased intervention by civilian leadership is likely to produce the greatest amount of innovation, by military leadership a lesser amount of innovation, and by the organization itself the least amount of innovation.

The idea that both top-down and bottom-up motivations could stimulate doctrinal innovation in similar ways may seem counterintuitive -- let us therefore examine this hypothesis more closely. At the most basic level, increased involvement for any reason could shake organizational routines and lethargy and thereby lead to more innovative doctrine. More specifically, actors who desire to improve national security and actors who wish to improve their personal or organizational standing are both more likely to use innovative approaches to doctrine. Such approaches may circumvent the established routines of the organization allowing the actors to exercise more control over doctrine more quickly and to reap the putative benefits of changed doctrine more quickly. The rationale for the rank-ordering of the amount of innovation likely from the three actors listed above is derived from the amount of vested interest each of these actors is likely to have in the organization most directly effected by the doctrinal innovation.

As the result of his case study, Posen makes two overall findings on the relative explanatory power of balance of power theory and organizational theory that relate directly to the basic hypotheses for this study just listed: First, he finds that balance of power theory is usually more helpful in explaining the development of military doctrine; and second, he finds that organizational theory is at its best during periods of relative international calm while balance of power theory is at its best during periods of international tension.[56] These findings have significant and interesting implications for this study. We can combine together the implications of these two findings to produce two more basic hypotheses on the operation of the doctrine development cycle for this study: 4) If the actors perceive that there is a high degree of international tension, they are more likely to be more involved in the doctrine development cycle and doctrinal

[56]Ibid., 80.

outputs are more likely to reflect national security considerations than organizational behavior considerations. 5) Conversely, if the actors perceive that there is a low degree of international tension, they are less likely to be involved in the doctrine development cycle and the doctrinal outputs are more likely to reflect organizational behavior considerations than when international tensions are high.

The five basic hypotheses above may help to explain many of the expected outcomes of the general doctrine development cycle from the model in this study. However, in order to address more fully the question of the relative explanatory power of balance of power theory versus organizational theory in the development of U.S. military space doctrine during the cold war, this study must now develop hypotheses on how these two major inputs may impact doctrinal outputs more specifically. To develop these more specific hypotheses let us examine the types of preferred doctrinal outcomes which flow from balance of power theory and organizational theory. The set of hypotheses derived from balance of power theory presented below lists four preferred doctrinal outcomes (B-1 through B-4) which correspond to the four categories of doctrinal outputs in the doctrine development model. Organizational theory produces a different set of four preferred doctrinal outcomes (O-1 through O-4) for the same four categories in the model.

The following four hypotheses about the impact of national security inputs on U.S. military space doctrine outputs flow from balance of power theory: B-1) As a status quo state with geographic and technological advantages, the U.S. usually should prefer a defensive space doctrine such as embodied by the sanctuary or survivability schools of thought to the extent that this is politically, operationally, and technologically attractive. B-2) The requirements of national security strategy and overall national space policy will largely determine the extent to which military space doctrine, systems, and data will be classified and compartmentalized. B-3) If the civilian or military leadership intervenes more strongly in the doctrine development cycle, U.S. military space doctrine outputs are likely to correspond closely to the perceptions of the leadership concerning the state of international relations and the efficacy of space systems and/or weapons. The space doctrine outputs in these cases are likely to be well integrated with national security strategy to the extent that the space-related perceptions of the leadership are well integrated with national security strategy. B-4) If the leadership intervenes more strongly in the doctrine development cycle, the doctrinal outputs are more likely to be more innovative than they otherwise would have been.

The hypotheses about the impact of organizational behavior inputs upon the four categories of U.S. military space doctrine outputs which follow from organizational theory are quite different. O-1) Military organizations should generally favor offensive doctrines because such doctrines tend to: provide a standard scenario which reduces operational uncertainties while raising the operational uncertainties of potential enemies, increase organizational size and wealth, and increase autonomy and independence from civilian authority. The U.S. military should therefore tend to favor more offensive space doctrines such as those embodied in the space control or high ground schools of thought and should fix on the locational and technological factors of space systems and/or weapons which would favor offensive doctrines. O-2) Organizations are likely to favor strict classification and compartmentalization of space doctrine, systems, and data to the extent that this hides their mistakes or increases and preserves their autonomy and power. O-3) If civilian and military leaders do not intervene actively in the doctrine development cycle, U.S. military space doctrine is not likely to be well integrated into the U.S. national security strategy and the Services are not likely to work together well on this issue. Strong intervention by civilian authorities provides the best chance to better integrate space doctrines with the national security strategy. If the actors intervene more actively in the doctrine development cycle, doctrinal outputs are more likely to match with the actors' preferred visions of the organization and their perceptions of the efficacy of space systems and/or weapons. O-4) U.S. military organizations are unlikely to develop innovative space doctrine unless responding to the combat experiences of a client state, failure on the battlefield, or leadership intervention. Additionally, the U.S. military is unlikely to use new space-based technologies which have not been tested in combat as the sole catalyst to create new doctrine.

Based upon the model, the basic hypotheses, and the hypothesized preferences for U.S. military space doctrine outputs listed above, this study can now develop a comparative framework. The goal of this comparative framework is to evaluate whether balance of power theory or organizational theory is better able to explain the development of U.S. military space doctrine during the cold war. The first part of this comparative framework is a consolidation of the sets of hypotheses (B-1 through B-4 and O-1 through O-4) discussed above. The second part of the comparative framework is presented in tables two and three below and consists of these hypothesized doctrinal preferences sorted according to the level of international tension (basic hypotheses four and five above). This comparative framework is used for each period of the cold war to determine the relative strength of national security considerations versus organizational behavior in shaping military space doctrine outputs at that time. In chapter seven, the findings from the application of the comparative framework during each period of the cold war are consolidated and analyzed.

The first part of the comparative framework consists of the following two sets of consolidated hypotheses on doctrinal outcomes:

A. If national security inputs have more impact on the development of U.S. military space doctrine during the cold war, then this doctrine will be characterized by the following factors:

1. a defensive doctrine such as embodied by the sanctuary or survivability schools of thought to the extent that this is politically, operationally, and technologically attractive

2. space doctrine, systems, and data classified and compartmentalized to the extent required by national space policy or national security strategy considerations

3. doctrine which corresponds closely to the perceptions of civilian and military leaders on international relations and the efficacy of space systems and/or weapons if the leadership intervenes more strongly in the doctrine development cycle

4. more innovative doctrine when the leadership intervenes more strongly in the doctrine development cycle

B. If organizational behavior inputs have more impact on the development of U.S. military space doctrine during the cold war, then this doctrine will be characterized by the following factors:

1. a more offensive doctrine such as embodied by the space control or high ground schools of thought which emphasizes the locational and technological aspects of space that favor the offensive

2. space doctrine, systems, and data classified and compartmentalized to the extent that this hides organizational mistakes or increases and preserves organizational power and autonomy

3. a lack of integration with overall national security strategy and a lack of coordination between the Services unless the leadership intervenes more strongly in the doctrine development cycle

4. a lack of innovation in doctrine unless one of the following factors intervene: the civilian leadership, failure on the battlefield, or combat experience with a new technology

On the basis of these consolidated hypotheses and the outcomes predicted by tables two and three, I expect that balance of power theory will be a slightly more useful tool in explaining the development of U.S. military space policy during the cold war than organizational theory.

Comparing actual doctrinal inputs and actual doctrine outputs of the cold war period with the sets of hypotheses above will help us gain a better understanding of which theoretical insights seem to hold in practice. The detailed analysis of the development of U.S. military space doctrine during the cold war presented below should provide insights on why one of these two major theoretical approaches may be more useful in explaining certain types of doctrinal development in certain situations. The analysis may also help us understand the contradictions between the two sets of hypotheses above and allow the application of the more powerful theoretical lens in most situations.

Finally, I must also discuss some of the weaknesses which are already apparent in this theoretical approach. First, both in operation and application, this model and the sets of hypotheses are critically dependent upon the judgements of the analyst in evaluating data, balancing conflicting inputs, and drawing fine distinctions. Then, at the end of this difficult process, the amount of insight and discernment possible from this study design may be somewhat disappointing. As with many other interesting topics within the social sciences, it is nearly impossible to operationalize precisely or completely

TABLE 2 : PREDICTED DOCTRINAL OUTPUTS DURING PERIODS OF PERCEIVED HIGH TENSION

The Actors Perceive a High Level of International Tension — They are More Likely to Intervene More Strongly in the Doctrine Development Cycle and Doctrinal Outputs are More Likely to Reflect National Security Considerations

Categories of Doctrinal Outputs

Doctrinal Outputs Predicted By	Type of Doctrine	Security Classification Level	Degree of Integration	Degree of Innovation
Balance of Power Theory	Sanctuary Survivability	to Extent Required by National Security Strategy	Very High	Very High
Organizational Theory	Space Control High Ground	to Extent Desired by Organization	High	High

TABLE 3 : PREDICTED DOCTRINAL OUTPUTS DURING PERIODS OF PRECEIVED LOW TENSION

The Actors Perceive a Low Level of International Tension — They are Less Likely to Intervene in the Doctrine Development Cycle and Doctrinal Outputs are More Likely to Reflect Organizational Behavior Considerations

Categories of Doctrinal Outputs

Doctrinal Outputs Predicted By	Type of Doctrine	Security Classification Level	Degree of Integration	Degree of Innovation
Balance of Power Theory	Sanctuary Survivability	to Extent Required by National Security Strategy	Low	Low
Organizational Theory	Space Control High Ground	to Extent Desired by Organization	Very Low	Very Low

model many of the concepts most closely associated with the development of military space doctrine. For example, a most difficult problem may arise when attempting to evaluate the degree of innovation displayed by a given military space doctrine since there are really no criteria against which to judge this characteristic. A different or changed military space doctrine is not necessarily very innovative. Similarly, the requirement of this study design to judge the degree of doctrinal integration or lack of integration with U.S. national security strategy and national space policy implies that both the space doctrine and these grand strategies are open and transparent. In practice, doctrine or grand strategies may not be available, may be unclear, or may be so broad and vague as to make this comparison very difficult.

This requirement for extensive judgement on the part of the analyst impacts the likelihood that others repeating the same research design would reach the same conclusions. This is a real weakness but since this analysis is not advanced as a theory, these problems with repeatability are best seen as a part of the theory building process. It is hoped that other studies on this or similar topics would add to the research program in this field and advance the possibility of theory for doctrinal development.

Another set of problems stem from using Posen's model as the basis for the model in this study and are related to the characteristics and timeframe of Posen's chosen period for analysis. It is very understandable why he chose the critical interwar period for an analysis of military doctrine but extrapolating from this period may be difficult, especially for periods which do not appear to be headed towards a major world war. Of course, this issue also relates directly back to Posen's finding that balance of power theory had more explanatory power than organizational theory. We may well find that without a major conflict on the horizon the relative explanatory power of the two theoretical lenses is reversed. A similar problem related to the period of Posen's analysis is that his work is all based on the prenuclear world. How much impact has the advent of nuclear weapons technology had on organizational preferences for offensive, defensive, or deterrent doctrines or are these organizational preferences more enduring? Ideally, our model would have been built upon previous works examining a period with a more peaceful ending during the nuclear age but unfortunately there do not appear to be any major studies on the evolution of doctrine under these conditions.

In closing this chapter, I must also note that this study design poses what is known as the level-of-analysis problem.[57] This problem could result from using the doctrinal development model for analysis and comparisons at both the systemic and domestic levels at the same time. The separation of the national security inputs from the organizational behavior inputs helps to mitigate against this problem but it cannot be entirely eliminated. As with most other interesting issues related to security studies or international relations, a more complete picture of causation requires inputs from both the systemic and domestic levels of analysis and the analysis of these inputs cannot always be kept separate. Thus, this study will keep this difficulty in mind but will not be driven by efforts to minimize the problem. With these caveats in mind, we are now ready to use the model and hypotheses in the chronological analysis of the development of U.S. military space doctrine.

[57] J. David Singer, "The Level-of-Analysis Problem in International Relations," in Klaus Knorr and Sidney Verba, eds., The International System (Princeton: Princeton University Press, 1961), 77-92. Waltz and others feel that this problem is at least overblown if not nonexistent, see Theory of International Politics, 61-62.

CHAPTER THREE: SQUANDERED INHERITANCE

This and the succeeding chronological chapters on developments related to the evolution of U.S. military space doctrine during the cold war each employ the same format for analysis. Each chapter begins with a brief overview of the setting for space developments during the period in question. Next, an overview of the major space doctrine development inputs and considerations at that time is provided. The bulk of each chapter consists of the issue-area analysis of the major developments related to the evolution of military space doctrine for the period in question. These major issue-area developments are chosen and analyzed with the aid of the model from chapter two. Finally, the last section of each chapter uses the comparative framework to evaluate the relative strength of balance of power theory and organizational theory in explaining the major doctrinal outcomes of each period. This last section of each chapter also addresses the other research questions by noting the relationships between the major doctrinal outcomes and the doctrinally-related elements of national space policy at that time, discussing the major interrelationships between doctrine and organizations for that period, and assessing the usefulness of the airpower development analogy for the spacepower developments of that time. This format provides for consistency and will ease the task of summarizing these findings in the final chapter of this study.

Overview

Generally speaking, space was not a major focus of U.S. public concern prior to *Sputnik* I. An overall lack of interest in space was certainly evident within the Services, despite the fact that the U.S. military was the chief repository of the technological expertise needed to develop boosters capable of spaceflight. None of the Services had anything approaching a comprehensive doctrine for space prior to *Sputnik*. Accordingly, this chapter will look primarily at the developments related to overall U.S. national space policy prior to *Sputnik* both because the military had so little doctrine or even focused thinking on space during this period and because U.S. national space policy prior to *Sputnik* laid the groundwork for much of subsequent doctrine and policy. The focus will be on the military to the extent possible but during this period other actors must be examined more carefully because the military generally had not yet started thinking seriously about space.

Several factors accounted for the general lack of U.S. interest in space during the first half of this period. First, the U.S. military faced massive cutbacks at the end of World War II and the unknown military potential of space simply could not compete against the core missions of the military in this very austere fiscal environment. Second, many top scientific and military leaders of the immediate post war period believed that space-related technologies capable of making major contributions to national security such as the ICBM would not mature for many years. Finally, prior to the hardening of the cold war and the recognition that the Soviets were putting substantial resources into their ballistic missile development programs, the U.S. was very reluctant to give much attention or funding to programs with unclear military potential and undefined missions. Cumulatively, these factors and others meant that the U.S. put very little effort into ballistic missile or space-related technologies for the bulk of President Truman's tenure. Ballistic missile and space-related efforts were significantly accelerated after President Eisenhower entered office but the inattention to these developments prior to 1953 was a fundamental cause of America's second place finish in the first space race.

The acceleration of U.S. space-related technologies under the Eisenhower administration was very important to subsequent U.S. space developments. Even more importantly, however, the Eisenhower administration was the first to develop a comprehensive U.S. space policy. Contrary to the public impression created in the crisis atmosphere sparked by the shock of the Soviet Union's *Sputnik* I triumph, the Eisenhower administration actually had a highly secret but quite logical and comprehensive set of space programs and policies which were designed to advance U.S. national interests at the opening of the space age.[1] Moreover, U.S. national space policy, even at this earliest date, already exhibited the inherent tensions and overlaps between civilian and military uses of space which have become ever more apparent as the space age continues to evolve. Eisenhower's primary space policy goal was to investigate and exploit the potential of space to open up the closed Soviet state via satellite reconnaissance. The second major U.S. space policy goal during this period was to design policies to create and protect a new international legal regime which would recognize the legitimacy of satellite overflight for all "peaceful purposes" including reconnaissance. A third major goal of early U.S. space policy was to investigate space for scientific purposes. Other policies and programs were advanced to support these three primary goals. Most importantly, the U.S. had to develop boosters capable of reliably launching ICBMs or satellites and create the organizations and infrastructure required to support all of these goals.

In retrospect, despite the considerable successes which these earliest space policies eventually achieved in their primary objectives of using satellite reconnaissance to help open up the closed Soviet state and in creating a new legal regime that legitimized this activity, the fact that the highest priority U.S. space efforts were largely hidden from public view also contributed directly to the public perception that the U.S. was behind in the space race and, ironically, fueled rather than dispelled the mounting crisis in American public confidence during the space and missile gap era of the late 1950s. Long before the opening of the space age, the Eisenhower administration laid the groundwork

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[1]The coherent but secret nature of the Eisenhower administration's space policy is a major theme in Walter A. McDougall, ... the Heavens and the Earth: A Political History of the Space Age (New York: Basic Books, 1985), chapters four through ten Rip Bulkeley in The Sputniks Crisis and Early United States Space Policy: A Critique of the Historiography of Space (Bloomington: Indiana University Press, 1991) not only discusses the logic of Eisenhower's space policies but also criticizes many of the histories of this period. Bulkeley argues that many histories have generally followed the Democratic Party line in the Johnson Hearings of 1957-58 when assessing Eisenhower's space policies and have failed to note the intricate nature of these policies while ignoring the culpability of the Truman administration for America's lack of space preparedness.

for two separate U.S. space programs: a hidden top-priority effort to develop spy satellites, and an open effort which emphasized using space for peaceful purposes such as space science and international cooperation. This bifurcation of space effort as well as the highly classified and top-priority nature of the earliest U.S. spy satellite programs and space organizations would also have a lasting impact on the development of U.S. military space doctrine.

Overview of Major Doctrinal Inputs and Considerations

The analysis of the major developments related to the evolution of U.S. military space doctrine prior to *Sputnik* focuses on three interrelated areas: the policy on the development of spy satellites, the policy towards scientific satellites, and the policy on the development of boosters capable of space launch. Both national security considerations and organizational behavior considerations influenced these major developments; however, for this period, national security considerations were generally far more important in conditioning outcomes related to the evolution of military space doctrine. The policy on the development of spy satellites is undoubtedly the best example of the major impact of the national security input. No organization (with the possible exception of RAND) initially had a major institutional stake in creating spy satellites. The potential of such systems to reorder and stabilize superpower relations in fundamental ways and to provide a hard data basis for U.S. security planning by helping to open up the closed Soviet state made their development a strategic imperative for the U.S. Likewise, U.S. policy on developing spy satellites is a classic example of national security inspired policy push rather than technology pull. In the Technological Capabilities Panel (TCP) report, Edwin H. Land urged that the U.S. *find* ways to use its technology to better conduct strategic planning at a time when the first successful U.S. space launch was not to take place for almost three years and the first successful U.S. spy satellites were more than five years away. National security concerns linked to spy satellites also dominated the recommendations of NSC 5520 and overshadowed space science or public policy considerations related to the first open U.S. space efforts. Finally, national security considerations played an important role in the pace and structure of early U.S. ballistic missile development efforts. The TCP report recommendations for top-priority ICBM and IRBM efforts were critical to the development of these systems while Defense Secretary Charles E. Wilson's decision for deliberate duplication on IRBM development was at least partially the result of a desire to respond very quickly and surely to a major perceived threat to U.S. security.

Organizational behavior inputs were generally less important during this period but they did play major roles in certain developments at different times. Generally, it would have been very difficult for organizational behavior inputs to be of critical importance in the making of the earliest U.S. space policy because few space-related organizations or vested space-related organizational interests existed at this time. Organizations played a very small role in the decision to develop spy satellites. Organizations played more of a role in the policy decisions related to space science. Each of the Services competed for the privilege of launching the first U.S. satellite and the Army, especially, saw space launch as a possible way to invigorate its Jupiter missile program and to provide a new avenue of growth for the Army. In the end, however, the Stewart Committee decision seemed to hang more on narrow technical issues rather than on national security or organizational behavior inputs. Organizational behavior undoubtedly played its largest role during this period in the competition to develop IRBMs between the Army and the Air Force. Organizational behavior inputs were primarily responsible for the great Army interest in IRBMs and dominated the motives of many of the subsequent Air Force countermoves during this competition. Developments in this area also provide the best example of the feedback loop in the model because the interservice rivalry of the Thor-Jupiter controversy conditioned the subsequent policy thinking of many decision-makers on the desirability of these types of developments among the Services in future space or missile efforts.

Analysis of Major Developments Related to U.S. Military Space Doctrine, 1945-*Sputnik* I

Policy on Spy Satellites

By the mid-1950s, the development of photoreconnaissance satellites with the potential to help open the closed Soviet state had emerged as the top U.S. space policy goal. To support this highest priority goal, U.S. space policy concurrently sought to build and protect a legal regime designed to legitimize the operation of spy satellites. This section will briefly trace how and why spy satellites, rather than any other type of space application, became the nation's top space priority and discuss the rather limited role which the military played in the development of this policy. The most important role of the U.S. military in this area, and of the Air Force in particular, was involved with the actual development of these spy satellites. Unfortunately, however, nearly forty years after the event, most of the details surrounding the Air Force's role in these hardware developments remain classified.

The problem of obtaining reliable information on strategic activities within the closed Soviet Union became a primary security concern for the U.S. at the onset of the cold war. Even in the earliest days of the cold war some visionaries believed that space might provide an ideal vantage point from which to spy upon the Soviets. In March 1946, the Commander of the U.S. Army Air Force (AAF), General Henry H. (Hap) Arnold, authorized the creation of a joint project with the Douglas Aircraft Company on Research and Development (RAND) which became the basis for one of the most influential think tanks in the U.S.[2] RAND's very first report, completed following three weeks of feverish yet prescient work in April 1946, was entitled "Preliminary Design of an Experimental World-Circling Spaceship".[3] This report not only detailed the technical design for and the physics involved in launching such a spaceship (the word satellite had not yet come into common usage), but also identified possible military missions for satellites including communications, attack assessment, navigation, weather

[2]On the pervasive impact of RAND on the evolution of U.S. strategic thinking during the cold war see, in particular, Fred Kaplan, The Wizards of Armageddon (New York: Touchstone Books, Simon & Schuster, 1983)

[3]The new Deputy Chief of Air Staff for R & D, Major General Curtis E. LeMay, requested this report from RAND after learning that the Navy Bureau of Aeronautics was studying satellites. Portions of RAND's first report are reprinted in Merton E. Davies and William R. Harris, RAND's Role in the Evolution of Balloon and Satellite Observation Systems and Related Space Technology (Santa Monica, CA: RAND Corporation, 1988), 6-9.

reconnaissance, and strategic reconnaissance.[4] Neither this first RAND report nor their subsequent early efforts to show the strategic utility of satellites generated much interest or any specific requirements or proposals for satellites on the part of the Air Force.

Several other satellite application studies were conducted by RAND, the Navy, and others during the late 1940s and early 1950s but were hampered by very limited funding and often marginalized by the mindset of many influential military and scientific leaders who relegated such notions to the realm of science fiction.[5] At this time, the U.S. military was preoccupied with the reorganization imposed by the National Security Act of 1947, the need to redivide roles and missions among three Services, and the Korean War. The primary impetus for the development of satellites with the potential for revolutionary military capabilities would not come from within the military.

The need for better intelligence on Soviet strategic capabilities and intentions was highlighted by a rapid succession of several ominous developments in the late 1940s and early 1950s. The most troubling of these developments were: the intelligence failure

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[4]Ibid., 9.

[5]The Navy's Bureau of Aeronautics undertook several satellite and advanced booster feasibility studies beginning in late 1945. The Navy unsuccessfully sought AAF financial cooperation on these projects for several years; these earliest military satellite study projects were canceled by the Navy in September 1948. Vannevar Bush, who lead U.S. scientific efforts as the head of the National Defense Research Committee during World War II and then became head of the Joint Research and Development Board after the war, is undoubtedly the most famous of the skeptics on the technical feasibility of both ICBMs and satellites. At this time, LeMay was probably more interested in the military potential of space than most military leaders but he was still unwilling to commit much funding or thought to projects for which there were no specific military requirements. On these earliest U.S. satellite investigations and the general scientific outlook on the potential of satellites and space, see R. Cargill Hall, "Earth Satellites: A First Look by the United States Navy," in R. Cargill Hall, ed., History of Rocketry and Astronautics: Proceedings of the Third through the Sixth History Symposia of the International Academy of Astronautics (San Diego: Univelt Inc., 1986), 253-278; Paul B. Stares, The Militarization of Space: U.S. Policy, 1945-1984 (Ithaca: Cornell University Press, 1985), 25-29; Eugene M. Emme, "Presidents and Space," in Frederick C. Durant, III, ed. Between Sputnik and the Shuttle: New Perspectives on American Astronautics (San Diego: American Astronautical Society, 1981), 8-9; Bulkeley, Sputniks Crisis, 50-54; and McDougall, Heavens and Earth, 78-81, 101-103.

regarding predictions on when the Soviets would first develop atomic weapons and questions over the pace and success of their thermonuclear weapon development program, uncertainties surrounding the possible development of a bomber gap, the failure of Eisenhower's "Open Skies" proposal of July 1955, and especially the many issues related to the progress and strategic impact of the Soviet ICBM program.[6] Some analysts have noted that the U.S. decision to pursue satellite reconnaissance to help solve our intelligence problems with the Soviet Union was a reflection of our broader penchant for technological approaches to political problems.[7] RAND certainly reflected this type of thinking and was instrumental in pushing the development of spy satellites as a seemingly ideal solution to the intelligence problems caused by the closed Soviet state. As early as February 1947, RAND had submitted a report which served to assist contractors in preparing their own designs and analyses for reconnaissance satellites.[8]

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[6]On the many U.S. difficulties in obtaining accurate strategic intelligence information on the Soviet Union see Lawrence Freedman, US Intelligence and the Soviet Strategic Threat (London: Macmillan Press, 1977); and John Prados, The Soviet Estimate: U.S. Intelligence Analysis & Russian Military Strength (New York: Dial Press, 1982). For a complete analysis of Eisenhower's Open Skies proposal see Walt W. Rostow, Open Skies: Eisenhower's Proposal of July 21, 1955 (Austin: University of Texas Press, 1982).

[7]The idea of U.S. "technological anticommunism" is associated with Harvard Political Scientist Stanley Hoffman. See, for example, his essay "A New World and Its Troubles" in Nicholas X. Rizopoulos, ed. Sea Changes: American Foreign Policy in a World Transformed (New York: Council on Foreign Relations Press, 1990), 274-92. Hoffman's observation relates directly to McDougall's major theme in Heavens and Earth that the U.S. was transformed into a technocratic state, in part, in order to more successfully compete with the Soviets in the space race. The U.S. technocratic impulse in arms control verification is chronicled in Robert J. DeSutter, Jr., "Arms Control Verification: Bridge Theories and the Politics of Expediency" (Ph.D. diss., University of Southern California, 1983).

[8]This February 1947 RAND report (also known as the Lipp Report) provided a sophisticated discussion of optics and surveillance requirements and even proposed electro-optical data transmissions from satellites. Such real time data transmission capabilities were apparently not perfected until the advent of the KH-11 spy satellite in 1976. See Davies and Harris, RAND's Role in Satellites, 9-19; and Jeffrey T. Richelson, America's Secret Eyes in Space: The U.S. Keyhole Spy Satellite Program (New York: Harper & Row, 1990), 3-4.

RAND also went beyond its studies of the technical requirements for satellite reconnaissance and was apparently the first organization in the world to comprehensively analyze the political implications of the opening of the space age. An October 1950 RAND report highlighted the importance of the psychological impact which the first satellite would have on the public.[9] More importantly, this report also raised the critical political issue of overflight -- how would the Soviets respond to this new issue in international law? Would they accept satellites flying over their territory as legal let alone acquiesce to space-based surveillance of their state? The report suggested that one way to test the issue of freedom of space would be first to launch an experimental U.S. satellite in an equatorial orbit that would not cross Soviet territory before attempting any satellite reconnaissance overhead the Soviet Union.[10] According to McDougall, this report not only illustrates RAND's position and influence in the development of U.S. space policy but also highlights the gulf between U.S. and Soviet thinking on the implications of space before *Sputnik*:

> Few documents demonstrate so clearly the exceptional nature of this first strategic "think tank." Its job was to divine the future and, by predicting and recommending, to help define it as well. At a time when the Soviets were proceeding full tilt on missiles, but giving little thought to the implications of space technology, the Americans were dragging their feet on missiles but, thanks to RAND, glimpsing with prescience the effects of the opening of the Space Age. The differing concentrations were crucial, for the developmental lag and the theoretical lead of the United States were responsible *both* for the United States finishing second in the satellite race *and* for the fact that the eventual American space program was much more suited to national strategic needs than was the Soviet. The RAND document of October 1950, more than any other, deserves to be considered the birth certificate of American space policy.[11]

Of course, RAND reports were not the only forces attempting to push the U.S.

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[9]Paul Kecskemeti, "The Satellite Rocket Vehicle: Political and Psychological Problems," (Santa Monica, CA: RAND Corporation, 4 October 1950), cited in McDougall, Heavens and Earth, 108-110.

[10]McDougall, Heavens and Earth, 110.

[11]Ibid., 108. Emphasis in original.

into thinking more seriously about space and developing spy satellites. Eisenhower's perceptions of space and strategic issues were strongly influenced by the top secret Technological Capabilities Panel (TCP) he commissioned in March 1954. Eisenhower chose Dr. James R. Killian, President of MIT, as chairman of the TCP and made it clear that it "was imperative that the best minds in the country attend to the technological problem of preventing another Pearl Harbor."[12] The TCP reported to the full NSC in February 1955. Drawing upon a wide range of strategic experts and access to the latest intelligence data, the TCP report divided the near-term future into four different periods and predicted the relative strategic balance during each of these periods.[13]

According to the TCP report, Period I (1954-55) was characterized by U.S. superiority (but less than a disarming first strike capability) due to a numerical lead in bombers and nuclear weapons partially offset by U.S. weaknesses in early warning and air defenses. Period II (1956-57 to 1958-60) was predicted to be the period of greatest U.S. strategic advantage: "our military superiority may never be so great again."[14] This advantage was predicted due to the ongoing buildup of the Strategic Air Command (SAC) and the U.S. nuclear stockpile. Period III was predicted to begin in the 1958-60 timeframe when the Soviets could start to deploy large numbers of heavy bombers, increase their nuclear stockpile, and first bring ICBMs on line. These developments would signal the end of the U.S. advantages of the previous period and a movement towards a nuclear stalemate. Throughout, the uncertainties regarding the timing of initial

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[12]Ibid., 115.

[13]For the text of the TCP report see U.S. Department of State, Foreign Relations of the United States, 1955-1957, Vol. XIX: National Security Policy (Washington: GPO, 1990), 42-55. (Hereinafter FRUS). On the details of the workings of the TCP and the report see James R. Killian, Jr., Sputnik, Scientists, and Eisenhower: A Memoir of the First Spacial Assistant to the President for Science and Technology (Cambridge: MIT Press, 1977), 67-93. On the relationship between the TCP report and subsequent U.S. nuclear strategy see Lawrence Freedman, The Evolution of Nuclear Strategy (New York: St. Martins Press, 1983), 76-90. The discussion of the TCP report which follows relies primarily upon these sources.

[14]FRUS, 1955-1957, Vol. XIX, 43.

Soviet ICBM deployments and the efficacy of these weapons had the greatest impact on the TCP timeline and strategic balance predictions. The final, Period IV, prediction indicated that both the U.S. and the U.S.S.R. would likely develop force structures capable of destroying the society of the other, even in a retaliatory strike. This projected condition would play a large role in the development of the concepts of Assured Destruction (AD) and MAD under Secretary of Defense Robert McNamara some ten years hence, but for this group of scientists in 1955 the stalemate condition they had predicted for the future was not something to be welcomed or even accepted. In closing, the TCP report argued strongly that the U.S. must continually seek to improve its strategic technology but also saw "*no certainty, however, that the conditions of stalemate can be changed through science and technology.*"[15]

Based on these remarkably accurate predictions, the TCP recommended several major programs including: the development of IRBMs suitable for land or sea launch (this recommendation would eventually lead to the Jupiter and Thor IRBMs as well as the Polaris sea-launched ballistic missile or SLBM), construction of a distant early warning (DEW) radar network to warn of a Soviet bomber attack, efforts to harden SAC facilities and aircraft to nuclear attack, and a research program to investigate the possibilities for ballistic missile defense (BMD). Probably most importantly, the TCP recommended that the existing U.S. ICBM program (the USAF Atlas program) "continue to receive the very substantial support necessary to complete it at the earliest possible date."[16] The ballistic missile priority recommendations were formally implemented by NSC Action 1433 in September 1955 which also specified that the Secretary of Defense was to brief the NSC on the status of U.S. ballistic missile programs at least once each year.[17] In Killian's later analysis, the TCP report conveyed "a sense of urgency without pessimism" by highlighting both potential dangers and potential opportunities while maintaining a firm

[15]Ibid., 45. Emphasis in original.

[16]Ibid., 48.

[17]Ibid., 121-2.

faith in America's technological prowess and strategic deterrent capabilities -- a faith which would be lost by many Americans during the height of the *Sputnik* and missile gap crises.[18]

The TCP report is equally important for its recommendations regarding the development of U.S. technical intelligence gathering capabilities. Edwin H. (Din) Land, founder of the Polaroid Corporation, was the chairman of the intelligence subcommittee of the TCP. The rationale behind creation of the TCP as well as the process of research for the report itself had convinced Land and others that the U.S. desperately needed more hard data on Soviet military capabilities in order to conduct more effective strategic planning. In the final TCP report Land wrote:

> We *must* find ways to increase the number of hard facts upon which our intelligence estimates are based, to provide better strategic warning, to minimize surprise in the kind of attack, and to reduce the danger of gross overestimation or gross underestimation of the threat. To this end we recommend adoption of a vigorous program for the extensive use, in many intelligence procedures, of the most advanced knowledge in science and technology.[19]

This recommendation and the one-half page of this section of the TCP report which remains classified led directly to the development of America's first high-tech intelligence collection platforms: the Lockheed U-2 aircraft and the WS-117L reconnaissance satellites.[20]

Killian and Land met privately with Eisenhower in November 1954 to present their most sensitive recommendations prior to the full presentation of the TCP report to the NSC and received the President's strong support for accelerating programs to develop

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[18]Killian, Sputnik, Scientists, and Eisenhower, 85-90. The quote is from the section heading on page 85.

[19]FRUS, 1955-1957, Vol. XIX, 54. Emphasis in original.

[20]Richelson, Secret Eyes, 79-85. See also McDougall, Heavens and Earth, 115-18; and William E. Burrows, Deep Black: Space Espionage and National Security (New York: Berkley Books, 1986), 69-74.

U.S. technical intelligence collection capabilities.[21] Eisenhower approved the development of the very high flying spy plane then on the drawing boards at Clarence L. (Kelly) Johnson's Lockheed "skunk works" in Burbank California with the proviso that the Central Intelligence Agency (CIA) rather than the Air Force be given primary responsibility for its development and man the planes with CIA pilots.[22]

The remaining doubts within the Air Force about the technical feasibility and military utility of spy satellites were gradually giving way to the continuing promptings from RAND and especially the TCP report.[23] On 27 November 1954 the Western Development Division (WDD) of the Air Research and Development Command (ARDC) issued the secret System Requirement Number 5, "System Requirement for an Advanced Reconnaissance System."[24] Then, on 16 March 1955 the USAF issued secret

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[21]Killian, Sputnik, Scientists, and Eisenhower, 81-82. See also McDougall, Heavens and Earth, 115-18; and Michael R. Beschloss, Mayday: Eisenhower, Khrushchev and the U-2 Affair (New York: Harper & Row, 1986), 74-84.

[22]Killian, Sputnik, Scientists, and Eisenhower, 82; and Beschloss, Mayday, 81-82, 119-21. Under the direction of Johnson and Richard M. Bissell, Jr. of the CIA, the U-2 program progressed at an incredibly rapid pace and the first operational overflight of the Soviet Union took place in July 1956.

[23]Two additional reports were especially influential during this period. The Beacon Hill Report, delivered to the Air Force in June 1952, indicated that improvements in reconnaissance technology would allow valuable intelligence data to be gathered from within the Soviet Union via a variety of collection platforms. Project Feed Back, completed by RAND on 1 March 1954, successfully tested the ability of contractors to design and build many of the specific components which would be needed for a reconnaissance satellite. See R. Cargill Hall, "The Origins of U.S. Space Policy: Eisenhower, Open Skies, and Freedom of Space," in John M. Logsdon, ed., The Evolution of the U.S. Space Program: A History through Selected Documents (Washington: GPO, forthcoming), 7-9. (Hereinafter Hall, "Origins of Space Policy"); and Davies and Harris, RAND's Role in Satellites, 53-55.

[24]Robert L. Perry, Origins of the USAF Space Program, 1945-1956 (Los Angeles: USAF Space Systems Division, 1961), viii; microfiche document 00313 in U.S. Military Uses of Space, 1945-1991: Index and Guide (Washington: The National Security Archive and Alexandria, VA: Chadwyck-Healey, Inc., 1991). (Hereinafter Military Uses of Space).

requirements for what became project WS-117L.[25]

> They included the ability to attain a precise, predicted orbit; to be stabilized on three axes with a "high-pointing accuracy"; to maintain a given attitude for disturbing torques; to receive and execute commands sent from the ground; and to transmit information to ground stations. This was no "quick and dirty" orbiting beeper, but a large integrated spacecraft integrating the most advanced technology from a dozen fields of American industry.
>
> It was a paragon of peacetime command economy . . . and the first American space program.[26]

The WS-117L project soon grew to encompass secret development programs on each of the three primary types of reconnaissance/surveillance satellite systems which would be used over the next thirty years: reconnaissance via recoverable film systems under the CORONA program, reconnaissance via electro-optical systems under the SAMOS program, and infrared surveillance for missile launch detection under the MIDAS program.[27] Thus, in spite of Air Force organizational indifference if not outright hostility towards satellite and missile programs at this time, the WS-117L and the Atlas programs made the USAF primarily responsible for the nation's first and highest priority space programs a full two and one-half years prior to the opening of the space age. Prior to *Sputnik*, the Air Force was in a position of institutional preeminence in space for which it was not very well prepared or motivated -- a situation which did not last long and has yet to be repeated.

Policy on Space Science

U.S. space policy designed to support the exploration of space for scientific purposes proceeded along a parallel track during this period. These scientific efforts are an important part of the background for the development of U.S. military space doctrine because while they were of lower priority than the top secret U.S. spy satellite

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[25]Ibid.; and McDougall, Heavens and Earth, 111.

[26]The text is from McDougall, Heavens and Earth, 111. McDougall's quotes are from Perry, Origins of the USAF Space Program, 35-36, 42-44; microfiche document 00313 in Military Uses of Space.

[27]Burrows, Deep Black, 80.

development efforts, they were clearly the highest priority open U.S. space efforts and impacted on how the U.S. considered other military uses of space. Of course, the pace and structure of U.S. space science efforts played a crucial role in how the U.S. entered the space age. Moreover, these open scientific satellite efforts (as well as the spy satellite efforts) were dependent upon military booster expertise for any launch into space. Thus, these scientific satellite efforts can been seen as a type of hybrid open civilian/military effort which stood in contrast to the secret military efforts to build spy satellites and ballistic missiles.

The considerable scientific interest within the U.S. and around the world in developing satellites to explore the upper atmosphere and beyond became the major impetus behind the creation of an International Geophysical Year (IGY) to be held between 1 July 1957 and 31 December 1958. The idea for an IGY focused on high altitude research issues was first broached at an informal meeting of a group of American space scientists near Washington in April 1950.[28] In October 1954, the Special Committee for the IGY recommended that governments attempt to launch scientific satellites during the IGY and by March 1955 the Presidents of the National Academy of Science and the National Science Foundation had met with Eisenhower and received support at this highest level for a U.S. science satellite in support of the IGY.[29] In July 1955, White House Press Secretary James Hagerty publicly announced "that the President has approved plans by this country for going ahead with the launching of small, earth-circling satellites as part of the United States participation the International Geophysical Year."[30]

The U.S. IGY satellite proposal was the final major input which necessitated that the NSC undertake the delicate and hidden task of attempting to prioritize and harmonize the often conflicting and inconsistent strands of the disparate space goals and programs

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[28]McDougall, Heavens and Earth, 118. For a detailed discussion of the politics of the IGY see Bulkeley, Sputnik Crisis, chapters seven and eight.

[29]McDougall, Heavens and Earth, 118-19.

[30]Ibid., 121.

of the U.S. during the mid-1950s. During the spring of 1955, the NSC Planning Board and Special Assistant to the President on Government Operations Nelson A. Rockefeller reviewed and analyzed the differing goals and requirements of the WS-117L program, the U.S. IGY satellite proposal, and several military requirements and booster considerations submitted by Assistant Secretary of Defense for R & D Donald A. Quarles. This review became the basis for the May 1955 secret document labeled NSC 5520.[31]

NSC 5520 reflected the types of political considerations first raised in the October 1950 RAND report discussed above and translated these political concerns into recommendations and priorities for the first U.S. space efforts. The report noted that the Soviets were hard at work with their own IGY satellite efforts and recognized that "[C]onsiderable prestige and psychological benefits will accrue to the nation which first is successful in launching a satellite."[32] In Annex B, Rockefeller added his personal views to the report and emphasized "[T]he stake of prestige that is involved makes this a race that we cannot afford to lose."[33] But, despite these predictions which would ring so true in late 1957 and early 1958, the primary focus of NSC 5520 was directed not on racing to place the first U.S. satellite in orbit but on protecting and legitimizing the U.S. spy satellite program.

NSC 5520 noted that "a small scientific satellite will provide a test of the principle of 'Freedom of Space.'"[34] Accordingly, the report recommended United States Government support for a U.S. scientific satellite program during the IGY and recognized that this effort represented "an excellent opportunity" publicly to emphasize and link the U.S. to the scientific and peaceful purposes of its first projected satellite and generally

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[31]For a discussion of NSC 5520 and related matters see McDougall, Heavens and Earth, 119-21; and Bulkeley, Sputniks Crisis, 136-82. For the text of NSC 5520 see FRUS, 1955-1957, Vol. XI, United Nations and General International Matters, 723-33.

[32]FRUS, 1955-1957, Vol. XI, 725.

[33]Ibid., 730.

[34]Ibid., 725.

to characterize U.S. space efforts in this way.[35] At the same time, however, the report also emphasized factors it considered to be more important than the IGY program. Support for the IGY satellite project was to be structured to: preserve "U.S. freedom of action in the field of satellites and related programs"; not "delay or otherwise impede" other U.S. satellite programs; protect U.S. classified information; and in no way "imply a requirement for prior consent by any nation over which the satellite might pass in its orbit" or "jeopardize the concept of 'Freedom of Space'".[36] NSC 5520 was approved by Eisenhower on 27 May 1955.[37] In sum, NSC 5520 meant public support for the U.S. IGY satellite proposal but in secret meant political and programmatic primacy for the WS-117L program and the plan to use the benign IGY program as the first test of the Soviet response to the overflight issue.

Following this secret maneuvering and the public announcement that the U.S. would launch a satellite during the IGY, one major issue remained: how would the IGY satellite be launched into space? Given the rapidly approaching IGY period, only military booster technology offered the chance for the U.S. to launch its satellite within the IGY window. Assistant Secretary Quarles named an advisory group of scientists chaired by Dr. Homer J. Stewart of the Jet Propulsion Laboratory (JPL) to study the booster question. Each of the Services made presentations to the Stewart Committee in July 1955 and competed for the honor of having its booster open the space age. The USAF proposed to launch a large IGY satellite atop its top priority Atlas ICBM but could not guarantee that this would not interfere with the development of the Atlas or even that the Atlas would be ready in time for the IGY and this proposal was therefore quickly eliminated from the competition. Army ballistic missile experts from the Redstone Arsenal and Wernher von Braun offered the Stewart Committee their previously developed (September 1954) Project Orbiter proposal which called for a small satellite

[35] Ibid., 725-26.

[36] Ibid., 726.

[37] Ibid., 733.

to be launched atop a V-2 derived Redstone booster. The Naval Research Laboratory's (NRL) proposal called for the development of an upgraded version of the Navy's Viking sounding rocket capable of launching a very small satellite.[38]

On 3 August 1955 the Stewart Committee voted 3-2 in favor of the NRL proposal. Many factors were at work in influencing this close vote. The committee had been briefed on its charter and some of the political sensitivities involved in the booster choice by Quarles and RAND analysts but had not, apparently, been made aware of the WS-117L program or NSC 5520.[39] The scientists on the committee were far more familiar with the requirements on the satellite end of the IGY program and generally felt that the NRL's proposed satellite and "Minitrack" tracking system were superior to the Army's

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[38]On the deliberations and impact of the Stewart Committee see McDougall, Heavens and Earth, 121-23; Constance McLaughlin Green and Milton Lomask, Vanguard: A History (Washington: Smithsonian Institution Press, 1971), 35-37, 48-56; and Bulkeley, Sputniks Crisis, passim.

[39]Following the U.S.'s second place finish in the satellite race, the political factors influencing the Stewart Committee's decision have come under a good deal of scrutiny but, to date, there is no hard evidence that the U.S. was deliberately attempting to finish second in order to protect the WS-117L. McDougall probably gives more emphasis to the impact of U.S. concerns with establishing the legitimacy of spy satellite overflight than any other major space policy analyst. He chooses his words carefully in an overall assessment of the place of this issue within the space policy of the Eisenhower administration: "there were two ways the legal path could be cleared for reconnaissance satellites. One was if the United States got away with an initial small satellite orbiting above the nations of the earth 'for the advancement of science' -- and had no one object to it. The other way was if the Soviet Union launched first. The second solution was less desirable, but it was not worth taking every measure to prevent." Heavens and Earth, 123-24. Bulkeley also examines this issue in detail and generally praises McDougall's scholarship but rejects his hypothesis in this area due to the lack of documentary evidence, see, especially, Sputniks Crisis, 209-11. As Hall points out in "Origins of Space Policy," 20-22, it is also illuminating that in 1956 the Eisenhower administration "restrained government officials from any public discussion of space flight." Military space leaders were not aware of the secret dimensions of U.S. space policy and could not understand the rationale behind this gag order. Even more telling, beginning in November 1956, Air Force Secretary Quarles imposed slowdowns on the WS-117L to insure that a military satellite "would under no circumstances precede a scientific satellite into orbit."

Project Orbiter. They were apparently less impressed with the fact that the Redstone was America's best and most proven booster at this time and seemed confident that the upper stages for the Viking could be developed from scratch in time for the IGY. Less tangible factors were at work as well: The NRL booster was not directly associated with any major military missile program and was, therefore, better suited to maintain a more civilian face on the IGY effort; Stewart even suggested privately in 1960 that the desire to avoid having a Nazi-tainted booster lead the U.S. into the space age was a significant factor in the decision.[40] With the selection of the Viking booster by the Stewart Committee, the WS-117L project received more political protection but the stage was also set for America's second place finish in the first space race.

Policy on ICBM, IRBM, and Space Booster Development

The final major developments related to the evolution of U.S. military space doctrine prior to *Sputnik* examined in this chapter are the programs and policies for developing ballistic missiles capable of long range flight or space launch. Several of these systems and some of the most important elements of these policies have already been mentioned above and this is an excellent illustration of the interconnected nature of many types of space policies and hardware. In some ways, booster development programs and policies represent the most direct input of military thinking to the development of U.S. space policy prior to *Sputnik* because at this time virtually all major U.S. booster development efforts were directed by the military. However, because these booster policies and programs were usually focused almost exclusively on developing weapons systems rather than space launch vehicles they should not yet be considered true military space doctrine per se. Prior to *Sputnik* I, only a few within the military foresaw major military missions in space or desired rapid development of manned military spaceflight. At this time, most within the military generally viewed the potential use of U.S. military boosters for space flight as a felicitous but unintended consequence of their military mission.

A full review of the rather torturous development path for America's first major

[40]McDougall, Heavens and Earth, 122.

missile efforts is well beyond the scope of our purposes for this study; however, this section does address some of the major missile developments on the road to the opening of the space age which most clearly seem to illustrate early U.S. military thinking on missiles and space. Thanks to the desire of von Braun and the bulk of his team from the V-2 launch complex at Peenemunde to be captured by the Americans rather than by the British or especially the Russians and secret, top-priority American efforts to spirit von Braun's team, their files, and 100 V-2s out of Soviet and British occupation zones, the U.S. came away from the war with the lion's share of German missile expertise.[41] Despite this cache, American support for missile development efforts in the immediate postwar period was lukewarm at best due, primarily, to a marked lack of enthusiasm for these new types of weapons among civilian and military leaders.

In the immediate postwar period, the U.S. military not only had no military requirements for potential military satellite missions but also saw little utility in military ballistic missiles themselves. A recurring institutional dynamic was also at work here: the Air Force had become a separate Service in 1947 primarily on the basis of its unique strategic bombardment mission and was institutionally dependent upon this mission. The potential of ballistic missiles presented the Air Force with an institutional identity crisis in that missiles might replace bombers as the primary means for conducting the strategic bombardment mission. Within the context of interservice rivalry, this Air Force identity crisis became even more pronounced because the Air Force was pulled in divergent

[41]The definitive account of von Braun's team in both Germany and America is Frederick I. Ordway III and Mitchell R. Sharpe, The Rocket Team (New York: Thomas Y. Crowell, 1979). Both the Peenemunde launch complex and the Mittelwerk underground factory where slave labor was used to assemble V-2s were located in the Soviet occupation zone. The abandoned mine shaft in Dornten where thirteen years' worth of missile development files were buried during the rocket team's hasty flight towards the American lines was located within the British occupation zone. Special Mission V-2, an ad hoc unit created by the chief of U.S. Army Ordinance Technical Intelligence in Europe, was very successful in plundering the last two sites prior to the arrival of the Russians and British, respectively. The U.S. Army maintained control of the von Braun team and transferred them along with the V-2s to the newly created White Sands Proving Ground, New Mexico in October 1945. See Ordway and Sharpe, chapters one, thirteen, fourteen, and eighteen.

directions. Bomber pilots created the primary institutional drive to organize the Air Force around the strategic bombardment mission and to see bombers and SAC as the institutional core of the Air Force. On the other hand, the Air Force also had to be concerned with the possibility that another Service might gain the strategic bombardment mission via the use of ballistic missiles. Thus, the development of ballistic missiles presented the Air Force with the need for a difficult balancing act: it needed to gain primacy over the other Services in the development of ballistic missiles to protect its strategic bombardment raison d'etre while simultaneously protecting the bomber force at its institutional core against the potentially revolutionary impact of this new weapon. The Air Force's ambivalence on ballistic missiles from the immediate postwar period through the mid-1950s becomes more clear with an understanding of this institutional dynamic.[42]

Technical difficulties with long range ballistic missiles, the radical drawdowns in the military at the end of the war, the lack of a developed or threatening Soviet ballistic missile program, unclear Service roles and missions, as well as the Air Force institutional ambivalence described above combined to halt U.S. ballistic missile efforts almost completely soon after the end of the war. The Army was determined to maintain control over von Braun and his team at White Sands but was not at all interested in long range missiles for strategic missions and did not yet see much utility in shorter range missiles. By 1947, the U.S. ended its major efforts to advance the state of the art in ballistic missiles when the Air Force stopped funding for continuing development on the Convair MX-774 5000 mile range missile.[43]

The Soviet A-Bomb and reports of rapid Soviet ballistic missile progress, the

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[42]The impact of Air Force and Army institutional dynamics on the development of ballistic missiles during this period is discussed in detail in Michael H. Armacost, The Politics of Weapons Innovation: The Thor-Jupiter Controversy (New York: Columbia University Press, 1969); and Edmund Beard, Developing the ICBM: A Study in Bureaucratic Politics (New York: Columbia University Press, 1976).

[43]Beard, Developing the ICBM, 49-67. Despite the cancellation of project MX-774 in the summer of 1947, the three test vehicles of this proto-ICBM were launched at White Sands during 1948. In the most successful of these test launches, the engines shutdown after 51 seconds of flight.

Korean War and NSC-68, and the continuing development of H-bombs and missile guidance systems combined together to give both a political and technical push to the development of ballistic missiles in the early 1950s. In October 1950, Secretary of Defense George C. Marshall appointed K. T. Keller, President of the Chrysler Corporation, "as a special advisor charged with coordinating all military activities connected with research, development and production of guided missiles."[44] Keller's appointment was at least partially the result of adverse publicity charging that interservice rivalry was stifling U.S. missile efforts and, in Beard's judgement, "may have been as much a public relations effort as a sincere and aggressive attempt at reorganizing and firmly coordinating the various guided missile programs of the Armed Forces."[45]

Despite the passive approach of this first U.S. missile czar, U.S. ballistic missile development efforts did move forward again after the outbreak of the Korean war. The Air Force restarted its ICBM efforts in January 1951 with a $500,000 authorization for Convair to begin project MX-1593, the forerunner to the Atlas ICBM.[46] In July 1950, the Army decided for the first time to attempt to move forward in missile design by initiating the project which would culminate in the Redstone missile and by moving the von Braun team out of semi-captivity at White Sands to the Redstone Arsenal in

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[44]Ibid., 124.

[45]Ibid., 124-25. Keller did not leave his post at Chrysler, apparently never briefed President Harry S. Truman on his findings, and clearly fell far short of organizing a "Manhattan-type" missile program which the Secretary and Under Secretary of the Air Force (Thomas K. Finletter and John A. McCone) had originally urged on Truman. In an attempt to absolve himself of responsibility for losing the space race in the wake of *Sputnik*, former President Truman put a different spin on Keller's appointment by recalling that he had given Keller "instructions to knock heads together whenever it was necessary to break through bottlenecks . . ." See article by Arthur Krock, New York Times, 1 November 1957, p. 26, quoted in Beard, Developing the ICBM, 124. Of course, Keller's instructions and his lack of impact on U.S. ballistic missile efforts are examined in Bulkeley's Sputniks Crisis critique of the space historiography on the Truman administration.

[46]Beard, Developing the ICBM, 132-34.

Huntsville, Alabama.[47] Finally, technical developments during the early 1950s such as the design of smaller and lighter atomic warheads and, especially, the success of the November 1952 MIKE thermonuclear test, helped to break down the remaining technical objections to the possible military effectiveness of ICBMs.[48]

U.S. ballistic missile efforts were significantly accelerated soon after the Eisenhower administration took over the reigns of the Pentagon. Three individuals who came into the Air Force civilian leadership structure with the change in administration were instrumental in stepping up and shaping the Air Force ballistic missile efforts of the mid-1950s. These individuals were Trevor Gardner, appointed in 1953 as a special assistant to Secretary of the Air Force Harold E. Talbott for research and development issues, Secretary Talbott, and Donald A. Quarles, the new Assistant Secretary of Defense for R & D and later (August 1955) Secretary of the Air Force.

Of the three, Gardner was by far the most active and outspoken supporter of accelerated ICBM efforts. Upon entering office, Gardner was immediately dissatisfied with what he perceived to be the slow pace and lack of direction in the Air Force's ballistic missile efforts, especially in the Atlas ICBM program. In April 1953, he began his quest to speed these programs by requesting a review of all Air Force missile

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[47]Ordway and Sharpe, Rocket Team, 370. The original requirements called for a range of 500 miles but this was reduced as the Redstone evolved to 200 miles due to a desire on the part of the Army to take an evolutionary, cautious approach to this extension of field artillery. Beard, Developing the ICBM, 104.

[48]Beard, Developing the ICBM, 140-44. On page 143, Beard notes that the Millikan Committee recommended in December 1952 that the requirements for the Atlas be relaxed from a 1500 foot CEP (circular error probable or the radius of a circle within which half of the warheads aimed at its center are expected to land) and a 10,000 pound payload capability to one mile and 3,000 pounds, respectively. The original stringent requirements for the Atlas should also be viewed in less technical terms and more as a bureaucratic ploy within the Air Force to delay ICBMs in favor of continued dependence strictly on bombers. On the relationships between warhead yield, accuracy, and performance requirements see also Herbert York, Race to Oblivion: A Participant's View of the Arms Race (New York: Simon & Schuster, 1970), 88-89.

projects.[49] By June 1953, the JCS had recommended that the missile programs of all three Services be reexamined and, with Talbott's blessing, Gardner built upon this recommendation to create the Strategic Missiles Evaluation Committee (SMEC) in November.

The recommendations of the SMEC or von Neumann Committee, after its chairman John von Neumann of Princeton University, were the single most important factor in setting the structure and pace of the Atlas ICBM program from 1954 onward.[50] The SMEC report of February 1954 formally recommended that the Atlas program be strongly supported and accelerated. It also found that a new management structure and philosophy was the most urgent need of the program. Based upon these recommendations and Talbott's strong support, Gardner was able to push a radically restructured Atlas ICBM program through the opposition of the Air Staff and Air Material Command. In May, a memo from Air Force Vice Chief of Staff General Thomas D. White directed that the Atlas be given the highest R & D priority in the Air Force.[51]

Brigadier General Bernard A. Schriever took command of the new Western Development Division (WDD) of the Air Research and Development Command (ARDC) in August 1954. The WDD had been created to expedite Atlas development; it pioneered new methods of systems management which moved beyond the traditional Air Force contractor model and also explored concurrent development.[52] Specifically, Gardner and

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[49]Beard, Developing the ICBM, 145-46.

[50]The discussion of the SMEC below is drawn primarily from Beard, Developing the ICBM, 146-94. See also York, Race to Oblivion, 85-92; Armacost, Thor-Jupiter Controversy, 56-58; McDougall, Heavens and Earth, 106-7; and Robert Frank Futrell, Ideas, Concepts, Doctrine: A History of Basic Thinking in the United States Air Force, 1907-1964 (Maxwell AFB, AL: Air University Press, 1971; reprint, New York: Arno Press, 1980), 244-45 (page references are to reprint edition). The SMEC is sometimes also referred to as the teapot committee.

[51]Beard, Developing the ICBM, 171.

[52]Armacost, Thor-Jupiter Controversy, 155-60. Under the contractor model for weapon system management usually used by the Air Force, the Service sets the specifications for a weapon system and then requests and selects from prototypes

Schriever largely were able to shield the WDD from the normal ARDC financial and system review channels and, more importantly, they moved the overall systems engineering responsibility for the Atlas from Convair to the newly created Ramo-Woolridge Corporation.[53] As discussed above, based upon the TCP report recommendations, President Eisenhower gave the Atlas the highest national priority for R & D in September 1955 and thereafter the ICBM consistently was developed about as fast as technologically possible. The Atlas was first test flown successfully in November 1958 and the system achieved initial operational capability (IOC) in September 1959.

The story of the development of the Atlas ICBM is important not only for illustrating the critical role of civilian leadership in structuring and prioritizing this new weapons system but also shows the movement of the institutional culture of the Air Force towards acceptance of ICBMs. While the guidance of Eisenhower, the TCP, and Gardner were essential in accelerating the program and placing it upon a firm footing, Schriever, the WDD, and others internalized this momentum and came to be strong supporters of ICBMs within the Air Force. Thus, the development of the Atlas showed that a radically new type of weapon could survive and prosper within a hostile institutional culture while at the same time this development was helping to alter that culture and beginning to get the Air Force to think more seriously about missiles and space in the period before *Sputnik* I.

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developed by private contractors. Responsibility for design, production, and performance rests with the contractor. In the older Army arsenal model, the Service-run arsenal develops the prototype and then selects a contractor to produce the system. There are several advantages and disadvantages to each approach although the general trend by all Services has been towards the contractor model. Concurrent development refers to the difficult and risky task of moving the development of various subsystems forward in parallel rather than in series.

[53]Beard, Developing the ICBM, 175-79. Drs. Simon Ramo and Dean E. Woolridge were members of the SMEC who had recently left the Hughes Aircraft Company to form their own company. Moving overall systems engineering responsibility from the contractor to this new company was not only virtually unprecedented but it also smacked of some sort of sweetheart deal given the membership of the SMEC and its recommendations.

The final area examined in this section is the competition between the Air Force and the Army to develop IRBMs. It is important to look at this competition because it marks some of the most severe interservice rivalry of the cold war period and because it illustrates the attitudes and motivations of the Army and the Air Force when approaching missile and space issues. This competition shows just how important organizational behavior inputs can be in the pace and structure of weapons development programs and how programs driven by organizational behavior inputs can impact upon future policies.

The military priorities and resource allocation created by Eisenhower's new look military policy of 1953 had an enormous impact on the Air Force and the Army. In broad terms, the Air Force, and SAC in particular as the instrument of massive retaliation, came to a position of dominance within the DoD while the Army, without a strategic nuclear mission, struggled with large cutbacks and the loss of institutional clout. The story of the Air Force-Army competition over the development of IRBMs should therefore be seen as a part of the larger interservice rivalry of the new look era where the Air Force was attempting to preserve its expanded turf by maintaining or even broadening its control over the strategic nuclear mission and the Army was attempting to bolster its institutional standing by expanding its roles and missions into this area.

The Army was in the difficult organizational position of decline and dependency and needed new thinking and new ways to attempt to improve its standing. In November 1954, Major General John B. Medaris (who would become commander of the Army Ballistic Missile Agency or ABMA in February 1956) argued at a meeting of the Ordinance Staff that the Army needed to structure its new procurement initiatives explicitly to mesh with the political realities of the new look:

> It is far easier to justify a budget with modern items that are popular, and I would strongly recommend that you increase the amount of money you show in the budget for the production of missiles, limiting yourself on the other items to the modest quantities that you know you can get by with. If you increase your demands for guided missiles, I think there is a fair chance you can get a decent budget. Why don't you accentuate the positive and go with that which is popular,

since you cannot get the other stuff anyway?[54]

Others in the Army were frustrated by what they considered to be artificial boundaries imposed on Army doctrine and weapons systems within the DoD. General Maxwell Taylor was among the most outspoken critics of these restrictions. In The Uncertain Trumpet Taylor even implied that sustained Army investments in cutting-edge technology (especially guided missiles) was a way for the Army to obtain political leverage within the DoD against the Air Force.[55]

A primary factor in allowing the Air Force-Army interservice rivalry to come to a sharp head over the issue of the development of IRBMs was the fact that the DoD had never clearly delineated specific roles and missions between the Services in this new military arena of ballistic missiles. Moreover, in the context of this period, it was quite unclear exactly where these novel weapons systems were heading and the Services could entertain the dream that these systems might lead directly to their own significant manned military space missions. Guided missiles had not even been mentioned in the Key West and Newport agreements which had originally divided roles and missions among the three Services. In March 1950, the JCS had recommended and Secretary of Defense Louis A. Johnson had approved exclusive Air Force jurisdiction over long range missiles but this directive did not specify what constituted "long-range".[56] In practice, the distinction between long- and short-range missiles seemed to be related to the nebulous concept of strategic versus tactical weapons and each Service was apparently free to pursue ballistic missile development programs appropriate to support its assigned roles and missions. During the height of the Thor-Jupiter competition this issue was finally settled more definitively. In November 1956, Secretary of Defense Charles E. Wilson issued a

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[54]Major General John B. Medaris, USA, (Ret.) Countdown for Decision (New York: G. P. Putnam's Sons, 1960), 65. Cited in Armacost, Thor-Jupiter Controversy, 44.

[55]General Maxwell Taylor, The Uncertain Trumpet (New York: Harper & Brothers, 1959), 168-69. Cited in Armacost, Thor-Jupiter Controversy, 43-44.

[56]U.S. Congress, House, Committee on Science and Astronautics, A Chronology of Missile and Astronautic Events, 87th Cong., 1st sess., 1961, 14.

memorandum on roles and missions which specified that "[t]he U.S. Army will not plan at this time for the operational employment of the intermediate range missile or for any other missiles with ranges beyond 200 miles."[57]

The TCP report recommendation that the U.S. develop a 1500 nautical mile range missile, coming on top of the interservice rivalry of the new look era and the lack of a clear line of jurisdiction over this type of weapon by any one of the Services was the proximate cause of the Army-Air Force IRBM controversy. The Army jumped at the opportunity presented by this recommendation as a way to improve its organizational standing and to employ the von Braun team at the Redstone Arsenal more gainfully at last.[58] The Army's IRBM program was originally structured to be conducted in full partnership with the Navy. The Air Force was somewhat slower to respond to the IRBM recommendation in the TCP report largely because Gardner, in particular, was worried that an IRBM effort might detract from the Air Force's higher priority Atlas efforts. Moreover, the Air Force originally held that an IRBM could be created simply by downgrading the range of an ICBM. Nonetheless, at least partially as a response to the great Army enthusiasm over developing an IRBM, the Air Force proposed its own IRBM program during the Fall of 1955. In November 1955, Secretary Wilson chose to allow deliberate duplication of IRBM efforts among the Services with the Air Force assigned responsibility to develop the land-based missile and the Army and Navy jointly assigned responsibility to develop a land- or sea-based missile.

The two years between November 1955 and November 1957 were marked by the most intense interservice rivalry over the IRBM issue. Despite Wilson's November 1955 decision to allow for deliberate duplication in IRBM development efforts, most observers both within and outside the military suspected that only one system would eventually survive and that only one Service would have operational control over the missile. Accordingly, the Army and the Air Force both pulled out all the stops in attempting to

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[57]Cited in Armacost, Thor-Jupiter Controversy, 120.

[58]Ibid., 54-55. The subsequent paragraphs are drawn primarily from ibid., 54-179; and Medaris, Countdown for Decision, chapters six and nine through fourteen.

sell their system. The Navy had never been a very committed partner with the Army on the liquid-fueled Jupiter missile because the Navy wanted solid-fueled missiles for safety reasons at sea. Throughout 1956, the Navy was busy studying the possibility of developing its own smaller, solid-fueled IRBM and on 10 December the Navy formally ended its cooperation on the Jupiter missile to concentrate exclusively on the Polaris SLBM. This Navy defection from the program coupled with the Wilson roles and missions memorandum of November 1956 which gave operational control of IRBMs to the Air Force, limited future Army missile efforts to 200 nautical miles, and made the Air Force responsible for funding the Jupiter after June 1957 combined to place the Jupiter program in grave danger of cancellation.

Following the November 1956 roles and missions memorandum many called for the cancellation of the Jupiter development program; even within the Army many favored cancellation since the Army would not be able to operate the system. Secretary of the Army Wilbur Brucker and General Medaris urged a different course, however.[59] They were concerned that the Army maintain its technological edge and especially desired to keep the von Braun team under Army control. Secretary Brucker and the ABMA also redoubled their efforts to maintain the funding for and the pace of the Jupiter program. In particular, Brucker called for a review of the decision of the Stewart Committee and attempted to sell the Jupiter as America's most sure means into space or at least to have the Jupiter designated as the official backup to the Vanguard. Despite these efforts and the fact that the Jupiter was performing better in its tests than the Thor, the Jupiter

[59]Armacost, Thor-Jupiter Controversy, 124-28; and Medaris, Countdown for Decision, 12[illegible]-40. In what was probably the absolute height of the interservice rivalry generated by the Thor-Jupiter competition, Army Colonel John Nickerson, Congressional liaison for ABMA, publicly lashed out at those he perceived to be impeding the progress of the Jupiter. In this series of attacks, which were apparently launched on his own initiative, Nickerson strongly disputed the findings in the Wilson memorandum of November 1956, questioned the judgement and financial interests of Wilson himself, and highlighted the alleged duplicity of the Air Force. Nickerson plea-bargained his way out of a court-martial but this incident undoubtedly further poisoned the relationship among the services and alarmed civilian leaders concerned with the ability of the services to conduct these type of programs.

appeared to be headed towards cancellation during most of 1957. The reprieve for the Jupiter came in the wake of *Sputnik*; on 27 November 1957, the new Secretary of Defense, Neil H. McElroy, announced that both the Jupiter and the Thor would be produced.

Of course, a Jupiter-C propelled America's first satellite into space by launching *Explorer* I on 31 January 1958 and both the Jupiter and the Thor went on to be deployed as weapons systems and be used as space launch vehicles. For the purposes of this study, however, the most lasting impact of these systems on U.S. military space doctrine came as the result of the pre-*Sputnik* period of interservice rivalry described above. The Thor-Jupiter competition was probably the most pronounced interservice rivalry of the new look period, a period often characterized by interservice rivalry. As such, this competition created in the minds of many observers a negative perception of the ability of the Services to conduct programs associated with missiles and space.

The atmosphere created by this competition tended to have both a direct and subtle stifling effect on future Service cooperation in investigating the military potential of space. The atmosphere created by this and other instances of interservice rivalry also had an impact on how the president and the Congress viewed space and defense issues in the late 1950s. By his second administration, Eisenhower was often in an adversarial relationship with Congress or the DoD over defense and space issues: he had come to distrust the motives of the Services, felt a strong need for defense reorganization, pushed a measured rather than a race approach to space, and of course emphasized these feelings with the warning about the military-industrial complex in his farewell address. Likewise, this competition over IRBMs undoubtedly influenced the Congress as it debated the Defense Reorganization Act of 1958 and pondered the need for a civilian space agency. Cumulatively, these pressures would have a large impact on how the U.S. and the U.S. military would approach the defense implications of space.

Applying the Comparative Framework and Addressing the Research Questions

Overall, the developments analyzed for this earliest period of the cold war reveal some of the first space doctrinal preferences of the Services but, especially for the earliest parts of this period, the Services were not often thinking seriously about how to use space to enhance U.S. national security. The analysis above more clearly reveals the first elements of U.S. space policy -- a highly secret policy which fundamentally shaped the course of later U.S. space policy and military space doctrine. Subsequent chapters will be able to focus more exclusively on military space doctrine and the relationships between military space doctrine and national space policy.

The analysis in this section begins by applying the comparative framework from chapter two to the developments related to the evolution of U.S. military space doctrine discussed above. The goal of the comparative framework is to evaluate whether national security considerations or organizational behavior considerations were more important in conditioning doctrinal outcomes at this time. Next, the major policy and doctrine outcomes of this period are identified and compared with the doctrinally-related portions of national space policy. The major relationships between specific space-related organizations and doctrinal preferences are discussed. Finally, the airpower development analogy is compared with the actual spacepower developments of this period.

Applying the Comparative Framework

Using the comparative framework to examine the major developments related to the evolution of military space doctrine for this period yields the following observations: 1) The first pair of consolidated hypotheses on types of space doctrine schools strongly support the importance of national security inputs in conditioning space policy and doctrine outputs. U.S. space policy during the pre-*Sputnik* era was generally defensively oriented. The emphasis on exploiting and protecting the potential of spy satellites as well as the lack of any serious capability for offensive actions in space during this time all supported the development of the sanctuary school of thought on military space doctrine. Virtually nothing in U.S. space policy was offensively oriented during this time and neither the Services nor any other major group had seized on technological or locational aspects of space which might favor offensive doctrines.

2) National security considerations were more important than organizational behavior in conditioning policy and doctrinal outcomes related to security classifications for space policy and space systems during this period. Spy satellites and U.S. space policy regarding spy satellites were both highly classified due to national security

considerations. The overriding importance of attempting to open up the closed Soviet state and the need to establish a legal regime to legitimize satellite overflight stemmed directly from the U.S. national security strategy of the 1950s and led to the need for highly classified programs and policies. Due to organizational behavior considerations, the Services and the scientists working on the IGY program opposed much of the highly classified nature of almost all aspects of space-related hardware and policy. Generally, both the Services and the scientists sought recognition and publicity as a means of bolstering their space efforts but were blocked by national security-related security considerations imposed from the top-down.

3) In most cases, the space policy and doctrinal outcomes of this period were well integrated with U.S. national security strategy. Due to strong intervention by civilian leadership in the development of space policy, the policy reflected the perceptions of the civilian leadership on international relations and the efficacy of space systems. The civilian leadership of the Eisenhower administration crafted a space policy which was hidden but that was well integrated with their perceptions of the highest U.S. national security goals. Moreover, the Eisenhower administration's lack of emphasis on the public impact of the opening of the space age did not stem from a failure to address this factor but was a judgement that this issue was less important than the national security considerations served by the broader U.S. space policy. While space policy was generally well integrated with national security strategy, there was a lack of coordination between the Services on space-related issues during this period as each Service responded primarily to its individual organizational behavior considerations. The competition between the Air Force and the Army in developing IRBMs is the best example not only of a lack of coordination but of actual hostility between these Services on this issue. The Army's efforts to move strongly into missiles and space, the most clear attempt at space-related organizational aggrandizement during this period, were largely possible due to the lack of stronger civilian intervention but also were ultimately unsuccessful, in large part, due to the shortage of high-level support for this move among the civilian leadership.

4) The space policy and doctrine outcomes for this period were among the most innovative of the entire cold war era. When the civilian leadership intervened more

strongly in the space policy development cycle, more innovative policy resulted. The civilian leadership, assisted by the RAND reports and the TCP report, strongly pushed an innovative approach to space policy and doctrine which was eventually successful in reaping the benefits from spy satellites and had to overcome the more conservative and institutionally bound approach of the Services. The policy on the revolutionary spy satellites is the best example of this but the Atlas ICBM was also fundamentally shaped by strong civilian intervention. The strength and importance of civilian intervention in conditioning more innovative outcomes is clear when examining the overall outlook of the Services towards ballistic missiles and space. The Services and other organizations generally were institutionally bound to policies which did not emphasize missiles or space and it usually took civilian leadership to move them in this direction, even when such a move would seem to benefit the organization. For example, by 1955 the Air Force was the preeminent organization in space and missile programs thanks to the WS-117L and the Atlas programs but these had only been accelerated as the result of Gardner's efforts and the TCP report recommendations rather than through major efforts of the Air Force itself.

Table two is the most appropriate tool for continuing with the comparative framework because most of the pre-*Sputnik* era was perceived as a period of high U.S.-Soviet tensions. Generally, most of the outcomes predicted by the balance of power theory hold for the actual policy outcomes of this period: Policy was characterized by the sanctuary school of thought, security classification levels corresponded to national security considerations, and levels of both integration and innovation were quite high. These policy outcomes match more closely than the outputs predicted by organizational theory, especially in the areas of type of doctrinal school and security classification level.

<u>Addressing the Research Questions</u>

Due to the limited development of military space doctrine during this period, there are not many significant relationships between military space doctrine and U.S. national space policy for this earliest period of the cold war. Moreover, the strength of the civilian interventions into the doctrine development cycle during this period also tended to overshadow military doctrinal preferences. By the end of this period, however, the military was beginning to recognize more clearly that their organizational interests in space would probably not be well served by the sanctuary policy of the Eisenhower administration. Of course, the major aspects of this sanctuary policy were not clear even to the top military leadership at the time due to the highly secret nature of Eisenhower's space policy. This very secrecy was one of the first major factors which helped the Services recognize the growing divergence in outlooks on space. By the end of this period, the Services and the administration had very different perspectives on the need for extremely tight security surrounding nearly all space activities. Finally, the fallout from the Thor-Jupiter controversy also moved space policy and doctrine further apart: as the Services learned more about space and began thinking more seriously about military space applications, the administration moved to restrict these options as a way to mitigate against interservice rivalry.

Likewise, the interrelationships between military space doctrine and specific organizations had not become very prominent or important even by the end of this period. Of course, it would be difficult for many of these types of relationships to emerge since several of the most important space-related organizations had not yet been created. Additionally, the Services were really only beginning to think seriously about the security implications of space by the end of this period. None of the Services or individual military organizations such as ABMA or WDD had yet developed preferred doctrinal outcomes. The Eisenhower administration was the only organization with a highly developed outlook on space. The administration's secret but top-priority spy satellite efforts strongly favored the sanctuary school perspective on space. Thus, it is difficult to address this research question based on the limited developments in this area for this period.

The final research question on the suitability of the airpower development analogy for describing the major spacepower developments of this period is not applicable due to the lack of spacepower developments in this earliest period of the cold war. There were few actual spacepower developments during this period and few analogies being drawn at this time between spacepower developments and airpower developments. This question is not addressed for this period.

For the cold war period prior to *Sputnik*, a general review of the model and the policy outcomes for this period as well as a more focused look at the comparative framework both support the finding that the most important space policy and doctrine inputs came from the top-down and were related to national security. In fact, national security inputs were usually much more important in shaping policy and doctrine outcomes before *Sputnik*. It will be interesting to see if the model and comparative framework continue to provide such clear patterns as we move forward chronologically.

The highly secret and national security-driven U.S. space policy goals crafted by the Eisenhower administration during this period remained the top U.S. space policy goals for the next period as well. However, the context in which these policies operated was drastically altered following the launch of *Sputnik* I. The enormous shockwaves generated by the Soviet triumph in opening the space age make the launch of *Sputnik* I the single most important development related to the evolution of U.S. military space doctrine during the cold war. Unlike this earliest period of the cold war, following the launch of *Sputnik* I, space matters would be a top concern of the Services and the American public. The near-hysteria amongst the American public following *Sputnik* would drastically alter the content of and process for making U.S. national space policy and the implications of *Sputnik* would forever change how the U.S. military viewed space.

CHAPTER FOUR: CLASH OF THE TITANS

Overview

The launch of the *Sputniks* had an enormous impact on the U.S. The American public quickly understood that the space age had begun and that the U.S. had been beaten into space but few could claim to understand the implications of the opening of the space age. The unknowns of satellites and space perplexed both the experts and the public. The Eisenhower administration's public relations efforts were largely ineffective in attempting to downplay the importance of the *Sputniks* or in allaying American concerns about space. The Soviet space triumphs simultaneously elicited many feelings: fascination, wonder, fear, anger, awe, envy, and uncertainty. These strong public emotions were tapped by those with long-standing grievances against Eisenhower's policies to help create and sustain the crisis in confidence which dominated Eisenhower's second term in office. The shock of being beaten into space and the uncertain security implications of this new frontier fueled many of America's space policies created in the wake of the *Sputniks* and would leave a lasting imprint on America's view of space.

Despite the fact that each of the Services had initiated at least some type of missile development program prior to *Sputnik* 1, the Services were almost as caught up in and ill prepared for the opening of the space age as was the American public. In 1957, no Service had anything approaching a comprehensive doctrine related to all of the potential military uses of space and the U.S. national space policy focused on the development of space reconnaissance as virtually the only acceptable militarily-related aspect of space. The shock of the Soviets opening the space age and the unclear security implications of space provided the necessity and incentive for each of the Services, and the Air Force in particular, to investigate more fully other potential military uses of space and to stake out their claims to this new high ground. Both national security and organizational behavior inputs motivated the Air Force to argue that the U.S. should rapidly create a manned military presence in space. Historical analogies to the strategic importance of a strong military presence in the opening of man's previous frontiers were used to bolster the case for a strong U.S. military presence in space. Moreover, the Air Force advanced the concept of "aerospace" to argue that there was no logical distinction between air and space operations and that the Air Force should be given the primary operational responsibility for missions within the whole of this area.

Efforts by the Air Force and the other Services to move the U.S. into a stronger military presence in space were not very successful. Following the creation of the National Aeronautics and Space Administration (NASA) on 1 October 1958, the civil route for America's entry into space gained increasing focus and support. Moreover, the Eisenhower administration's continuing efforts to shape the image of the U.S. as a peaceful presence in space and desire to protect and nurture the potential for spy satellites dictated the de-emphasis of any other potential military missions in space. The creation of the Advanced Research Projects Agency (ARPA), the expense and time required to develop space hardware, and debates within the Services over the military potential of space and over allocations of effort on space also contributed to the lack of many significant military inroads into space by the end of the Eisenhower administration.

The military and the Air Force in particular were encouraged by the initial missile and space gap rhetoric of the Kennedy administration and renewed their efforts to expand the U.S. military presence in space during this period of extreme U.S.-U.S.S.R. tensions. By the end of the Kennedy administration, however, the U.S. was moving into space almost entirely along a civil path rather than via a military path. Spy satellites were cloaked with even more stringent security classifications and the Air Force's X-20 manned space vehicle was canceled while the race to the moon was initiated and consumed the bulk of America's attention and effort in space. Thus, by the end of 1963, the initial sorting of U.S. priorities in space had been completed and the military had been largely ineffective in arguing the need for space control or in selling space as the ultimate high ground. By the end of this period, the military clearly had been denied repeatedly the hardware tools necessary to investigate the high ground potential of space and the stage was set for the military generally to resign itself to the sanctuary school of thought on space.

This chapter will examine several space-related developments of this period chosen because of their impact on the evolution of U.S. military space doctrine or because they illustrate important outputs of national space policy. Unfortunately, there were no formal military space doctrine statements per se during this period; but, there were certainly enough other statements, hardware developments, and space policies from which to build a rather complete picture of how the military generally viewed the security implications of space at this time. The emergence of this first U.S. military space doctrine during this period also allows us to move away from the national space policy emphasis of the previous chapter and begin to focus on the developments related to the evolution of U.S. military space doctrine more specifically. From this point forward, the general development of overall national space policy will not be examined in detail. The study will, however, continue to focus on the interrelationships between military space doctrine and the military-related aspects of national space policy in accordance with the study design described in chapter two.

Overview of Major Doctrinal Inputs and Considerations

As will be clear from the various detailed and complicated policy processes described below, the development of U.S. military space doctrine became a far more complex proposition beginning in this period. This section introduces some of the most prominent and most important doctrinal issues of this period. In particular, the focus is on instances where either national security inputs or organizational behavior inputs may have had a decisive impact on the development of military space doctrine in each of the eleven issue-areas discussed below. In general, as with the last period, national security inputs usually seem to be more important and more powerful in shaping many military space doctrine outputs. However, the establishment and operation of several important space organizations during this period also greatly increased the complexity of the military space doctrine development cycle by increasing the number, strength, and impact of organizational behavior inputs. Moreover, overall judgements concerning the relative strength of inputs to military space doctrine development at this time often are also difficult to make due to the vigorous doctrinal sorting of this period, the divergent positions and lack of dialogue between top civilian and military doctrine makers, and the many unresolved doctrinal issues left at the end of this period.

During the period of the initial *Sputniks* shock, most bureaucracies were not prepared to take advantage of this situation and national security considerations generally dictated the immediate top-level U.S. responses to the opening of the space age. Thus, many of the most important first U.S. responses to the opening of the space age such as the creation of the Science Advisor's office, the acceleration of U.S. space programs, and the eventual approval for the Jupiter-C to back up the Vanguard were generally shaped more by top-down responses to the *Sputniks* situation rather than by bottom-up bureaucratic initiatives. The requirements of spy satellites and Eisenhower's space policy generally continued to predominate at the level of national space policy.

Other responses during this period represented more of a blending of national security and organizational behavior considerations. The first Air Force space doctrine as announced by General Thomas D. White on 29 November 1957 is a good example of this type of blending. Here, legitimate national security considerations were involved in addressing the unknown security implications of the new high ground potential of space. However, the other major Air Force positions in this first space doctrine statement including the ideas that: spacepower would prove as dominant in combat as the Air Force believed that airpower already was, there are no distinctions between air and space in the one operational medium of aerospace, and the Air Force should have operational control over all forces within this one operating medium clearly were driven more by organizational behavior considerations.

Likewise, the creation of ARPA is another example of an output produced by competing bureaucratic pressures. In this case, the DoD, and Secretary of Defense Neil H. McElroy in particular, put more emphasis on national security considerations by attempting to use ARPA to establish a consolidated and focused military space effort.

Based on the Thor-Jupiter controversy, organizational behavior considerations probably would have continued to emphasize separate Service space programs and could have led to greater interservice rivalry. However, ARPA itself did not seem clearly or strongly to articulate a preferred military space doctrine and this new space organization thereby muddled early Service efforts to think clearly about space.

The process and outputs of the Johnson Hearings were also conditioned by a variety of conflicting national security and bureaucratic pressures. Overall, the process and outputs of these hearings seem to be based more upon a convergence of overall bureaucratic considerations which mixed Johnson's political interests with the many attempts by witnesses to advance their preferred organizational agendas than upon a more straightforward attempt carefully to examine national security considerations raised by U.S. space policy and the opening of the space age. Indeed, the fact that the considerations behind Eisenhower's secret space policy never came close to being examined in open session during the entire course of this inquiry is strong evidence that bureaucratic considerations predominated. What is more clear from these hearings and the report they generated is that Congress was initially far more concerned with high ground military space consideration than was the Eisenhower administration.

The inputs into the creation of NASA and the impact of NASA on military space programs and doctrine is certainly one of the most important and complex issue-areas related to military space doctrine during the cold war. The organizational agenda of Science Advisor Dr. James R. Killian and the President's Science Advisory Committee (PSAC) dominated much of the process of drafting the legislation for NASA. The organizational preferences of the Congress and the various major military space actors then shaped this legislation in significant ways. Most importantly, the organizational agendas of the Office of the Secretary of Defense (OSD) and the Air Force were major factors in the process of injecting more of a national security focus into the final NASA bill. The creation of this powerful new space bureaucracy and the emergence of two separate, but closely interrelated, American space programs fundamentally set the context in which all subsequent U.S. military space doctrine developed.

The top-level Eisenhower space policy such as expressed in NSC 5814/1 and subsequent documents continued to set the underlying limits for military space doctrine development. National security inputs rather than organizational behavior considerations predominated at this policy level and again highlighted the predominance of spysats and spysat policies over all other space programs or policies. Eisenhower's and Killian's perceptions on the relationships between space and national security were also clearly illustrated during the deliberations over NSC 5814/1 when they specifically downgraded the priority of other military missions in space. The highly secret nature of Eisenhower's top space priorities and emphasis on space as a sanctuary for spy satellites created much of the vigorous doctrinal sorting of this period as the military repeatedly attempted to develop military space applications more ambitious than desired under this comprehensive U.S. policy for space.

Military space plans and programs during this period were driven forward by both sets of inputs in various degrees. Many of the extreme military space plans advanced in the wake of the *Sputniks* such as Brigadier General Homer A. Boushey's doomsday moon base plan were bottom-up organizational efforts at creating doctrine. By contrast, most of the mainstream military space systems which came on line beginning in the early 1960s reflected national security considerations to a far greater degree than organizational preferences. The earliest U.S. ASAT systems represent somewhat of a mix between these two considerations because while the military generally strongly supported the development of ASAT systems, the actual ASAT systems deployed at the end of this period (Programs 505 and 437) were initiated by Secretary of Defense Robert S. McNamara and OSD and strongly reflected their ASAT doctrinal preferences rather than those of the military.

The changes in military space organizations and responsibilities during this period were strongly influenced by organizational behavior considerations. The changes in Army space programs culminating in the transfer of Wernher von Braun's team from the Army Ballistic Missile Agency (ABMA) to NASA effective 1 July 1960 were the result of organizational behavior struggles and had few direct national security implications. Likewise, the DoD decisions in September 1959 and March 1961 which increased Air Force responsibilities for space system and booster development as well as for launch of all DoD space systems were largely shaped by organizational behavior considerations. The thwarted Army and Navy efforts to create a unified space command in order to block the consolidation of Air Force space dominance within DoD as well as the efforts of Director of Defense Research and Engineering (DDRE) Herbert York and Secretary McNamara to gain more control over all DoD space efforts by centralizing military space within the Air Force were all direct reflections of the organizational agendas of the various groups and individuals involved.

Organizational behavior considerations also dominated much of the Air Force effort to build a large military man-in-space program. From the pre-NASA Man-In-Space-Soonest (MISS) Plan through the cancellation on the X-20, the Air Force largely identified itself with the high ground school on space and strongly believed in the need for a significant manned military presence in space. The support of the Air Force and the Air Force Association for military man-in-space programs was certainly motivated in important ways by national security considerations. However, the best indication of the organizational behavior roots of these manned spaceflight initiatives was the depth and level of support which these programs received compared with other space programs and the fact that these organizations continued their strong support despite being unable clearly to define a necessary and cost-effective immediate military mission for military man-in-space.

Finally, national security considerations were of overriding importance in shaping nearly all aspects of U.S. spy satellite programs and policies as well as in setting most of the space policies of the Kennedy administration. The decisions to create the CORONA program, to establish the National Reconnaissance Office (NRO), and to impose a security blackout first on spy satellite programs and then all military space programs each flowed directly from national security considerations. Significant Air Force bureaucratic interests were overridden in each of these important decisions. Likewise, the major space policy initiatives of the Kennedy administration were generally motivated by top-down national security considerations rather than by bottom-up organizational behavior inputs. To be sure, the Kennedy administration's perceptions of the national security implications of space were far different and far more concerned with international prestige than the Eisenhower administration's perceptions of space and national security had been. Nonetheless, it was generally these considerations rather than organizational inputs which accounted for Project Apollo and the space arms control initiatives which culminated in the Outer Space Treaty (OST) of 1967. Thus, many of the most important space developments for this entire period such as the U.S. top-priority policy on spy satellites and the major space initiatives of the Kennedy administration were clearly motivated almost exclusively by national security considerations.

Analysis of Major Developments Related to U.S. Military Space Doctrine, *Sputnik* I-1963

Impact of the *Sputniks* Shock

The Soviet Union became the world's first spacefaring nation with the launch of *Sputnik* I on 4 October 1957. The Soviets rapidly followed this premiere by orbiting the 1,121 pound *Sputnik* II with Laika the dog aboard on 3 November. This potent one-two punch wreaked havoc on Americans' preferred image of themselves as the world's leaders in science and technology. These Soviet triumphs also accelerated the growing feelings of insecurity which the nuclear age had already thrust upon the American psyche. The U.S. response to the *Sputniks* challenge was both broad and deep, ranging from many new educational approaches and programs to increased military spending and reorganization. The shock of the *Sputniks* was the proximate cause of nearly all the space-related developments in the U.S. for the remainder of 1957 and through 1958. The most significant of these developments such as the Johnson Hearings in the Senate, the creation of ARPA within DoD, and the creation of NASA itself are discussed in separate sections below. This section briefly reviews those other developments initiated in the immediate wake of the *Sputniks* which are most directly relevant to the doctrinally-related aspects of U.S. national space policy and the development of military space doctrine.

Despite the warnings concerning the public impact of the first satellite in NSC 5520 two and one-half years before *Sputnik* I and the many public statements on impending satellite launches for the IGY, neither the Eisenhower administration nor the American public was well prepared for how the space age began. At the highest levels, the Eisenhower administration was interested in and kept informed on Soviet missile and satellite progress. The topic of when the Soviets would launch their first satellite was discussed several times at NSC meetings during the period from 1955 through early 1957 and the estimates generally held that the Soviets would achieve such a capability by mid-1957.[1] This intelligence information was highly classified and did not, apparently, prompt any plans for emphasizing to the American public the advanced state of Soviet missile and satellite programs or the creation of contingency plans for dealing with the American public reaction in the event that the Soviets were first into space.[2] This failure to anticipate and plan for the American public's reaction to being beaten into space is undoubtedly the greatest failure of the Eisenhower administration's space policy. Given the complex and largely hidden space policy goals of the Eisenhower administration, this failure to anticipate and plan placed the administration in a nearly indefensible public policy position -- a situation which could only be improved via a U.S. satellite success or an open discussion of the importance of the U.S. creating and legitimizing spy satellites and the impact of this top-priority U.S. space policy on other space efforts.

The public reaction to the *Sputniks* and the political reaction to the shock of the American public fundamentally shaped U.S. space policy for several years at least. The pervasive atmosphere of uncertainty and panic which developed after the *Sputniks* rocketed U.S. space efforts to the top of the political agenda and meant that these efforts would command almost unlimited attention and support. For the Services, this meant that space was no longer a strategic backwater and the concern only of true believers but was

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[1]For a comprehensive review of the space-related intelligence data available to the Eisenhower administration see Rip Bulkeley, The Sputniks Crisis and Early United States Space Policy: A Critique of the Historiography of Space (Bloomington: Indiana University Press, 1991), chapter ten.

[2]Of course, not all of the documentary record for this period has been declassified. It is significant, however, that neither Bulkeley's careful search for such plans in Sputniks Crisis nor Walter A. McDougall's hypothesis in . . . the Heavens and the Earth: A Political History of the Space Age (New York: Basic Books, 1985) that the U.S. did not make every effort to be first in space due to concerns with establishing the precedent of overflight revealed any documentary evidence of U.S. contingency plans for the public's reaction to being beaten into space.

now apparently a clear pathway to increased power and prestige. The uncertain security implications of the *Sputniks* in the minds of the public and the desire on the part of all the defense organizations and sectors which had been slighted by the new look to make up for the years the locust had eaten combined to create an atmosphere conducive to increased defense spending and a thorough examination of the security potential of space.

The development of the crisis in public confidence following the *Sputniks* can be seen as the outcome of a complex struggle between the administration and all of the groups and individuals dissatisfied with Eisenhower's policies where the winner would define the meaning of these satellites to the American public. Eisenhower was in a difficult and unprepared position in this regard -- while the loss of the first space race was apparent to all and the security implications of the *Sputniks* were uncertain, the complex and subtle nature of U.S. space policy could not be revealed without undermining that policy and there were few security or other considerations which would seem to excuse the American failure to beat the Soviets into space. This topic quickly expanded beyond the meaning of the *Sputniks* themselves to include the broader security implications of space and raise the issue of Eisenhower's overall defense policy. Soon, the *Sputniks* provided a catalyst around which all of the various discontents that had lay simmering beneath the surface during most of Eisenhower's tenure could now emerge into major debates on public policy.[3]

The development of this crisis in public confidence is also an illustration of the power of the media in shaping public opinion. Through the all-important power of selection, the *Sputniks* were kept in the headlines in what devolved into a media feeding frenzy on this issue during late 1957 and into early 1958.[4] For example the New York Times carried at least one major story on *Sputnik* I or some related defense issue on page

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[3]The best treatment of Eisenhower's responses to the deep and wide-ranging impact of the *Sputniks* is Robert A. Divine, The *Sputnik* Challenge (New York: Oxford University Press, 1993).

[4]For a sample of the tenor of some of the initial media responses see, for example, Divine, Sputnik Challenge, introduction through chapter three; or McDougall, Heavens and Earth, 142-51. McDougall refers to the media reaction as a "media riot."

one every day from 5-27 October and by midmonth had stories with titles such as "Science 'Failure' Laid to President," "Republicans put Budget Before Security," and "Democrats Score Policies of GOP as Threat to U.S."[5] Following *Sputnik* II, the tone of reporting generally became even more shrill and anti-administration while the volume of coverage on this issue increased for several weeks. Much of the media's restraint and perspective seemed to be lost after the second Soviet triumph; even the usually restrained New York Times editorialized with the fervent hope that the administration would "take immediate measures to remedy deficiencies and put the U.S. again in the lead in a race that is not so much for arms or even prestige, but a race for survival."[6] Thus, both the media and the individuals and groups critical of Eisenhower's policies were influential in shaping the American public's response to the opening of the space age and were quite successful in putting their "spin" on the *Sputniks*.

By contrast, many of the Eisenhower administration's initial public relations efforts following the *Sputniks* were disjointed and ineffective. The failure of these efforts helped to perpetuate a crisis atmosphere in which the security implications of the opening of the space age were emphasized. In apparently uncoordinated immediate reactions, administration figures at first attempted to dismiss the significance of *Sputnik* I by pointing to the non-threatening and unsophisticated nature of the satellite. The administration also loudly renewed its calls for bringing future developments in outer space under international control via the United Nations.[7] The final initial approach in attempting to minimize the impact of *Sputnik* I was to downplay any ideas that the U.S. had been engaged in a space race for the first satellite with the Soviets. Thus, Press Secretary James Hagerty reassured America that *Sputnik* "did not come as any surprise"

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[5]The first title is from 19 October, the second two are from 20 October.

[6]New York Times, 10 November 1957. Cited in James R. Killian, Jr., Sputnik, Scientists, and Eisenhower: A Memoir of the First Special Assistant to the President for Science and Technology (Cambridge, MIT Press, 1977), 8.

[7]"U.S. Plan to Control Outer-Space Arms at U.N.," New York Times, 7 October 1957, p. 1; see also McDougall, Heavens and Earth, 127.

and that the administration "never thought of our program as one which was in a race with the Soviets."[8]

There was considerable confusion and disarray within the administration on how to deal with the opening of the space age behind the scenes as well. The State Department was the first to view *Sputnik* I as a major propaganda victory and to link this triumph to the competition for influence in the underdeveloped world -- themes rapidly picked up and trumpeted by the media.[9] On 8 October, Eisenhower privately called Deputy Secretary of Defense Donald A. Quarles to the White House to explain the situation. Eisenhower's personal aide, Brigadier General Andrew J. Goodpaster, took detailed notes of this meeting which provide an inside look at the state of U.S. space policy in the wake of *Sputnik* I:

> "There was no doubt," he [Quarles] confessed, "that the Redstone, had it been used, could have orbited a satellite a year or more ago." Ike said that when this information reached Congress they would surely ask why such action was not taken. The President "recalled, however, that timing was never given too much importance in our own program, which was tied to the IGY, and confirmed that, in order for all the scientists to be able to look at the instrument, it had to be kept away from military secrets."
>
> Quarles then accentuated the positive: ". . . the Russians have in fact done us a good turn, unintentionally, in establishing the concept of freedom of international space. . . . The President then looked ahead five years, and asked about a reconnaissance vehicle."[10]

These comments again reveal the hidden and conflicting goals of Eisenhower's space policy and highlight the difficulties in attempting to present these policies convincingly to the public in the best light.

Eisenhower's first public comments on *Sputnik* I came at a press conference on 9 October. His prepared statement at the beginning of the conference emphasized the deliberate separation of the U.S. IGY satellite efforts from the top-priority U.S. military

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[8]New York Times, 6 October 1957, p. 1.

[9]McDougall, Heavens and Earth, 143.

[10]Ibid., 134. McDougall's quotes are from the Goodpaster notes at the Eisenhower Library. On this meeting see also Divine, Sputnik Challenge, 5-7.

missile efforts and that the "well designed and properly scheduled" Vanguard IGY satellite program would proceed on track in order "to achieve the scientific purpose for which it was initiated."[11] Eisenhower was then deluged with questions about *Sputnik* and its significance for almost the entire remainder of the thirty minute conference. Apparently unconvinced by Eisenhower's halting reassurances, the reporters returned again and again to the military significance and strategic implications of the Russian satellite. At one point during the questioning Eisenhower revealed his relief at the lack of sophistication and small size of the *Sputnik* by declaring "at this moment you [don't] have to fear the intelligence aspects of this."[12] In closing the conference, Eisenhower asserted that the Russian satellite had not raised his apprehensions over national security "by one iota."[13] Overall, however, Eisenhower's lackluster performance at this press conference was not the type of strong personal assurance on American security in the face of *Sputnik* that the American public now seemed to want from the top American war hero. In Divine's judgement, the conference "completely failed to defuse the growing sense of public alarm."[14]

The *Sputnik* shock soon resulted in a reordering of U.S. IGY efforts, but not fast enough to suit Major General Medaris. Incoming Secretary of Defense Neil H. McElroy was visiting ABMA on 4 October when the news of *Sputnik* broke. Following this news flash, von Braun and Medaris cornered McElroy and unloaded on him their views on the Stewart Committee's errors and the Vanguard program's woes before assuring him that

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[11]Divine, Sputnik Challenge, 7.

[12]R. Cargill Hall, "The Origins of U.S. Space Policy: Eisenhower, Open Skies, and Freedom of Space," in John M. Logsdon, ed., The Evolution of the U.S. Space Program: A History Through Selected Documents (Washington: GPO, forthcoming), 22. (Hereinafter Hall, "Origins of Space Policy"). Hall notes that this Presidential gaffe revealed Eisenhower's true major interest in satellites but that this slip went unnoticed in the excitement of the day.

[13]W. H. Lawrence, "President Voices Concern on U.S. Missile Program but not on the Satellite," New York Times, 10 October 1957, p. 1.

[14]Divine, Sputnik Challenge, 8.

ABMA's Project Orbiter could place a satellite in orbit within 90 days of being given approval to proceed.[15] Von Braun and Medaris could give the Secretary-designate these assurances because they had carefully stored two complete Jupiter-C missiles for just such a contingency following the completion of a nose cone reentry test program in August 1957.[16] On 8 October, Eisenhower agreed to Quarles's request for the DoD to study the possibility of using the Jupiter-C as a quicker and more sure way to launch America's first satellite. Fully anticipating that ABMA would be given rapid approval to launch a satellite, Medaris had already begun funding and preparing this project without formal authorization.[17]

Following *Sputnik* II, ABMA was formally directed to prepare to launch a satellite but, much to Medaris's chagrin, actual launch authority was withheld and Vanguard was still to be given every opportunity to launch America's first satellite. Medaris speeded ABMA's preparations to attempt to launch a satellite as much as possible following the spectacular failure of America's first satellite launch attempt with the 6 December launch pad explosion of Vanguard TV-3. However, formal launch authority was not granted to the Army team until after the postponement of the second Vanguard attempt on 26 January 1958. To Medaris, unaware of the WS-117L and apparently unconcerned with overflight issues, this halting and begrudging approval process for what would become America's first successful satellite launch came on top of all the other political and programmatic neglect which he believed ABMA had consistently and unfairly endured.

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[15]Major General John B. Medaris, USA, (Ret.) Countdown for Decision (New York: G.P. Putnam's Sons, 1960), 155. McElroy became Secretary of Defense on 9 October.

[16]Ibid., 147, 119-20. Medaris and von Braun were also confident because more than a year earlier (20 September 1956) a similar Jupiter-C had risen to an altitude of 600 miles while traveling 3000 miles downrange despite having an inert fourth stage loaded with sand. The Jupiter-C was not really related to the Jupiter IRBM program at all but was a modified Redstone (also known as a Juno) consisting of a Redstone first stage with solid-fuel upper stages developed by JPL. In a questionable expedient, Medaris officially labeled this and other types of modified Redstones as Jupiters in order to take advantage of the Jupiter program's top priority for scheduling and funding.

[17]Ibid., 162.

Much of his book Countdown for Decision reads as an outspoken diatribe of the ABMA David against the incompetence and parochialism of the Goliath represented by the administration, DoD, and Air Force.

The *Sputnik* shock also underscored the interrelationships between U.S. national security and the state of U.S. science and technology. On 15 October, Eisenhower met with the distinguished scientists who made up the Science Advisory Committee. The discussion centered around what *Sputnik* I meant for U.S. security and U.S. science. Ike was startled that the American people were so "psychologically vulnerable" and sought the scientists' advice on how to proceed in the wake of *Sputnik*.[18] The scientists saw *Sputnik* as an example of the relative decline in U.S. scientific prowess and urged Eisenhower to use this shock as a stimulus to reinvigorate U.S. scientific efforts across the board.[19] Suggestions at this meeting also provided the inspiration for Eisenhower to create the new position of Special Assistant to the President for Science and Technology and to give the American public a series of "chins-up" speeches to reassure them and to stress the importance of space for continued progress in science and technology.

In early November, Eisenhower and the NSC received an important report from a top-secret strategic review committee he had commissioned in the spring of 1957. This review, known as the Gaither Report after committee chairman Rowan Gaither, presented a very somber picture of the current and future U.S.-U.S.S.R. strategic balance and was especially concerned with the vulnerability of the U.S. bomber force in the missile age.[20]

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[18]The quote is Killian's recollection of Eisenhower's assessment of the public mood, in Killian, Sputnik, Scientists, and Eisenhower, 10.

[19]Ibid., 15-17; and Divine, Sputnik Challenge, 12-15.

[20]For the text of the Gaither Report and notes on the NSC discussions on this topic see U.S. Department of State, Foreign Relations of the United States, 1955-1957, Vol. XIX (Washington: GPO, 1990), 620-61. (Hereinafter FRUS). On the development of the concepts behind and the Gaither Report itself see Fred Kaplan, The Wizards of Armageddon (New York: Touchstone Books, Simon & Schuster, 1983), 85-143; Morton H. Halperin, "The Gaither Report and the Policy Process," World Politics 13 (April 1961): 360-84; Paul H. Nitze, From Hiroshima to Glasnost: At the Center of Decision

The Soviet success with *Sputnik* I had been another indication of the Soviet lead and missiles to Paul Nitze as he drafted the final report.[21] Eisenhower believe Gaither Report was a worst-case analysis and, following a limited oral presenta... 4 November, told co-chairmen Robert Sprague and William Foster to recheck their figures before delivering the report to the full NSC.[22] During the formal delivery of the report at a very large NSC meeting on 7 November, the president argued that "the gloomy findings in the report would panic the American people into going off in all directions at once."[23]

While Eisenhower and the NSC rejected the tone of the Gaither Report and many of its recommendations, the report was evidence of the widening split between Eisenhower and his growing number of detractors over his handling of the *Sputniks*, the perceived missile gap, and his general defense policy. Leaks and speculation about the contents of the Gaither Report were driven by the crisis atmosphere sparked by the *Sputniks*: On 20 December, the Washington Post carried an alarmist article which purported to be based on the Gaither Report and claimed that the report "portrays a

-- A Memoir (New York: Grove Weidenfeld, 1989), 166-69; and Killian, Sputnik, Scientists, and Eisenhower, 96-101. On the impact of the Gaither Report see Dwight D. Eisenhower, The White House Years: Waging the Peace, 1956-1961 (New York: Doubleday, 1965), 220-23; Divine, Sputnik Challenge, 35-41; Kaplan, 144-54; and Lawrence Freedman, The Evolution of Nuclear Strategy (New York: St. Martins Press, 1983), 160-71. Albert J. Wohlstetter, a driving force behind the emphasis on the vulnerability of SAC during this period, presented many of the major themes from the Gaither Report in an influential article entitled "The Delicate Balance of Terror," Foreign Affairs 37 (January 1959): 211-34.

[21]Nitze, Hiroshima to Glasnost, 167.

[22]Divine, Sputnik Challenge, 37.

[23]Quoted in McDougall, Heavens and Earth, 151. A primary reason why Eisenhower rejected the alarmist picture of Soviet progress painted by the Gaither Report was the intelligence information he had received based on the U-2 overflights of the U.S.S.R. begun in July 1956. The U-2 data had, correctly, indicated that there was no missile gap but this information was not made available to the Gaither Committee or the American public and was, therefore, of limited value in Eisenhower's crisis in public relations. Divine, Sputnik Challenge, 41-42.

United States in the gravest danger in its history."[24] Overall, the Gaither Report would provide an important source of support for the groups outside the administration attempting to increase U.S. defense and military space efforts during the next several years.

Eisenhower's final major attempt to defuse the immediate impact of the *Sputniks* crisis was the series of "chins-up" speeches to the American public in November 1957. The negative impact of *Sputnik* for the president was indicated when Gallup polls showed that Eisenhower's popularity had dropped from a post-reelection high of 79 percent in November 1956 to 57 percent one year later.[25] Eisenhower delivered the first of these radio and television addresses from the Oval Office on the evening of 7 November. This first speech, "Science in National Security," focused almost exclusively on reassuring the American public of the adequate state of U.S. defense and science efforts despite the Soviet space triumphs. Ike asserted that "ballistic missiles, as they exist today, do not cancel the destructive and deterrent power of our Strategic Air Force."[26] The President also touted the nation's missile and space achievements and indicated that the U.S. had solved the difficult problem of reentry by displaying the Jupiter-C nose cone recovered in August.[27] Near the end of the speech the President announced that Dr. Killian had

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[24]Killian, Sputnik, Scientists, and Eisenhower, 98. This article was later inserted into the Congressional Record. Eisenhower refused calls in Congress and elsewhere to release even a sanitized version of the Gaither Report -- a refusal which some interpreted as evidence that he had something to hide in his defense and space policies.

[25]Divine, Sputnik Challenge, 45. Following *Sputnik* II, Ike moved the schedule for these speeches forward by one week.

[26]Ibid., 46.

[27]In Countdown for Decision, 165-66, Medaris took umbrage at the lack of credit to ABMA for the world's first successful reentry: "I am sure that almost every person in ABMA took pains to be watching [Eisenhower's 7 November address]. We had no real hope that our exploits would be publicly acknowledged, having been through the bitter experience of total anonymity many times before, but there was always a chance. True to form, however, there was not a single mention of the Army or of ABMA. So far as the public could judge, a faceless and nameless group of unknown characters had come up with the first positive and visible demonstration of man's ability to conquer the so-

accepted his invitation to become the country's first Science Advisor. Eisenhower focused the second of these speeches, delivered from Oklahoma City on 13 November, on the need to improve the U.S. public education system in order to better equip students to live in the space age. The third in this series was planned for late November but was never delivered due to the mild stroke Eisenhower suffered on 25 November. Eisenhower's two speeches undoubtedly helped to quiet some of the panic within the U.S. but, overall, they might best be characterized as "too little, too late" as the *Sputniks* crisis continued to spin out of the President's control and to be increasingly shaped by other factors.

The Initial Military Response and the "Aerospace" Concept

The crisis atmosphere which accompanied the *Sputniks* produced deep and wide-ranging changes in the way the military approached space. The crisis moved the security implications of space from the back burner into an intense period of national scrutiny. During the initial period of the *Sputniks* crisis, however, military space doctrine generally was not yet well defined enough to make significant or coherent inputs into this national debate over the military uses of space. This crisis did accelerate and strengthen many specific military programs related to missiles and space. Moreover, the *Sputniks* crisis created an intense focus upon two perennial major questions related to U.S. military uses of space and military space doctrine: 1) what security role should the military (and especially military man) play in space? and 2) what types of organizations are most appropriate for this role?

As we have seen, neither the DoD nor the individual Services had thought very seriously about space prior to *Sputnik* I. Elements within the Army and the Air Force such as ABMA and WDD were already thinking very seriously about space but they did not necessarily have the support of their respective Services behind them. The *Sputniks* shock greatly increased the visibility of these organizations both within their respective Services and beyond. But on the whole, the Services did not have strong, coherent, or

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called 'heat barrier' of high speed re-entry into the earth's atmosphere."

developed answers to the two major questions on military space doctrine listed above. Thus, none of these defense organizations was well positioned conceptually to translate the initial crisis sparked by the *Sputniks* into an immediate bureaucratic advantage.

Late 1957 and early 1958 was a time for the Services and the DoD as a whole to learn about space, to consider the security implications of space, and to incorporate the space and missile expertise of the ABMA and the Ballistic Missile Division (AFBMD) into the mainstream thinking of the Army and Air Force.[28] The interservice rivalry which marked the Thor-Jupiter IRBM competition remained an important factor in shaping the views of the Services on the uncertain security potential of space. Moreover, as Medaris's stymied efforts to launch America's first satellite amply illustrate, the crisis sparked by the *Sputniks* did not by any means simply provide carte blanche to the military for plans or operations in space because the hidden factors which drove Eisenhower's space policy remained of critical importance. Air Force leaders received a strong reminder of the administration's preference for only limited discussion of military space applications during a briefing on Air Force satellite programs to Deputy Secretary of Defense Quarles shortly after *Sputnik* I:

> . . . Mr Quarles took very strong and specific exception to the inclusion in the presentation of any thoughts on the use of a satellite as a (nuclear) weapons carrier and stated that the Air Force was out of line in advancing this as a possible application of the satellite. He verbally directed that any such applications not be considered further in Air Force planning. Although both General [Curtis E.] LeMay and [Lieutenant] General [Donald L.] Putt voiced objection to this . . . on the grounds that we had no assurance that the USSR would not explore this potential of satellites and could not be expected to do so, Mr Quarles remained adamant.[29]

The fruit of the *Sputniks* in terms of major new patterns in military thinking about space would soon become more apparent and more widely acceptable following the restyling

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[28]In June 1957 the Air Force's Western Development Division was redesignated as the AFBMD and operational ballistic missile programs were transferred to SAC.

[29]Colonel F.C.E. Oder, USAF, Director, WS-117L, Memorandum for Record, "Briefing of Deputy Secretary of Defense Mr Quarles on WS 117L on 16 October 1957," 25 October 1957. Quoted in Hall, "Origins of Space Policy," 29.

of U.S. space policy caused by the initial crisis.

The changes in military space plans and programs prompted by the *Sputniks* were more clear and immediate. The Army and ABMA moved quickly in attempts to expand the Army's space mandate. As noted in the previous chapter, the *Sputniks* crisis provided the final reprieve for the Army's Jupiter IRBM program. By the end of November, the DoD had formally authorized production of both Jupiter and Thor IRBMs and both of these systems went on to be deployed operationally as well as to be used extensively as early space launch vehicles.[30] On 26 October 1957, the Army submitted to DoD detailed proposals for a family of military reconnaissance satellites "capable of providing complete photographic coverage of the USSR every three days, cloud cover permitting."[31] Then, on 19 November, the Army briefed the Science Advisor's Office on a comprehensive ASAT proposal.[32] Apparently, neither of these proposals led to any early Army programs in these areas.[33] Thus, much to General Medaris' disappointment, neither the decision to produce the Jupiter, the Army's proposed spysats and ASATs, nor

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[30]Killian, Sputnik, Scientists, and Eisenhower, 113. Killian and the PSAC favored the Thor over the Jupiter and called for the cancellation of the Jupiter but were ineffective in making their case to DoD. The official reprieve of the Jupiter came in a statement by Secretary of Defense Neil H. McElroy at the Johnson Hearings on 27 November 1957. U.S. Congress, Senate, Committee on Armed Services, Preparedness Investigating Subcommittee, Inquiry into Satellite and Missile Programs: Hearing before the Preparedness Investigating Subcommittee, 85th Cong., 1st and 2nd sess., 1957-1958. (Hereinafter SASC, ISMP).

[31]Jeffrey T. Richelson, America's Secret Eyes in Space: the U.S. Keyhole Spy Satellite Program (New York: Harper & Row, 1990), 24. In Countdown for Decision, Medaris claimed that the Army could have helped to prevent the U-2 shootdown by having a spy satellite operational in 1959, page viii.

[32]Paul B. Stares, The Militarization of Space: U.S. Policy, 1945-1984 (Ithaca: Cornell University Press, 1985), 49; and Medaris, Countdown for Decision, 162.

[33]These sources do not specifically discuss what became of these early Army proposals and do not provide any further evidence of Army-directed spy satellite programs. By contrast, the Air Force had named Lockheed as the prime contractor for the WS-117L in October 1956. Later Army ASAT programs are discussed in the ASAT section below.

the success in launching America's first satellite provided ABMA with a clear space mandate or even a more clear pathway towards increased Army responsibilities in space.

Following *Sputnik* II, the Air Force also made some efforts to move as quickly as possible into space and to plan for more ambitious space programs. On 12 November, the Assistant Secretary of the Air Force for R & D Richard E. Horner wrote to McElroy recommending the use of Thor boosters as satellite launchers to "furnish an early demonstration of space capability".[34] The Air Force did not have a developed program for early satellite launches at this time and estimated that the Thor could not orbit a satellite until July 1958; this Air Force offer was not accepted. In early December, the Air Force Scientific Advisory Board ad hoc Committee on Space Technology noted that "*Sputnik* and the Russian ICBM capability have created a national emergency," and recommended "acceleration of specific military programs and a vigorous space program with the immediate goal of landings on the moon."[35] During December, a team led by von Braun at ABMA had also created a proposed fifteen-year space program which called for two man satellites by 1962 and a fifty-man lunar base by 1971.[36] A final indication of the initial programmatic impact of the *Sputniks* came on 3 February 1958 when Eisenhower directed that the development of ICBMs, IRBMs, and the WS-117L satellite systems "be given highest and equal national priority."[37]

Interservice rivalry and bureaucratic maneuvering by the Services were evident in

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[34]Department of the Air Force, Air Force Systems Command, Space Systems Division, "Chronology of Early Air Force Man-In-Space Activity (1955-1960)," (Andrews AFB, MD: Air Force Systems Command, 1965), 5; microfiche document 00446 in U.S. Military Uses of Space, 1945-1991: Index and Guide (Washington: The National Security Archive and Alexandria, VA: Chadwyck-Healey, Inc., 1991). (Hereinafter "Early AF MIS Activity").

[35]Department of the Air Force, "Report of Science Advisory Board ad hoc Committee on Space Technology," 6 December 1957. Cited in ibid., 7.

[36]Medaris, Countdown for Decision, 186-88. Von Braun's plan was primarily related to civil sp[illegible] objectives and, with the exception of the proposed lunar base, matched closely wi[illegible]he actual NASA pursuit of manned landings on the moon.

[37]"Chron[illegible]ogy" in Military Uses of Space, 27.

the uncertain security environment of the initial period of the *Sputniks* crisis. In broadest terms, each of the Services sought to use the opening of the space age as a way to increase its operational area of responsibility and overall power. Each Service was apparently also anticipating that military space missions would be sufficiently large for all of the Services to participate and perhaps even grow via this route. In the initial period of the *Sputniks* crisis, none of the Services pushed for the creation of a unified space command, a bureaucratic maneuver often used by the Services in attempts to check a major growth in the power of a rival Service. The *Sputniks* shock, combined with the maneuvering by the Services as well as within DoD did, however, lead to the compromise solution on military space programs of creating the Advanced Research Projects Agency on 7 February 1958. ARPA's creation, its relationship with the Services, and its role in developing space hardware is discussed in a separate section below.

In the period immediately after the *Sputniks* there was also considerable interest outside of the DoD in at least reexamining if not overhauling the military's organizational structure for space and missiles. Interservice rivalry was anathema to Eisenhower and the *Sputniks* shock convinced him of the need for a DoD space R & D organization such as ARPA and, further, of the need for the type of fundamental DoD reforms which were enacted in the Defense Reorganization Act of 1958.[38] The American public also recognized the interservice rivalry over missile and space issues thanks, largely, to the Thor-Jupiter competition and many Americans assumed that this type of rivalry had contributed directly to America's second place finish in the first space race. Political cartoonist "Herblock" captured this attitude in a November 1957 cartoon depicting a member of the U.S. military brass sighing in relief as a Soviet rocket passes overhead and confiding to his comrade, "Whew! For a minute I thought it was launched by one of the other services!"[39] In retrospect, it is clear that the hidden hand of the WS-117L

[38]Divine, Sputnik Challenge, 85-86. The space-related aspects of the DoD Reorganization Act of 1958 are discussed in the ARPA section below.

[39]Reprinted in McDougall, Heavens and Earth, 167.

and overflight issues as well as scientific considerations had been far more important in producing the U.S. second place finish but at the time of the *Sputniks* crisis the effects of interservice rivalry were, for some, a plausible and convenient explanation for America's belated entry into space.[40] Calls for a changed and more unified military space bureaucracy were advanced in some quarters as one means to deal with the problems in America's earliest space efforts attributed to the effects of interservice rivalry.[41] The unknown security implications of the opening of the space age were also advanced by some as evidence that new military structures were necessary to deal with the new security challenges of the space age.

Many difficult doctrinal issues for the Services attended the opening of the space age. The internal and public responses of the Services to the opening of the space age varied considerably. General Medaris chafed at the virtual gag order on space issues imposed on ABMA by General Lyman L. Lemnitzer of the Army Staff and deplored that meanwhile "the whole Air Force propaganda machine [had] swung into action to get the aviation industry into the space business."[42] This gag order had been designed primarily to keep ABMA from publicly running afoul of Eisenhower's emphasis on space for "peaceful purposes" and to end the Army's denigration of the continuing Vanguard IGY efforts. Meanwhile, within the Air Force, wide differences of opinion on the military potential of space between the "space cadets" and the traditional airpower enthusiasts led to significant conceptual and bureaucratic difficulties in developing space doctrine. Most

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[40]Bulkeley Sputniks Crisis, chapter nine and 205-7 details the propensity of many IGY scientists to point to interservice rivalry as a convenient scapegoat for their own considerable culpability in the many deficiencies of the IGY and Vanguard programs.

[41]On 22 October 1957, a prestigious committee commissioned by Secretary of the Air Force James H. Douglas and chaired by Dr. Edward Teller called for greater unification of space efforts between the services and especially emphasized the need for greater cooperation between U.S. civil and military space efforts. See "Early AF MIS Activity," 5; microfiche document 00446 in Military Uses of Space; and John M. Logsdon, The Decision to Go to the Moon: Project Apollo and the National Interest (Cambridge, MIT Press, 1970), 46.

[42]Medaris, Countdown for Decision, 168-70. The quote is from page 170.

significantly, the Army and the Air Force could not resolve doctrinal differences over the proper potential use of military forces in space or even agree to a common definition of space itself.[43] Doctrinal differences in this area emerged largely due to the Air Force's development of the "aerospace" concept. Moreover, the Air Force asserted that it should have primary responsibility for operations within the aerospace -- a region it defined as one indivisible medium above the surface of the earth.

Internally, the opening of the space age left the Air Force in a similar but even more difficult bureaucratic box than had the advent of ICBMs: At the beginning of the space age, one set of bureaucratic pressures compelled the Air Force to emphasize the importance of military space operations, its own space expertise, and its claims to operational control over military missions within the one medium of the aerospace against the competing space claims of the other Services. Other simultaneous bureaucratic pressures moved the Air Force to protect its own core air and growing ICBM missions from possibly being usurped by excessive funding or emphasis on space. Thus, the Air Force was (and is) bureaucratically channeled into a narrow and difficult conceptual tightrope when approaching space issues: On the one hand, it should tout and exploit its space capabilities and the general military potential of space to stay ahead of possible space encroachments by the other Services; on the other hand, it should de-emphasize the potential of military space systems to the extent that they overshadow traditional Air Force missions or prompt calls for a separate space Service.

Despite these internal bureaucratic dilemmas, the Air Force moved the most quickly and directly of all the Services to claim jurisdictional control of U.S. military operations in outer space during the initial period of the *Sputniks* shock. The Air Force's campaign to gain control of military space missions stemmed from both national security

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[43]Lieutenant Colonel Frank W. Jennings, USAF Reserve, (Ret.) "Doctrinal Conflict Over the Word Aerospace," Airpower Journal 4 (Fall 1990): 46-58. As the Jennings article points out, the JCS and the other Services never accepted the Air Force's aerospace concept or definition throughout the entire cold war period. These different definitions and outlooks on the aerospace concept caused specific differences between official Air Force and DoD space doctrine statements in the 1980s as is discussed in greater detail in chapter six below.

considerations and organizational behavior. This initial campaign consisted of two interrelated parts, an evolutionary, semantic approach emphasizing the development of the aerospace concept and a revolutionary high ground approach which asserted the critical contributions of space to national security.

The first part of the Air Force's strategy for attempting to increase its scope of operations was mainly based upon organizational behavior considerations and used a semantic/definitional approach through the use of the word "aerospace". Some organizations within the Air Force had been considering the conceptual and doctrinal implications of the space age since the early 1950s and the Air Force's rapid adoption of the concept of aerospace after the *Sputniks* should be seen in the context of this evolutionary movement. An interesting article by Frank Jennings traces the evolution of the word aerospace. Jennings served as a writer for the Air Force News Service (AFNS) in the Pentagon during the 1950s and he emphasizes the steady, consistent, and logical evolution of the aerospace concept. AFNS editorials had begun to claim Air Force responsibility for space operations as early as 1954.[44] In October 1957, AFNS began to merge the air and space mediums into one conceptual operational medium and to use the word "air/space" to express this concept.[45] General White first used the term "air/space" in a speech to the Los Angeles Chamber of Commerce on 16 May 1958.[46] Finally, the first use of the new word "aerospace" came in an AFNS new release on 8 July 1958.[47] This approach emphasized the evolutionary logic of simply extending the

[44]Ibid., 52-55. Jennings strongly believes in the conceptual validity and national security benefits of the aerospace concept. His main purpose in this article is to illustrate that the Air Force was largely guileless in advancing the aerospace concept.

[45]Ibid., 55. Jennings points out that the first AFNS editorial to use the word "air/space" came as a direct response to testimony of Army Lieutenant General James M. Gavin which asserted that in the missile age control of land would insure control of the air and space above -- a statement in direct opposition to longstanding Air Force doctrine which asserts that control of the air is necessary for success in all other operations.

[46]Ibid., 57.

[47]Ibid., 56.

Air Force's operational medium further away from the earth, noted that some organization within the military would have to fulfill this new mission, and touted the Air Force's first successful steps into space. Jennings' exposition of the logical evolution of these concepts helps to explain how and why the concept of aerospace developed and rapidly became so important to the Air Force in the space age.

The second part of the Air Force's earliest approach to space emphasized the critical national security implications of space and linked the potential of spacepower directly to the Air Force's doctrinal position on the importance of airpower. In this regard, the Air Force was clearly asserting that space was the new high ground and that, in the future, spacepower would be as dominant during conflict as the Air Force believed that airpower already was. This doctrinal position was also clearly built upon the airpower development historical analogy. Herein lay the seeds of possible doctrinal inconsistency which would not become more apparent for several years: if spacepower is so important, why should it be treated doctrinally under this umbrella aerospace concept? Moreover, asserting the potential of spacepower and linking together spacepower development with the historical analogy of airpower development certainly raises questions about the role of the Air Force in this process -- questions which became glaringly apparent by the late 1970s.

The most important statement of Air Force space doctrine in the earliest days of the space age was given by Air Force Chief of Staff General Thomas D. White in a speech to the National Press Club on 29 November 1957. This speech is the first official expression of Air Force space doctrine. White's speech illustrates both of the Air Force approaches to space discussed above and stakes out two major doctrinal tenets regarding the relationships between space, security, and the USAF. First, White asserted that just as "whoever has the capability to control the air is in a position to exert control over the lands and seas . . . in the future whoever has the capability to control space will likewise possess the capability to exert control of the surface of the earth."[44] This bald assertion

[44]White's speech is reprinted in Eugene M. Emme, ed., The Impact of Air Power: National Security and World Politics (Princeton, NJ: D. Van Nostrand, 1959), 496-501.

was clearly linked directly to the central but still controversial Air Force doctrinal tenet regarding the necessity for air superiority for success in any other military operations. White further asserted that the U.S. "must win the capability to control space."[49] This first assumption on space as the new high ground would be the cornerstone upon which the space cadets in the Air Force and space enthusiasts in the other Services and elsewhere would build most of their rationales for the development of significant U.S. military space forces.

White's second major doctrinal assumption in this speech addressed the relationship between air and space: "there is no division, *per se*, between air and space. Air and space are an indivisible field of operations."[50] White went on from this assumption to stress Air Force expertise in experimental flight in near space and to imply the logic of extending Air Force jurisdiction further out into this indivisible medium. Thus, White's second doctrinal tenet was bureaucratically tied to the aerospace concept (although this word had not yet evolved) and posited that the Air Force was the best Service to respond to the grave national security challenge indicated in his first doctrinal assumption. White's second tenet is a clear example of the links between doctrine and organizations and shows how organizations are likely to develop doctrine which expands upon their areas of responsibility.

Finally, White's speech is also important for helping to set the conceptual context in which U.S. military space doctrine developed during this period. With this speech the Air Force was clearly and strongly asserting the need for space control due to its perception of space as the ultimate high ground for future conflict. These assumptions about space held by the Air Force and others were in direct conflict with Eisenhower's policy on space as a sanctuary for the development, use, and protection of reconnaissance satellites. The highly classified nature of this portion of Eisenhower's space policy made

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The quote is on page 498.

[49]Ibid.

[50]Ibid. Emphasis in original.

the sorting and resolution of these doctrinal issues more prolonged and difficult. Without knowledge of these classified portions of Eisenhower's space policy, many in the military and elsewhere simply assumed that the president either did not understand the military potential of space or was more concerned with a balanced budget than with responding to this potential military opportunity and threat. Much of the struggle over space doctrine development during this period can be seen as the education of the military and its supporters in Congress and elsewhere to the fact that the Eisenhower and then the Kennedy administrations really did value space reconnaissance more highly than any other possible military space application.

Johnson's Inquiry into Satellite and Missile Programs

One of the most important, if not the most important, single factors in shaping American attitudes on space and security issues in the period immediately following the *Sputniks* were the Senate hearings called by Majority Leader Lyndon B. Johnson (D.-TX). Johnson used his position as Chairman of the Preparedness Investigating Subcommittee of the Senate Armed Services Committee to convene these hearings. The hearings dominated the space-related news within the U.S. for much of late 1957 and early 1958. These hearings were critical in shaping the average American's perception of space, helped to channel early American space policy onto certain paths, and even helped to mold the historiography of the opening of the space age.[51] Johnson's Hearings also provided an important forum for top civilian and military leaders to express their views on the state of U.S. national security at the opening of the space age.

High politics was involved in the intricate maneuvering prior to and during the Johnson Hearings. Johnson and the Democrats had been searching in vain for several years for some important issue on which the popular Eisenhower might be found vulnerable. The *Sputniks* crisis provided Johnson with an issue which seemed to be tailor-made for him to challenge Eisenhower and catapult into national prominence as he prepared his bid for the 1960 presidential election. As Eisenhower had confided to

[51]The impact of the Johnson Hearings on the historiography of the opening of the space age is a major theme in Bulkeley, Sputniks Crisis.

Quarles shortly after *Sputnik* I, some type of Congressional inquiry into America's failure in the satellite race was probably inevitable but Ike desired, naturally, to shape and defuse any inquiry as much as possible. Eisenhower and Johnson met on 6 November and discovered that they had a mutual interest in containing Senator Stuart Symington (D.-MO), who was probably Ike's most vehement critic on defense issues in Congress and was also another leading Democratic contender for president in 1960.[52] Eisenhower and Johnson apparently reached a type of *modus vivendi* for a bipartisan approach to the upcoming hearings during this meeting. Under this arrangement, the Republicans would cooperate with the committee in fact finding but refrain from focusing on the poor missile and space record of the Truman administration in return for restraint from the Democrats in attacking the space performance of Eisenhower and his administration.[53] The hearings began on 25 November 1957 and ran for some thirty days before ending on 23 January 1958.

Despite this understanding, overall the hearings were strongly biased towards a Democratic party view of the opening of the space age and certainly served to advance the interests of Johnson and the Democrats far more than those of Eisenhower and the Republicans. Johnson's aides debated whether to take a more straightforward or more sensationalized approach to the witnesses and the hearings and opted for the latter.[54] This sensationalized approach, together with the agreed bipartisan framework for the hearings, resulted in a set of hearings which were usually long on flash and news appeal but quite short on actual fact finding and objectivity. Many witnesses seem to have been chosen on the basis of their "star quality" rather than on the basis of their space policy

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[52]Divine, Sputnik Challenge, 62-64.

[53]Ibid., 63; and Killian, Sputnik, Scientists, and Eisenhower, 100. Killian met with and briefed committee staffers several times before and during the hearings.

[54]Bulkeley, Sputniks Crisis, 187-89.

expertise.[55] In addition, the Johnson hearings provided the first major national exposure for several individuals who played critical roles in shaping America's earliest military space programs such as the Director of Army R & D Lieutenant General James M. Gavin, Medaris, von Braun, and Schriever. Most importantly, the open sessions of the hearings did not even come close to uncovering the Eisenhower space policy requirements driven by spy satellites and overflight considerations and thus could not begin to inspire informed debate or produce a complete or coherent picture of this complex policy. Nonetheless, at the time and for many subsequent years, the Johnson Hearings were widely regarded as a fair and quite definitive investigation into America's earliest space policy.[56]

Several of the civilians and most of the military leadership which appeared before the Johnson subcommittee presented a view of space as the ultimate high ground and stressed the need for U.S. space control -- views which buttressed and shaped the emerging space policy outlook of Johnson and many other Democrats. The three opening witnesses, Edward Teller, Vannevar Bush, and James Doolittle, left no doubts concerning their views on the dire military implications of the *Sputniks* and the severity of the challenges facing America in the space age. Lieutenant General Gavin discussed the military uses of space and satellites and then strongly seconded Teller's suggestion that the U.S. should rapidly go to the moon by stating that "we have got to have some understanding of who is going to occupy the moon."[57] Von Braun stressed the strategic significance of space by giving the subcommittee this somber assessment of the Russian

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[55]For example, the first three witnesses, Edward Teller, Vannevar Bush, and James H. (Jimmy) Doolittle were all very well known but had almost no missile or space expertise and certainly no personal knowledge on the making of Eisenhower's space policy. By contrast, Eisenhower missile and space policy insiders such as Charles E. Wilson, Homer J. Stewart, and Trevor Gardner were never called as witnesses.

[56]See Bulkeley, Sputniks Crisis, chapter twelve for examples of the many rosy assessments of the Johnson committee's work garnered at the time. This chapter also examines the substantial historiographic impact of these hearings on the writing of early U.S. space history.

[57]SASC, ISMP, 507.

view towards space: "They consider the control of space around the earth very much like, shall we say, the great maritime powers considered control of the seas, in the 16th through the 18th century, and they say 'If we want to control this planet, we have to control the space around it.'"[58] Finally, Schriever not only stressed the need for space control but also advanced the aerospace concept as the following exchange illustrates:

> Senator Johnson. And you consider control of outer space extremely important to the free world; do you not?
>
> General Schriever. Well, I certainly do, although I would not be able to give you exactly why in tangible terms, again a year ago, that I thought perhaps future battles would be space battles instead of air battles, and I still feel that way about it. . . . from a mission point of view there is a great similarity in operating in the air, in the atmosphere above the earth, and in operating in space . . .[59]

Most of the military witnesses were united in their opposition to the creation of a new unified military space command or civilian space agency. Schriever noted that the creation of a new space agency "would result in duplication of capabilities already existing in the Air Force ballistic missile programs at a cost in funds and time similar to that already expended on these programs."[60] Assistant Secretary of the Navy (Air) Garrison Norton opposed a consolidated DoD agency for space.[61] Medaris also looked unfavorably on a new space agency believing that it would create confusion and delay; earlier, he had suggested that U.S. military missile efforts be consolidated, presumably under ABMA: "missiles as an extension of artillery should be in the hands of the ground forces."[62] On this point von Braun parted company with his military masters; much of

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[58]Ibid., 597.

[59]Ibid., 1649.

[60]Ibid., 1678.

[61]Ibid., 1757-58.

[62]Ibid., 1710; quote from 572. In his testimony, Medaris also noted how the Soviets had done things: "[The Russians] have committed their missiles entirely to their Army force, and I have to agree that in my professional opinion that is where they belong." Page 572.

his testimony concerned the prospective civil and scientific space tasks which he proposed should be undertaken by a "national space agency".[63]

Overall, the Johnson Hearings are best remembered for presenting a view of space very different from the space policy statements coming from the White House. The Johnson Hearings can also be seen as marking the end of the initial *Sputniks* crisis period because they were the focal point of the process of moving America away from the calm and restrained response to the opening of the space age which Eisenhower favored towards a far more active and concerned response. Johnson had driven much of the testimony at the inquiry to create the impression that Eisenhower and his administration were tight-fisted and short-sighted and simply did not understand the importance of space. The hearings had also nurtured and reinforced Johnson's belief that security considerations would dominate what he perceived to be a space race between the U.S. and the U.S.S.R.

By the end of the hearings, Johnson, along with many other Democrats and some Republicans, was firmly located within the high ground and space control schools of thought. Johnson clearly expressed these sentiments in a well-publicized speech to the Democratic caucus on 7 January 1958, just two days prior to Eisenhower's State of the Union address: "If, out in space, there is the ultimate position -- from which total control of the earth may be exercised -- then our national goal and the goal of all free men must be to win and hold that position . . ."[64] When sending the subcommittee's findings to the president, Johnson concluded that "[w]e are in a race for survival and we intend to win that race."[65] At the beginning of 1958, powerful forces in Congress clearly viewed recent space developments as a grave threat to U.S. national security and looked favorably upon the development of offensive U.S. military space doctrines such as those

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[63]Ibid., 602-5. Von Braun's proposals received a good deal of respectful attention from the subcommittee. The tasks for and structure of the national space agency proposed by von Braun were very similar to those eventually adopted for NASA.

[64]Bulkeley, Sputniks Crisis, 194.

[65]Divine, Sputnik Challenge, 79.

recently advocated by the Air Force and others.

ARPA and the Direction of Military Space Programs

Another development which rapidly followed the initial *Sputniks* crisis was the creation of the Advanced Research Projects Agency within the DoD. During a press conference on 15 November 1957, Secretary McElroy had indicated that he was considering centralizing control of space R & D efforts within a new organization at DoD.[66] The fallout from the Thor-Jupiter controversy, the *Sputniks* crisis, and the prospects for continuing or increased interservice rivalry on future military space projects had combined to convince the Secretary of the need for a new approach to defense space R & D. Creating a new space organization within DoD was also a way at least temporarily to derail early Congressional efforts to advance their own, more wide-ranging solutions to perceived problems with U.S. space policy.[67] Moreover, a new space organization controlled by the Office of the Secretary of Defense (OSD) was also a way to circumvent Air Force bureaucratic efforts to gain greater control of all military space programs.[68] The development of this new agency was confirmed by Eisenhower in his State of the Union address on 9 January and ARPA was formally established by DoD Directive 5105.15 on 7 February 1958.[69]

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[66]"Early AF MIS Activity," 11; microfiche document 00446 in Military Uses of Space.

[67]Divine, Sputnik Crisis, 100. Several bills for reorganizing U.S. space efforts had been introduced prior to the creation of ARPA.

[68]On 10 December, the Deputy Chief of Staff for R & D, Lieutenant General Donald L. Putt, announced that Brigadier General Homer A. Boushey would immediately take command of a new Directorate of Astronautics on the Air Staff. Deputy Secretary Quarles asked the Air Force to delay such action pending the creation of ARPA and on 13 December Secretary of the Air Force James H. Douglas suspended the creation of the new Directorate. See Enid Curtis Bok Schoettle, "The Establishment of NASA," in Sanford A. Lakoff, ed., Knowledge and Power: Essays on Science and Government (New York: Free Press, 1966). 195, 209.

[69]"Early AF MIS Activity," 15; microfiche document 00446 in Military Uses of Space.

APRA was responsible for the "direction or performance" of advanced projects in R & D as directed by the Secretary of Defense.[70] Accordingly, ARPA was "authorized to arrange for the performance" of R & D work by "other agencies of Government, including the military departments" or directly to "enter into contracts with individuals, private business entities, educational, research or scientific institutions . . ."[71] These responsibilities for R & D given to ARPA applied not only to space but to all other DoD programs as well and were clearly very broad and comprehensive. Roy W. Johnson, a former General Electric executive, was chosen as the first ARPA Director and Dr. Herbert F. York of the PSAC was selected to serve as Chief Scientist. According to York, Secretary McElroy initially gave ARPA two assignments:

> One was specific: to assume authority over all military space programs. The second was more general and therefore more difficult: to initiate such programs and actions as seemed necessary to avoid another "Sputnik" -- i.e. another situation in which the United States suddenly found or even seemed to find itself far behind the principal military competition in some important branch of technology.[72]

In Congressional testimony in 1959, Director Johnson was very clear about his understanding of ARPA's primary purpose: "The Defense Secretary is very concerned about programs where all three services have a common interest, to prevent duplication. He wants one space program, not three."[73]

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[70]U.S. Department of Defense, DoD Directive 5105.15, 7 February 1957. Reprinted in U.S. Congress, House, Committee on Science and Astronautics, Defense Space Interests: Hearing before the Committee on Science and Astronautics, Appendix, "History of the Advanced Research Projects Agency -- Organizational outline and reference guide," 87th Cong., 1st sess., 1961, 217. (Hereinafter House, Defense Space Interests).

[71]Ibid.

[72]Herbert York, Race to Oblivion: A Participant's View of the Arms Race (New York: Simon & Schuster, 1970), 117.

[73]U.S. Congress, House, Committee on Government Operations, Organization and Management of Missile Programs: Hearings before the Committee on Government Operations, 86th Cong., 1st sess., 1959, 532. Cited in Michael H. Armacost, The Politics of Weapons Innovation: The Thor-Jupiter Controversy (New York: Columbia University Press, 1969), 227.

ARPA experienced a brief but intense period of time where it directed virtually all U.S. space R & D efforts. By the spring of 1958, ARPA had assumed responsibility for most major military space programs. Generally, ARPA allowed the program offices for these projects to remain in place within the Services and exerted overall control of these programs through these offices. For example, on 27 February 1958, ARPA assumed direction of the WS-117L program through the Air Force's WS-117L program office at AFBMD.[74] The WS-117L was ARPA's single most important space project and accounted for $152 million or nearly one-third of ARPA's budget in 1958.[75] Moreover, until the establishment of NASA on 1 October 1958, ARPA was also responsible for directing all U.S. civil space R & D efforts. The most publicized ARPA civil space program at this time was an $8 million project to design probes to hit the moon approved by Eisenhower on 24 March.[76]

The response of other space actors towards ARPA was mixed. The Army was probably the most supportive of the new agency. It desired to reduce the potential for Air Force control of military space through a strong organization at the OSD level and believed that ARPA might make better use of Army space expertise by removing the restrictions imposed by the Wilson Memorandum of November 1956. Killian even noted that General Medaris apparently believed that "ARPA in partnership with the army could get and manage the space program."[77] Killian and the PSAC were also supportive of

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[74]"Chronology" in Military Uses of Space, 27.

[75]Divine, Sputnik Challenge, 11, 110. The WS-117L budget for Fiscal Year (FY) 1957 had been only $13.9 million and, before *Sputnik*, the spy satellite had been programmed for only $15.5 million in FY 1958. Of course, these funding levels also related directly to Quarles' stipulation that under no circumstances would the WS-117L be the first satellite into orbit, as discussed in the policy on space science section of chapter three above.

[76]Divine, Sputnik Challenge, 109-10.

[77]Killian, Sputnik, Scientists, and Eisenhower, 127.

the new agency, mainly because centralizing DoD space efforts gave the scientists more room to maneuver in crafting a civilian space agency.[78] Congress initially viewed ARPA as an inadequate "stopgap measure, pending further congressional consideration of space organization."[79] The other Services and much of the aerospace industry generally were not very supportive of ARPA. The Air Force was the most opposed to the creation and operation of a strong ARPA, believing that a new strong space organization at the OSD level could derail its efforts to become predominant in space within DoD. Schriever was among those who were most openly and consistently critical of ARPA; in Congressional testimony in April 1959, he even recommended that ARPA be abolished as of 1 July 1959.[80]

Following the implementation of the Defense Reorganization Act of 1958, ARPA's role in directing military space R & D began to decline. In December 1958, Dr. York was appointed as the first Director of Defense Research and Engineering (DDRE) and was authorized to supervise all DoD research and engineering activities. ARPA's charter was limited and placed under the control of the DDRE in the revised DoD Directive 5105.15 issued on 17 March 1959.[81] In August 1959, York proposed to George Kistiakowsky, Eisenhower's new Special Assistant for Science and Technology, that primary responsibility for most military space R & D be returned from

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[78]Ibid., 129. Killian felt that ARPA "proved to be one of the most valuable organizational inventions of the period." But he strongly opposed McElroy's tentative offer in February 1958 for ARPA to control the nation's civil space efforts.

[79]Schoettle, "Establishment of NASA," 197.

[80]U.S. Congress, Senate, Committee on Aeronautics and Space Science, Subcommittee on Governmental Organization for Space Activities, Investigation of Governmental Organization for Space Activities: Hearing before the Subcommittee on Governmental Organization for Space Activities, 86th Cong., 1st sess., 1959, 417. (Hereinafter Senate, Governmental Organization for Space).

[81]Appendix in House, Defense Space Interests, 213.

ARPA to the Services subject to the overall supervision of the DDRE.[82] Eisenhower was initially skeptical of this proposal but acquiesced after it received the backing of McElroy.[83] At this same time, the Chief of Naval Operations (CNO), Admiral Arleigh Burke, forwarded a JCS proposal to create a unified space command. Burke's proposal was backed by the Army but was vigorously opposed by the Air Force and then rejected by Secretary McElroy on 18 September 1959.[84]

The impact of ARPA on military space programs and doctrine often was not clear or consistent. At times, Director Johnson and ARPA seemed to be sending mixed messages on the importance of the military space program. On the one hand, Johnson definitely did not build ARPA into an empire -- he deliberately limited his staff to only approximately eighty people and took a slow, cautious approach to many proposed space projects. On the other hand, Johnson believed that all space programs had military implications and was adamant that ARPA and military space programs not be placed under the control of a national space agency. These views were evident when he testified to Senator Johnson during hearings on the creation of NASA that national space policy should not be based on "space for peace or space for fun," but rather should be "set up with a military connotation."[85] Overall, ARPA generally achieved its primary mission of reducing interservice rivalry on space R & D programs but, by lessening Service control over and direction for these programs in their formative stages, ARPA's tenure

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[82]George Kistiakowsky, A Scientist at the White House: The Private Diary of President Eisenhower's Special Assistant for Science and Technology (Cambridge: Harvard University Press, 1976), 39, 57. See also York, Race to Oblivion, 138-39; and Stares, Militarization of Space, 43. Kistiakowsky replaced Killian as Science Advisor in July 1959 and served in that position during the remainder of Eisenhower's tenure.

[83]Stares, Militarization of Space, 43. The transfer of projects from ARPA was formally announced on 18 September 1959.

[84]Ibid., 43-44. McElroy's successor, Thomas S. Gates, Jr., reiterated this OSD opposition to a unified space command on 16 June 1960. The bureaucratic infighting surrounding this DoD space reorganization is discussed in greater detail in the changes in military space organizations and responsibilities section below.

[85]Divine, Sputnik Challenge, 145.

in charge of military space R & D undoubtedly also stunted and confused the development of early U.S. military space doctrine.

The Creation of NASA and Civilian-Military Space Issues

The creation of NASA was the single most important response of the U.S. government to the *Sputniks* challenge. This section will examine the role of the DoD in the creation of this policy response and begin to explore how NASA has interacted with DoD and thereby impacted upon the development of military space systems and doctrine. Of the many questions facing the administration and Congress as they struggled to craft a civilian space agency during the Spring and Summer of 1958, none were more important than the issues surrounding the proper relative priority of civil versus military space efforts and the questions concerning the likely bureaucratic impact of a new civilian space agency on military space organizations and doctrine. The National Aeronautics and Space Act of 1958 which established NASA represents a true compromise created out of many conflicting bureaucratic interests and policy goals. The DoD and military space doctrine played a limited but important role in the complex political process which resulted in the creation of NASA.

The tenor of the public and Congressional responses to the *Sputniks* shock put the administration on notice that major changes were expected in U.S. space policy. In early 1958, following the Johnson Hearings and a spate of proposed space and science legislation, Congress was clearly in the mood to consider far more sweeping organizational changes in the way America conducted its space business than had been accomplished through the creation of ARPA. The PSAC had spent the last months of 1957 in a series of debates over the relative value of various potential space missions and had considered many different ways in which the government bureaucracy might best be organized for the challenges of the space age. By the end of December, a consensus had emerged from these PSAC debates which indicated that scientifically oriented civil space missions ought to be the nation's top space priority and that a civilian space agency built from and modeled after the National Advisory Committee on Aeronautics (NACA) would be the best organizational approach for such a mission.[86]

Key meetings at the White House on the third and fourth of February, 1958 set the administration in motion to produce proposed legislation for a national space agency. On 3 February, the PSAC was formally tasked with studying space mission priorities and recommending possible organizational structures.[87] The next day, this PSAC study, which came to be known as the Purcell Report after its chairman Edward Purcell of Harvard, was initiated and publicly announced. Eisenhower made known his strong preference for keeping civil space efforts within ARPA during a private meeting with the top GOP Congressional leadership also held on the fourth of February.[88] Eisenhower wanted to keep his top-priority WS-117L program shielded and on track while avoiding the duplication he saw arising from the creation of a civil space agency; Killian and Vice President Nixon immediately objected to Eisenhower's approach arguing, respectively, that "a truly scientific space aspect does exist" and that the U.S. position in world opinion would benefit "if non-military research in outer space were carried forward by an agency entirely separate from the military."[89]

When Killian outlined the recommendations of the Purcell Committee in a memorandum to Eisenhower on 5 March, the president now responded enthusiastically

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[86]Divine, Sputnik Challenge, 102-4; Killian, Sputnik, Scientists, and Eisenhower, 129-31. Killian recorded his impression of this emerging consensus in a PSAC memorandum on 30 December. This position was very close to the eventual findings of the Purcell Committee. Jimmy Doolittle, a chairman of NACA and a member of the PSAC and Purcell Committee, was a key figure in moving the debates in this direction.

[87]Divine, Sputnik Challenge, 100.

[88]Ibid.

[89]Ibid., 101. At a small conference with his top scientists immediately following the Legislative Leaders meeting, Eisenhower also stated his opposition to placing military satellite missions completely within one service (Dr. York had proposed placing them in ABMA) and his support for strong control of DoD space activities at the OSD level, see Andrew J. Goodpaster, "Memorandum of Conference with the President, February 4, 1958 (following Legislative Leaders meeting)," 6 February 1958; microfiche document 00253 in Military Uses of Space; and Stares, Militarization of Space, 41-42.

to the plan to create a civilian space agency out of NACA.[90] The following day, Purcell and York presented the Purcell Committee's recommendations on space priorities to the NSC and the full council was also supportive of these proposed priorities for space.[91] The continuing public fascination with and confusion over the mysteries of the space age also prompted the PSAC to publish a public version of the Purcell Report entitled "Introduction to Outer Space."[92] For our purposes, the most significant aspect of the Purcell Report was its de-emphasis on military space applications. After briefly noting the potential military benefits of communications and reconnaissance satellites, the report went on to state that:

> Much has been written about space as a future theater of war, raising such suggestions as satellite bombers, military bases on the moon, and so on. For the most part, even the more sober proposals do not hold up well on close examination or appear to be achievable at an early date. Granted that they will become technologically possible, most of these schemes, nonetheless, appear to be clumsy and ineffective ways of doing a job. . . . In short, the earth would appear to be, after all, the best weapons carrier.[93]

With this outl[illegible] the [illegible] of mil[illegible]nd the strong backing of the president and the NSC, Killia[illegible] writing the proposed legislation

[90]Divine, Sputnik Challenge, 104; Killian, Sputnik, Scientists, and Eisenhower, 133. This memorandum, "Organization for Civil Space Programs," is reprinted as Appendix 3 in Killian, 280-87. During informal discussion with the president during February, Killian was apparently instrumental in moving Eisenhower towards his position on the need for a civilian space agency.

[91]Divine, Sputnik Challenge, 105-6. A memorandum on the discussion at this NSC meeting is reproduced in U.S. Department of State, FRUS, 1958-1960, Vol. II: United Nations and General International Matters (Washington: GPO, 1991), 828-30. Specific organizational recommendations were not discussed at this meeting.

[92]This brochure is reproduced as Appendix 4 in Killian, Sputnik, Scientists, and Eisenhower, 288-99. Much to Killian's delight, Eisenhower urged the public to read this report and it became "a best seller from the start." Pages 123-24.

[93]Ibid., 297. This is from the open version of the Purcell Report distributed as "Introduction to Outer Space".

to create a civilian space agency.[94] Following a brief and minimal interagency coordination process, the proposed legislation was delivered to Congress on 2 April.[95]

Despite the strong Congressional interest in rapidly creating a civilian space agency, it soon became clear that Congress had no intention of simply rubber-stamping the administration's proposal. Both houses held extensive hearings on the proposal in April and May and soon drifted into positions which differed from one another and from the administration. The most significant debates were within three issue-areas: the relative priority of the nation's civil and military space efforts, the type of relationship between the civilian and the military space organizations, and the decision-making structures for creating overall national space policy.

The testimony of the various military space actors on the proposed civilian space agency reflected their differing outlooks and bureaucratic positions. Several OSD witnesses including ARPA Director Johnson, Deputy Secretary Quarles, and ARPA Chief Scientist York focused on the question of who would determine which projects were military or civilian and on the general nature of the power balance between NASA and DoD. In particular, OSD took great exception to the wording of Section 2 of the proposal which seemed to imply that NASA, as the lead agency, not only would determine the military potential of individual projects but also would indicate the degree of cooperation it desired or would allow with DoD on any project.[96] OSD was adamant that it should maintain the power to define and control military space programs.

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[94]Ibid., 133. The actual drafting took place in the Division of Organization and Management within the Bureau of the Budget.

[95]Ibid., 135. Departments had only four days (27-30 March) to review the proposed legislation before it went to Congress -- a much shorter period than normally allotted for proposed legislation of this magnitude. Killian noted that this was a deliberate tactic on the part of the administration to avoid interagency debate, especially with DoD, prior to sending the bill to Congress, where debate seemed inevitable. The wisdom of this tactic in actually minimizing debate is questionable, Senator Johnson and others later indicated their opposition to seeing DoD railroaded into positions with which it did not agree.

[96]Schoettle, "Establishment of NASA," 242-43.

The positions of the Services were generally closely related to the stands they had taken in response to the creation of ARPA. Most Navy spokesmen opposed a strong civilian space agency and "wanted a reconstituted NACA, faithful to the tradition of passive support of and cooperation with the military services."[97] By contrast, the Air Force, quite confident of its military space role within DoD, strongly supported the creation of NASA "as a convenient receptacle for space research in which the Navy and Army had been engaged . . ." and was "content to leave to NASA rather than to another service, residual, nonmilitary space activities."[98] Moreover, the Air Force asserted that military space efforts should take clear priority over civilian exploration efforts and, consistent with OSD, argued that DoD rather than NASA must determine the military potential of space programs and maintain control over these programs. Finally, the Army generally took a position that was almost the exact opposite of the Air Force's. As an opening position, General Medaris opposed the creation of a civilian agency or the division of scientific and military missions in space. But the Army was beginning to sense the writing on the wall and also urged that if NASA were created that NASA, rather than DoD or the Air Force, should control the national space effort in the hopes that NASA would be more appreciative and supportive of Army space expertise.[99]

Of this military testimony, the arguments of OSD, and of ARPA Director Johnson in particular, seemed to carry the greatest weight with Congress. These arguments and the considerable Congressional support for them also prompted the administration to revise the wording of Section 2 to reflect the concerns of OSD as a part of a larger package to revise several sections of the proposed legislation.[100] However, by May, the

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[97]Ibid., 244.

[98]Ibid.

[99]Ibid., 245.

[100]Ibid., 253. The administration offered to amend Section 2 in return for Director Johnson's support for the creation of NASA. The amendment was delivered to Congress on 12 May. The applicable part of the new Section 2 read that NASA was responsible for space activities "except insofar as such activities may be peculiar to, or primarily

divergent positions of the House and Senate had hardened over this and other issues. Substantially different bills were sent out of the House and Senate on 24 May and 16 June, respectively. The House bill emphasized the priority of civil space, weighted the NASA-DoD power balance in NASA's favor, and provided for a space advisory committee on the Atomic Energy Commission (AEC) model. The Senate version indicated that DoD must remain independent of NASA on military space issues and called for the creation of a high-level space policy decision-making body on the NSC model.

The deadlock between the two bills was resolved only after presidential intervention and a meeting between Senator Johnson and the president on 7 July. This meeting resolved the major conflict between the administration and Congress -- the administration's difficulties with the decision-making structures provided for in both bills. At this meeting, Eisenhower agreed to accept Johnson's NSC-type committee if the president was made the chairman of the committee.[101] Following this accommodation, compromises between the two houses were ironed out at the conference committee meeting on 15 July. Here, compromises were finalized in which: the Senate abandoned its provision for a joint space committee and agreed to a modified version of the House's Civilian-Military Liaison Committee between NASA and DoD, the House accepted most of the Senate's patent provisions for NASA and acquiesced to the creation of the National Aeronautics and Space Council (NASC), and the final wording of Section 2 was resolved.[102] Both Houses immediately passed the conference bill and Eisenhower signed

associated with weapons systems or military operations, in the case of which activity the DOD will be responsible."

[101]Divine, Sputnik Challenge, 147; Killian, Sputnik, Scientists, and Eisenhower, 137. Johnson described this meeting in The Vantage Point: Perspectives of the Presidency, 1963-1969 (New York: Holt, Rinehart and Winston, 1971), 277.

[102]The final wording of Section 2 provided that NASA would exercise control over U.S. space activities "except that activities peculiar to or primarily associated with the development of weapons systems, military operations, or the defense of the U.S. [including the Research and Development necessary to make effective provision for the defense of the U.S.] shall be the responsibility of and shall be directed by the DOD." Schoettle, "Establishment of NASA," 260-61.

the National Aeronautics and Space Act into law on 29 July.

The creation of NASA on 1 October 1958 represented the primary policy response of the U.S. to the *Sputniks* challenge. It also marked the formal beginning of two separate, but closely related and imprecisely delineated, American space programs. NASA's rapid creation and its broad powers were recognition of the need for a new civilian space organization and of the primary importance of the civil space mission. At the same time, the process of creating NASA also highlighted the perceived importance of space in maintaining U.S. national security. The tone of the National Aeronautics and Space Act clearly expressed these latter considerations to a considerably greater degree than had the administration's original proposal. The testimony of OSD and Air Force witnesses was an important input to the political process by which these security considerations had been voiced more strongly than Killian and the Purcell Committee had originally intended. In bureaucratic terms, the creation of NASA had at least solidified and perhaps even enhanced the military space positions of ARPA, OSD, and the Air Force; the great loser was the Army, which was left with few military or civil space missions. Overall, the creation of NASA was itself only the beginning of the government's continuing task of attempting to determine the proper directions for and levels of effort required for military and civil space missions. The compromises involved in crafting the National Aeronautics and Space Act of 1958 had resulted in "an extraordinary piece of legislation fashioned in very little time. But it sewed as many snarls as stitches in the fabric of American government."[103]

Frictions on several specific space issues between ARPA and NACA became apparent even before the National Aeronautics and Space Act was signed. The need to divide responsibilities between the two organizations and to prepare the administration's budget for FY 1959 resulted in a series of meetings between key personnel from OSD and ARPA, NACA, and the Bureau of the Budget (BoB) during the summer of 1958. Killian was again a key actor behind the scenes; he was instrumental in shaping space

[103]McDougall, Heavens and Earth, 176.

compromises acceptable to the president during this difficult series of meetings.[104]

The most important substantive issue addressed during these meetings involved the question of which organization should control the man-in-space mission. Both ARPA and NACA strongly desired control of this mission; both organizations made impassioned pleas and mustered impressive logical and political arguments to make their case.[105] Sensing that the military faced a steep uphill battle with this audience, Quarles finally suggested that this decision be deferred. Killian and his staff then decided to have NASA design and build the capsules for manned spaceflight while ARPA would continue to concentrate on the boosters required for this mission.[106]

Organizational shuffling was also discussed during these meetings but only limited changes were made. The Navy had few qualms about rapidly turning its Vanguard program over to NASA and the Army seemed ready to grant the wish of its Jet Propulsion Laboratory to join NASA but did not finalize this action at these meetings. Most importantly, because the Army strongly desired to maintain control over the von Braun team at ABMA, it was decided to leave this organization in place for the time being.

Finally, these meetings resolved the administration's space budget for the coming year. Compromises on the budget reprogrammed $117 million from ARPA and the Air Force to NASA while ARPA retained $108 million for space programs outside of the

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[104]Divine, Sputnik Challenge, 152-53. Divine notes that in only six months Killian had emerged as Ike's "key post-*Sputnik* advisor."

[105]Ibid., 150-51. The military spokesmen touted all of the potential missions for military man-in-space and particularly emphasized the need for manned reconnaissance missions. Quarles also made the political argument that Congress was more likely to fund military space missions than civilian missions. The NACA participants and their allies on Killian's staff and with the BoB countered that international prestige concerns and Eisenhower's emphasis on space for peaceful purposes dictated that civilians must control this highest priority space mission.

[106]Ibid., 150

WS-117L.[107] Most importantly, Killian steadfastly refused to entertain any suggestions to change the organization for or to reduce the $186 million budget of the WS-117L program.[108] The difficulties in resolving many of the issues broached at these meetings complicated and strained early NASA-DoD relations and provide an excellent illustration of the near impossibility of sharply delineating between civilian and military space applications. The results of these meetings also reemphasized the preeminent position of spy satellites in shaping all other U.S. space considerations.

NSC 5814 and The Evolution of U.S. Space Policy

The *Sputnik* challenge clearly illustrated the international prestige aspects of the opening of the space age but the superpowers were also very concerned with the security implications of this new medium and with tailoring international law to meet their needs in this area. Both the United States and the Soviet Union had been jockeying for position in attempts to present their space programs to the international community in the best possible light. Eisenhower initiated a series of exchanges with Soviet Premier Nikolai Bulganin on 12 January 1958 in a letter which proposed that the superpowers agree "at this decisive moment" to use outer space for "peaceful purposes" only.[109] The sweeping Soviet response suggested a UN "ban on the military use of space, liquidation of foreign bases, and creation of 'appropriate international control' and a UN agency to devise and supervise an international program for launching space rockets."[110] Both superpowers then retreated behind procedural issues at the UN and otherwise largely avoided attempts to make serious headway on these issues. After much maneuvering, on 24 November

[107]Ibid., 151-52.

[108]Ibid.

[109]McDougall, Heavens and Earth, 179. The quotes are from these public exchanges which are reprinted in U.S. Arms Control and Disarmament Agency, Documents on Disarmament, 1945-1959, Vol. II (Washington: GPO, n.d.), 938-39, 976-77. The term "peaceful uses" deliberately was not further defined.

[110]McDougall, Heavens and Earth, 179. The interior quote is from the actual exchanges.

1958, these initiatives did finally result in the creation of the UN Ad Hoc Committee on the Peaceful Uses of Outer Space (COPUOS). The international law context for the early space age was thus set following the creation of COPUOS with its limited charter and the decision of the superpowers to posture rather than seriously address the most substantive issues regarding space and security concerns. As McDougall notes, this earliest international law regime for space served U.S. interests in several ways:

> . . . there would be no "control at the outset" for space technology. . . . The United States surely won out in the short term, for its goals were fulfilled by passage of the Western resolution [to create COPUOS]. "Space for peace" came to be associated primarily with the United States, but there was no danger of its being translated into perverse UN restrictions on national technology. The American formula of space for "peaceful" rather than for explicitly "nonmilitary" purposes also won out and served to guard the U.S. military space programs.[111]

Meanwhile, the Planning Board of the NSC was busy updating and coordinating U.S. space policy to account for the development of U.S. space expertise, the domestic and international reaction to the opening of the space age, and the space organizational changes within the U.S. government. Studies by an Ad Hoc Subcommittee on Outer Space, run by Killian's office, formed the basis for the Planning Board's secret draft of NSC 5814 completed on 20 June 1958.[112] This draft was debated at the NSC meeting on 3 July where it was decided to remove all references to ballistic missiles and anti-missile defense systems.[113] With these and other minor revisions the draft was referred back to the Planning Board.

The final NSC-level debate on NSC 5814 came at the NSC meeting on 14 August. Here, the primary discussion centered around the level of priority which would be given to military space missions as specified in bracketed paragraph 50 of the draft. The

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[111]Ibid., 185.

[112]National Security Council, Planning Board, "Preliminary Statement of U.S. Policy on Outer Space," [draft], 20 June 1958, NSC box, National Archives, Washington.

[113]S. Everett Gleason, "Memorandum of Discussion at the 371st Meeting of the National Security Council, Washington, July 3, 1958," FRUS, 1958-1960, Vol. II, 834-40. Killian and Quarles agreed that it was unnecessary to include ballistic missiles in a policy statement on space.

president and Killian successfully argued to delete this paragraph and thereby remove from NSC 5814 a clear statement that military space activities would receive priority. The paragraph was deleted despite the concerns expressed by McElroy and the objections of Chairman of the Joint Chiefs of Staff (CJCS) General Nathan F. Twining.[114] With this significant amendment, the NSC then adopted this statement as NSC 5814/1 and it was approved by the president on 18 August.

The secret NSC 5814/1 "Statement of Preliminary U.S. Policy on Outer Space" emphasized the major space concerns of the administration at this time. Several sections of the report focus on military space activities or deal with issues related to the development of military space doctrine. The declassified portion of the "Problem of Defining Space" section skirted the major issue of where space begins by stating that "the upper limit of air space has not been defined."[115] However, the wording of the report clearly conflicted with the Air Force's emerging concept of aerospace: "For the purposes of this policy statement, space is divided into two regions: 'air space' and 'outer space'".[116]

The "Military" section of NSC 5814/1 divided military programs into three chronological categories: "Now Planned or in Immediate Prospect" containing military reconnaissance; "Feasible in the Near Future" containing weather, communications, navigation, and electronic counter-measures satellites; and "Future Possibilities"

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[114]Paragraph 50 read: "In the absence of a safeguarded international agreement for the control of armaments and armed forces, activities related to outer space necessary to maintain the over-all deterrent capability of the United States and the Free World will receive priority." The majority view on the Planning Board held that paragraph 50 was unnecessary because, as NSC 5814 noted, space priorities had already been established under NSC Action Number 1846 (Priorities for Certain Missiles and Related Programs). On this discussion, see S. Everett Gleason, Memorandum of Discussion at the 376th Meeting of the National Security Council, Washington, August 14, 1958," in ibid., 841-44.

[115]Ibid., 845-63, contains the declassified sections of NSC 5814/1. The quote is from page 847. Two paragraphs (1 page of source text) are not declassified in this section.

[116]Ibid., 847.

containing manned maintenance and resupply of space vehicles, manned defensive vehicles [ASAT], bombardment satellites, and manned lunar stations.[117] The report emphasized that "[r]econnaissance satellites are of critical importance to U.S. national security."[118] Moreover, the statement not only urged that "studies must be urgently undertaken in order to determine the most favorable political framework" for spysat operations but also called upon the U.S. to "seek urgently a political framework which will place the uses of U.S. reconnaissance satellites in a political and psychological context most favorable to the United States."[119] Turning to manned spaceflight, the statement indicated that "[t]o the layman, manned exploration will represent the true conquest . . ." of space and noted that unmanned missions cannot substitute in terms of their "psychological effect on the peoples of the world."[120] Finally, the report also noted that "*[n]umerous legal problems* will be posed by the development of activities in space" but that "*rules will have to be evolved gradually*" and that outer space "is not suitable for abstract a priori codification."[121]

The NSC discussed space policy issues in several additional meetings during the remainder of Eisenhower's tenure but, generally, the additions and revisions which were later approved did not substantially alter the major thrusts of NSC 5814/1. NSC 5918, "U.S. Policy on Outer Space," was drafted by the NASC and discussed at the NSC meeting on 29 December 1959. NSC 5918 was approved by the president on 26 January 1960 and superseded NSC 5814/1. The major points and even the specific wording is very similar between these two documents in most areas. NSC 5918 does seem to put less emphasis on possible military space applications; the sanitized version of the statement retains only the ASAT mission out of the four missions which had been listed

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[117]Ibid., 849.

[118]Ibid. Much of the section "Reconnaissance Satellites" remains classified.

[119]Ibid., 850, 857.

[120]Ibid., 850.

[121]Ibid., 853-54. Emphasis in original.

in the "Future [Military] Possibilities" section of NSC 5814/1.[122] The "International Principles, Procedures, and Arrangements" section of NSC 5918 explicitly noted "that definitions of 'peaceful' or 'non-interfering' uses of outer space have not been advanced by the United States or other states."[123]

The Eisenhower administration completed its last space policy statement just before leaving office. NSC 6108, "Certain Aspects of Missile and Space Programs," was approved by the president on 18 January 1961 following Planning Board coordination and NSC meetings on 5 and 12 January. Most of this top secret policy statement dealt with missile programs. In addition to the six top-priority missile programs listed, the declassified version includes:

> DISCOVERER (satellite guidance and recovery)
> MERCURY (manned satellite)
> SATURN (1,500,000 pound-thrust, clustered rocket engine)
> [designated as]
> Space programs determined by the President on advice of the National Aeronautics and Space Council to have objectives having key political, scientific, psychological or military import.
> [and thereby enjoying]
> the highest priority above all others for research and development and for achieving operational capability; scope of the operational capability to be determined by the President.[124]

This final Eisenhower space policy statement also included a new restriction which specified that "[a]ny test which involves destroying a satellite or space vehicle shall not proceed without specific Presidential approval."[125] This new prohibition was an explicit recognition of the political sensitivities involved in any ASAT testing and may have been

[122]National Aeronautics and Space Council, "U.S. Policy on Outer Space," [draft], 17 December 1959, 6-7, NSC box, National Archives, Washington.

[123]Ibid., 8.

[124]National Security Council, "Statement of Policy on Certain Aspects of Missile and Space Programs," 18 January 1961, 2-3, NSC box, National Archives, Washington. The space program(s) deleted from this section in the sanitized version presumably included at least the WS-117L.

[125]Ibid., 4.

included in response to the Air Force's Bold Orion ASAT test on 19 October 1959.[126]

Thus, the major tenets of Eisenhower's space policy were largely set by the time NSC 5814/1 was approved in August 1958. Both publicly and in its secret policy statements, the administration eschewed a space race with the Soviets by calling for the U.S. to become a leader rather than the leader in space exploits. The administration's balance of priorities between civilian and military space efforts was slightly skewed in favor of NASA. Finally, the most clear and emphatic portion of Eisenhower's space policy consistently emphasized the critical importance of spysats and of the political frameworks designed to protect spysats over all other possible space applications.

Military Space Plans and Programs

Beginning shortly prior to *Sputnik* and continuing on throughout the cold war, the U.S. military produced a large number of various space plans and actually deployed scores of space systems. This study will not attempt to begin a detailed discussion of all these U.S. military space plans and programs for this or the subsequent periods of analysis. Rather, the study will focus on those plans and programs which appear to be most ambitious and controversial because these activities are more likely to be at the cutting edge of military space doctrine than are non-controversial plans and programs. Focusing on this edge of controversy can help us better understand the major obstacles and landmarks which channeled the path of military space doctrine development towards certain directions. Unfortunately, the most ambitious and controversial plans and programs often are also those which are most likely to be highly classified; naturally, these restrictions impact upon the accuracy and comprehensiveness of this analysis. Major non-controversial military space plans and programs will be discussed to the extent necessary to provide a more complete picture of the development of U.S. military space programs and doctrine. For this period, two broad areas of plans and programs are be examined most closely: the extreme and ambitious plans and programs advanced in the wake of the *Sputniks* shock, and the less controversial programs which began to come on

[126]On the Project Bold Orion ASAT test see the ASAT section below.

line in the early 1960s. The first U.S. ASAT plans and limited programs initiated at this time, the debates over the usefulness of military man-in-space and the programs designed for this purpose, and the interface between spy satellite programs and other military space programs and organizations are discussed in separate sections below.

Soon after the *Sputniks* shock, elements within the military seemed intent to make up for the general neglect of space by the military prior to the opening of the space age. In so doing, these space cadets often let their enthusiasm get the best of them and their overreactions were often as serious as the neglect of space prior to *Sputnik*. These types of knee-jerk responses prompted the critique of military space plans in the Purcell Report cited above. With the benefit of hindsight, Killian provided this assessment of the initial military overreaction to the opening of the space age:

> It is strange now to recall the fantasies that *Sputnik* inspired in the minds of many able military officers. It cast a spell that caused otherwise rational commanders really to become romantic about space. No sir, they were not going to fight the next war with the weapons of the last war; the world was going to be controlled from the high ground of space. (Lyndon Johnson also took this view.) And they were convinced that their service, be it army or air force, was best qualified to develop the exotic technology that would be needed for space warfare -- and for civilian use, too. In recalling these conflicts and fantasies, I also recognize that most of these star-struck officers were also motivated by a laudable concern for the defense of the nation. I cannot say the same for some parts of the aerospace press which outrageously conjured up even wilder fantasies and scare talk, usually in the interest of circulation and advertising from the aerospace industry.[127]

Many of the most extreme initial military plans focused on the military potential of the moon and the need for the U.S. rapidly to seize and exploit the moon as a military outpost. Teller, Gavin, and others had briefly alluded to the military significance of the moon during the Johnson Hearings. But the most explicit initial public statement on the military potential of the moon came from USAF Brigadier General Homer A. Boushey

[127]Killian, Sputnik, Scientists, and Eisenhower, 128.

in a speech to the National Press Club on 28 January 1958.[128] Boushey began his speech by reiterating and strengthening the two major elements of Air Force space doctrine first annunciated by General White before the same audience back on 29 November:

> It has been axiomatic that whoever controls the air space can exert control over the land and seas beneath it. Similarly, it will be true in the future that control of space will permit control of the earth's surface. It is necessary that the Air Force establish, as a goal, superiority in space, and that the Air Force program be directed towards that end.[129]

From this initial doctrinal position, Boushey went on to describe the physical characteristics of the moon which he considered conducive to military operations and to form an "environmental doctrine" for the moon.[130] These characteristics included: the moon's orbital position as "high ground" in relation to the earth, its low gravity and the low escape velocity required for launches from the lunar surface or subsurface, the ability to constantly monitor the earth from the non-rotating moon, the warning time any station on the moon would have of an attack from earth, and the protection and secrecy offered by the far side of the moon.[131] Based upon these lunar characteristics, Boushey concluded:

> . . . the moon provides a retaliation base of unequalled advantage. If we had a base on the moon, either the Soviets must launch an overwhelming nuclear attack towards the moon from Russia two or two-and-one-half days prior to attacking the continental United States (and such launchings could not escape detection), or Russia could attack the continental U.S. first, only and inevitably to receive, from the moon some forty-eight hours later, sure and massive destruction. It has been said that "He who controls the moon, controls the earth." Our planners must

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[128]Boushey had been denied the position of commanding the first Directorate of Astronautics on the Air Staff in December 1957 (see note 68 above). Instead, he was made Director of Advanced Technology on the Air Staff.

[129]General Boushey's speech is reprinted in Emme, Impact of Air Power, 865-873. The quote is from page 870.

[130]See the discussion of Drew's doctrine tree model in the doctrine section of chapter two above.

[131]Emme, Impact of Air Power, 871-72.

carefully evaluate this statement, for, if true (and I for one think it is), then the United States must control the moon.[132]

In light of Eisenhower's and Quarles' previous injunctions against public discussions of the military potential of space, Boushey was certainly guilty of great indiscretion for proposing the moon as the ultimate "doomsday" base in this speech -- but he certainly could not be accused of thinking small![133]

Public statements such as Boushey's helped to fuel heightened interest by both the military and the American public in the first moon race -- the U.S.-U.S.S.R. competition to hit the moon first with a probe. The Eisenhower administration denied that such a race was underway; further, after a series of public statements by top Air Force and Army officials which attempted to highlight their upcoming moon shots, Eisenhower again privately took "strong exception" to such public remarks and insisted that only ARPA was authorized to release such information.[134] Meanwhile, the military continued secretly planning for moon missions and moon bases. A secret memorandum from General White to the Secretary of the Air Force dated 10 April 1959 made clear the continuing interest of the Army and Air Force in the moon. The memorandum contains a working list of Army space requirements forwarded to ARPA including a "manned lunar outpost," a "lunar assault vehicle," and a "lunar surface vehicle;" for its part the Air Force working

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[132]Ibid., 872.

[133]On this speech and the reaction to it see also, William E. Burrows, "Securing the High Ground," Air & Space Smithsonian 8 (December 1993/January 1994): 66-68; Lieutenant Colonel S. E. Singer, "The Military Potential of the Moon," Air University Quarterly Review 11 (Summer 1959): 31-53; and Divine, Sputnik Challenge, 98. Boushey's most vocal civilian critic was Dr. Lee A. DuBridge, President of the California Institute of Technology, who found Boushey's plan "utter nonsense" and asked: "Why transport a hydrogen warhead, together with all the men and equipment, 240,000 miles to the moon, just to shoot it back to earth when the target is only 5,000 miles away in the first place?" Quoted in Singer, 36.

[134]Divine, Sputnik Challenge, 154-55. The quote is from a Goodpaster memo dated 3 July 1958. Despite three attempts at impacting the moon (the Air Force's *Pioneer* I and II in October and November 1958 and the Army's *Pioneer* III in December 1958), the Soviets scored another space first with the lunar impact of *Luna* II on 12 September 1959.

list of requirements included a "manned military lunar base" as well as "manned bombardment space vehicles (or space base)" and "manned detection, warning and reconnaissance space vehicles (or space base)".[135] Perhaps the most detailed and comprehensive military moon base plan which has surfaced to date was prepared by the Air Force Ballistic Missile Division's Directorate of Space Planning and Analysis. This secret report entitled "Military Lunar Base Program" called for a large, self-supporting lunar missile complex capable of insuring "positive retaliation" in the event of an attack on the U.S.[136] Of course, none of these very ambitious military lunar plans came close to being implemented; their existence attests both to the extreme high ground position adopted by elements within the Army and especially the Air Force at this time and to the failure of these elements to comprehend the very different perspective and military requirements of U.S. space policy.

Several miscellaneous military space plans and programs were also undertaken during this period. The first of these was a classified ARPA project designed to study both ballistic missile defense and ASAT techniques. Known as Project Defender, this effort consisted of mainly low-level paper studies in the late 1950s and early 1960s.[137] However, Project Defender was granted "highest national priority for research and development" by National Security Action Memorandum (NSAM) 191 on 1 October

[135]General Thomas D. White, "Memorandum for Secretary of the Air Force, Subject: Air Force Requirements for Space Systems," 10 April 1959; microfiche document 00511 in Military Uses of Space.

[136]Burrows, "Securing the High Ground," 67-68. This report was completed in April 1960, see McDougall Heavens and Earth, note 20 on page 507. Kistiakowsky's Private Diary, 383, contains the following entry for 5 August 1960: "Listened to Air Force briefing on the ARDC space program and was shocked by the incredible wastage of taxpayer's money. For instance, $8 million spent in paper studies such as lunar defense systems."

[137]Stares, Militarization of Space, 107

1962.[138] The second miscellaneous project was a rather bizarre Air Force communications test program known as Project WEST FORD. Project WEST FORD was designed to improve the Earth's ionosphere as a reflector of radio signals by exploding 400 million tiny copper dipoles into the upper atmosphere.[139] The first WEST FORD test attempt failed in October 1961. The second test was completed in 1963 after the NASC had studied this issue and despite numerous foreign protests.[140] The final set of miscellaneous space related projects discussed here is the U.S. high-altitude nuclear test series. These tests were conducted in August and September of 1958 and again during the Summer and Fall of 1962.[141] The ARGUS series was designed to

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[138]Carl Kaysen, "National Security Action Memorandum No. 191, Subject: Assignment of Highest National Priority to Project DEFENDER," 1 October 1962, NSC box, National Archives, Washington. It is unclear from this NSAM or other open sources what types of technologies (ASAT or BMD) were being given this priority and whether Project DEFENDER now included development programs instead of just studies. The highest priority for Project DEFENDER was granted following a memo to the National Security Advisor which recommended this action from Budget Director David E. Bell and Science Advisor Jerome B. Wiesner, see "Memorandum for Mr. Bundy, Subject: Request for DX Priority Rating for Project DEFENDER," 25 September 1962; microfiche document 00008 in Military Uses of Space. Parts of the ARPA Project DEFENDER studies did help to spawn the Army's Nike-X endoatmospheric BMD system. In the 1980s, proponents of space-based BMD systems using kinetic energy weapons (KEW), such as High Frontier Director Lieutenant General Daniel O. Graham, USA, (Ret.), cited Project Defender studies as evidence that the U.S. had studied KEW BMD for more than 20 years and could have deployed such a system by 1968. See Graham's testimony in U.S. Congress, Senate, Committee on Foreign Relations, Controlling Space Weapons: Hearings before the Committee on Foreign Relations, 98 Cong., 1st sess., 1983, 30.

[139]McDougall, Heavens and Earth, 338.

[140]Ibid. See also Dr. Edward C. Welsh, "Peaceful Purposes: Some Realistic Definitions," Air Force/Space Digest 44 (November 1961): 74.

[141]Samuel Glasstone and Philip J. Dolan, The Effects of Nuclear Weapons, Third Edition, (Washington: Department of Defense and Department of Energy, 1977), 45; and Stares, Militarization of Space, 107-8. The major tests and series included: The HARDTACK Series above Johnson Island in the Pacific consisting of TEAK (1 August 1958, 48 miles altitude), and ORANGE (12 August 1958, 27 miles); the ARGUS Operation in the South Atlantic in September 1958 consisting of three 1-2 kiloton (kt)

test and did confirm the theory of Nicholas Christofilos of the University of California's Radiation Laboratory that the high-energy electrons produced in a high-altitude explosion would become trapped in the earth's magnetic field.[142] The results of these tests were used by ARPA in later studies on ASAT weapons.[143]

The fruits from more mainstream U.S. military space plans and programs first started to come on line during the early 1960s. In each example listed below, the U.S. scored a significant military space first and illustrated that the U.S., not the U.S.S.R., was the true leader in military space applications technology. Clearly, within a few years of the opening of the space age, U.S. space policy and military space doctrine had enhanced U.S. national security by exploiting the military potential of unmanned space systems more rapidly and effectively than the U.S.S.R. These earliest military space systems can be divided into two categories: systems designed for strategic warning and surveillance and systems designed for terrestrial force enhancement.

The Air Force's missile detection and alarm system (MIDAS) was originally part of the WS-117L program. MIDAS satellites used infrared sensors to detect the heat from

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bursts from 125-300 miles altitude; and the FISHBOWL Series above Johnson Island consisting of STARFISH PRIME (9 July 1962, 248 miles, 1.4 megatons) and three subsequent submegaton devices in October and November of 1962. Significant communication disruptions were recorded in Hawaii (700 miles away) following the STARFISH PRIME shot.

[142]Stares, Militarization of Space, 107.

[143]Ibid., 108. Specifics on exactly how vulnerable space systems are to the Christofilos Effect and broader Electromagnetic Pulse (EMP) effects are not available in open sources. Seven satellites which were not in line-of-sight of the detonation suffered "permanent effects" from trapped high energy electrons following the STARFISH PRIME test. Of course, these type of tests were prohibited following the Limited Test Ban Treaty (LTBT) of 5 August 1963. The most detailed open discussions of these phenomena are found in Glasstone and Dolan, Effects of Nuclear Weapons, 350-53, 474-78, 514-40; Lieutenant Colonel David E. Lupton, USAF, (Ret.) On Space Warfare: A Space Power Doctrine (Maxwell AFB, AL: Air University Press, June 1988), 71-75; and Bruce G. Blair, Strategic Command and Control: Redefining the Nuclear Threat (Washington: Brookings Institution, 1985), Appendix C, "Electromagnetic Pulse," and Appendix D, "Satellite Vulnerability to System-Generated EMP," 321-331.

ballistic missile launches and explored the possibility of using space technology to address the early warning problem posed by the new technology of ICBMs. By providing the first indications of a missile attack, early warning satellites help to insure positive control over nuclear forces and were a very important means of providing strategic stability between the superpowers during the later portions of the cold war; the early warning mission is almost always viewed as one of the least controversial military uses of space. MIDAS 2, the first successful test satellite in this series, was orbited on 24 May 1960.[144] A similar type of satellite system for strategic surveillance known as Vela Hotel also became operational in the early 1960s. Vela Hotel satellites were designed to detect nuclear detonations on earth or in space; they operated in pairs on opposite sides of the earth at altitudes between 60,000 and 70,000 miles.[145]

Programs designed for force enhancement during this period included communication, navigation, geodesy, and meteorology satellite systems. On 18 December 1958 the U.S. placed the greatest weight to date in orbit when an Atlas booster successfully orbited its entire 8700 pound final stage. The 150 pound payload carried within this stage was a passive repeater radio communications satellite known as Project Score. In the first demonstration of voice communications from space, the Score satellite

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[144]"Launch Listing," in Military Uses of Space, 68. The first generation infrared sensing technology in the MIDAS system had a great deal of trouble reliably detecting missile launches. It was apparently not until May 1963 that Program 461 (the classified follow-on to MIDAS) scored its first major successes by accurately detecting nine U.S. ICBM launches. OSD was on the verge of reorienting this program as a purely R & D effort prior to this success. See Gerald T. Cantwell, "The Air Force in Space, Fiscal Year 1964," Secret History, Air Force Historical Division Liaison Office, June 1967, 51; microfiche document 00330 in ibid. (Hereinafter Cantwell, "AF in Space, FY 64").

[145]"Space Systems Glossary," in ibid., 173. The first operational pair of Vela Hotel satellites was launched on 17 October 1963. Along with overall surveillance, Vela Hotel satellites were used to monitor Soviet compliance with the LTBT of 5 August 1963 and, although not generally specified as such, could thus be considered as the U.S.'s first national technical means of verification (NTMV).

transmitted the president's taped goodwill message beginning on 19 December.[146] The Army became primarily responsible for the next major U.S. communications satellite project when the Courier program was transferred from ARPA to the Army on 18 September 1959.[147] This delayed repeater satellite communications system was successfully tested following its launch by a Thor-Able booster on 4 October 1960.[148]

The Navy became primarily responsible for the first U.S. navigation satellite system known as Transit following the transfer of this program from ARPA to the Navy which also took place on 18 September 1959.[149] The first successful test in the Transit series came following the launch of Transit 1B by a Thor-Able booster on 13 April 1960.[150] The first successful geodetic satellite was Anna 1B launched on 31 October 1962.[151] This joint program between the three Services and NASA began the process of making highly accurate measurements of the earth's geodetic features.[152] Finally, the

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[146]On Project Score see Divine, Sputnik Challenge, 204-5; and U.S. Congress, House, Committee on Science and Astronautics, "Message from the President of the United States Transmitting the First Annual Report on the Nation's Activities and Accomplishments in the Aeronautics and Space Fields," 2 February 1959, 7-8. (The President's Annual Space Reports are hereinafter cited as President's Space Report, year of report). ARPA directed Project Score with the Air Force as agent. Divine emphasizes that the propagandistic approach to Project Score and the decision to orbit the entire (non-scientific) final stage of the Atlas both indicated how much Eisenhower's original aversion to space spectaculars had changed in just one year.

[147]"Chronology," in Military Uses of Space, 30. In February 1960, the Army also gained responsibility for the Advent communications satellite program.

[148]Ibid., 32.

[149]Ibid., 30.

[150]"Launch Listing," in ibid., 68. The Transit system allowed surface ships and submarines to fix their positions within approximately 200 meters by measuring the Doppler shift in the radio signals from a satellite passing overhead.

[151]Ibid., 72.

[152]Determining worldwide locational positions with precision and measuring the earth's gravitational anomalies are both necessary for high accuracy with ballistic missiles.

military cooperated with the development and launch of NASA's first meteorological satellite, Tiros 1, on 1 April 1960.[153]

While this impressive string of space firsts certainly illustrates early U.S. military space expertise, with the possible exception of the highly classified MIDAS and Vela Hotel systems, none of these early unmanned military space applications programs elicited great enthusiasm or support from the military. The military space doctrine of terrestrial force enhancement via unmanned military space systems was non-controversial among the civilian leadership but was generally not the top space priority of most of the military leadership. In keeping with the high ground and space control schools of thought, the military generally reserved its greatest enthusiasm for manned military space missions and the possible placement of actual weapons systems in space rather than just systems for force enhancement. The pattern by which these early mainstream space systems were developed and the emerging Service attitudes towards these systems also illustrates the beginning of an ongoing split between the space system development and user communities. This split has made it more difficult for the space system development community to build operationally relevant space systems, has limited the knowledge of space system potential and capabilities within the user communities, and, overall, has made the development of coherent space doctrine that much more difficult.

ASAT Plans and Programs

The final area of military space plans and programs examined in this section deals with the earliest U.S. ASAT efforts. Because of their focus on actual weapons systems, ASAT plans and programs often received more support and enthusiasm from within the military than did the force enhancement systems described above. But the development of ASATs and the doctrine for their use was a far more sensitive issue and was more constrained by the space policies of the Eisenhower and Kennedy administrations. Thus, despite Service support for the deployment of ASAT weapons (especially manned ASATs) at this time, ASAT programs moved forward only haltingly and did not result in deployed systems until the very end of this period.

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[153]McDougall, Heavens and Earth, 221.

The *Sputniks* shock provided a clear rationale for the U.S. military to explore the need for ASAT systems. Each of the Services advanced some type of ASAT proposal prior to the end of November 1957.[154] In June 1957, General Gavin had requested that ABMA begin a comprehensive study of this problem; the Army proposal briefed to the Office of Special Assistant for Science and Technology on 19 November was undoubtedly the most detailed and complete of these early ASAT proposals.[155] The earliest policy guidance on ASATs came following a 13 February 1958 meeting of the NSC and the adoption of NSC 5802/1, entitled "U.S. Policy on Continental Defense".[156] NSC 5802/1 specified that "Defense against Satellites and Space vehicles" was an area of "particular importance" warranting a "vigorous research and development program . . ."[157]

Despite this approval for vigorous ASAT R & D in NSC 5802/1, other political factors strongly mitigated against substantial U.S. ASAT efforts at this time. According to Stares, there were four primary reasons why the Eisenhower administration chose to take a very slow and studied approach to the development of ASAT or other space weapons during the remainder of its tenure: 1) The current and projected Soviet space threat from reconnaissance satellites or possible orbital bombardment systems was not considered grave enough to require a U.S. ASAT system. 2) Orbital bombardment systems and other possible space-to-earth weapons systems were not judged to be the most rational allocation of defense efforts. 3) Space-based systems with a demonstrated military rationale such as a space-based ballistic missile defense system faced prohibitive technical and cost hurdles. And, 4) most importantly, because of the administration's overriding concern with the development of spy satellites, it had an equal desire to protect

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[154]Stares, Militarization of Space, 49. Stares provides the most detailed account of the development of U.S. ASAT programs and is the primary source for the following section.

[155]Ibid.; and Medaris, Countdown for Decision, 162.

[156]Stares, Militarization of Space, 49-50.

[157]Ibid.

these systems from the impact of a possible U.S.-U.S.S.R. "ASAT race".[158] According to York, "[t]he President himself, in recognition of the fact that we didn't want anybody else interfering with our satellites, limited this program [the SAINT ASAT] to 'study only' status and ordered that no publicity be given either the idea or the study of it."[159] Thus, once again the secret but all-powerful influence of spysat requirements fundamentally shaped another initial military space application.

The major ASAT R & D program underway during the Eisenhower administration was the satellite interceptor system known as the SAINT. The idea for an on orbit satellite inspection system had originated in an Air Research and Development Command (ARDC) study conducted in 1956.[160] ARPA kept this Air Force idea alive with very limited contracts for RCA to study such an inspection system until the Air Force formally proposed on 5 April 1960 that prototypes of the SAINT system be built.[161] In order to sell its proposal, the Air Force had to stress the inspection feature rather than any possible ASAT capability of the SAINT but the proposal still faced considerable political pressure and the staunch opposition of Science Advisor Kistiakowsky.[162] As the result of this emphasis on only the non-lethal aspects of SAINT (which was unpopular within the Air Force) and the fact that the Air Force had been directed by DDRE York to pay all costs associated with its development, the system now had to face increasing pressures

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[158]Ibid., 50-52.

[159]York, Race to Oblivion, 131.

[160]Stares, Militarization of Space, 112.

[161]Ibid., 112-13. Stares notes that the discovery of an unidentified satellite in December 1959 strengthened the Air Force's case to go ahead with SAINT. On the impact of this unidentified satellite see also Kistiakowsky, Private Diary, 245.

[162]Stares, Militarization of Space, 112-13; and Kistiakowsky, Private Diary, 229-30. As an indication of the perception that Kistiakowsky was at this time the key administration decision-maker on space and missile issues consider the following remark from General Schriever to Kistiakowsky as recorded in the latter's diary for 16 December 1959 (page 200): "everybody in the Air Force from the secretary down now thinks that you control the entire military R & D program."

within the Air Force as well. By 1962, technical problems with the program, the international law implications of on orbit inspection, fears of instigating a space-based ASAT race, and the open possibility of accomplishing this mission more easily and cheaply in other ways combined with the dwindling support for SAINT both within and outside of the Air Force; the Air Force decided to "reorient" the SAINT program on 3 December 1962.[163]

Several other very limited ASAT studies and demonstrations were also underway during this period. The most significant of these was the world's first ASAT test conducted by ARDC on 19 October 1959 as a part of Project Bold Orion. In this test, a Martin missile was air-launched from a B-47 at the Explorer VI satellite as it passed overhead the Eastern Test Range at Cape Canaveral.[164] Additionally, the Navy studied the feasibility of ship or submarine launched ASATs under the code names Early Spring and Skipper in the early 1960s. In April and July 1962, the Navy conducted two tests of an air-launched ASAT missile which were similar to the Bold Orion test.[165]

The advent of the Kennedy administration, rising U.S.-Soviet tensions over Berlin and elsewhere, improving space technology, more strident Air Force and industry lobbying for space weapon development, and especially the increasingly bellicose Soviet

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[163]Stares, Militarization of Space, 115-16. See also Gerald M. Steinberg, Satellite Reconnaissance: The Role of Informal Bargaining (New York: Praeger Publishers, 1983), 83-85. The reoriented SAINT program (program 706) was a study program only. The Air Force, noting that ASAT requirements were increasing, planned to use the Blue Gemini and the Manned Orbital Development Station (MODS) programs to test manned ASAT techniques. Steinberg's interviews with former Deputy Secretary of Defense Roswell L. Gilpatric, former Air Force Secretary Eugene M. Zuckert, and retired General Schriever indicate that McNamara personally canceled the SAINT program, primarily due to his fears of an action-reaction space-based ASAT race.

[164]Stares, Militarization of Space, 109. See also "Chronology" in Military Uses of Space, 30; and "Space Systems Glossary," in ibid., 154. Project Bold Orion was designed primarily to test the feasibility of air-launched ballistic missiles. The missile apparently passed with four miles of its target, certainly a lethal range for a nuclear warhead.

[165]Stares, Militarization of Space, 109-11. The smaller ASAT missiles used in these tests were launched from F-4s.

space rhetoric combined to cause the U.S. to rethink ASAT issues and eventually field its first limited ASAT systems in the early 1960s. As an example of the threatening Soviet space rhetoric of the day consider the following statement made by General Secretary Nikita S. Khrushchev on 9 August 1961 at a reception honoring Gherman Titov's spaceflight:

> You do not have 50 and 100 megaton bombs. We have bombs stronger than 100 megatons. We placed Gagarin and Titov in space and we can replace them with other loads that can be directed to any place on earth.[166]

These pressures prompted Secretary of Defense Robert McNamara to make a highly secret decision in May 1962 which directed the Army to develop a modified Nike Zeus missile as an ASAT system.[167] This decision resulted in Program 505, a nuclear tipped Nike Zeus ASAT system stationed at Kwajalein Atoll in the Pacific Missile Range. Tests of the Program 505 ASAT began in December 1962 and the system was declared operational on 1 August 1963.[168]

As a means of providing further insurance against Soviet orbital threats, on 15 February 1963 the Air Force was directed to prepare for "operational standby capability" with the nuclear tipped Thor ASAT missile it planned to begin testing from Johnson Island in the Pacific.[169] Designated Program 437, the Thor ASAT began testing in February 1964 and reached IOC on 10 June of the same year.[170] The existence of a

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[166]Ibid., 74.

[167]Ibid., 76.

[168]Ibid., 118-19. Stares questions whether the system was truly operational as of this date. Program 505 was deactivated by 1967.

[169]Ibid., 121.

[170]Ibid., 123. The modified Thor missiles used in Project 437 apparently had a somewhat longer range (approximately 700 miles) than the modified Nike Zeus missiles in the Project 505 ASAT system. See Cantwell, "AF in Space, FY 64," 61; microfiche document 00330 in Military Uses of Space. As requested by DoD, Program 437 was granted highest national priority for research and development by NSAM 258 on 6 August 1963. See McGeorge Bundy, "National Security Action Memorandum No. 258, Subject: Assignment of Highest National Priority to Program 437," 6 August 1963;

U.S. ASAT capability was publicly revealed by President Johnson on 17 September 1964 and these two systems were discussed in limited detail by McNamara at a news conference the following day.[171] Both of these initial ASAT systems suffered from a number of very significant operational deficiencies including: an inability to attack many satellites in many types of orbits due to the range and azimuth limitations imposed by the missiles themselves and by having only two launch sites for these direct-assent ASATs; an inability to discriminate in attacking individual targets due to the nuclear kill mechanisms on these ASATs; and a limited number of ASAT missiles, inadequate tracking and targeting support, and a weak logistical infrastructure.[172]

By the end of this period, the U.S. had marked a significant break with its previous space policy through the deployment of a limited number of ASATs. Unfortunately, neither Stares, Steinberg, nor other analysts have uncovered an extensive "paper trail" describing the decision-making process which led to this type of limited ASAT deployment and there are no accounts by leading space policy decision-makers of this period comparable to the many space-related memoirs available from the Eisenhower

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microfiche document 00542 in Military Uses of Space.

[171]"News Conference of Honorable Robert S. McNamara, Secretary of Defense, The Pentagon, Friday, September 18, 1964, 0900;" microfiche document 00018 in Military Uses of Space.

[172]On these operational deficiencies see Stares, Militarization of Space, 117-28; Steinberg, Satellite Reconnaissance, 85; Cantwell, "AF in Space, FY 64," 61; microfiche document 00330 in Military Uses of Space; and Henry F. Cooper, "Anti-Satellite Systems and Arms Control: Lessons From the Past," Strategic Review 17 (Spring 1989): 40-48. Cantwell stated that the limiting factor on the Program 437 system reaction time was "the target tracking time [between 24 and 36 hours] needed to acquire sufficiently accurate satellite position data". Steinberg notes that some of these operational deficiencies were explicitly highlighted by top U.S. officials including President Johnson; he believes these statements on the deficiencies of the Program 437 ASAT system were a part of the larger "informal bargaining" campaign between the superpowers on space which is the focus of his study. On the limitations of ASATs more generally see Ashton B. Carter, "Satellites and Anti-Satellites: The Limits of the Possible," International Security 10 (Spring 1986): 46-98.

era.[173] Thus, the rationale behind the Kennedy administration's decision to deploy ASATs is not nearly as clear as the rationale of the Eisenhower administration to avoid such deployments. Nonetheless, we can make the following observations about this initial U.S. ASAT deployment related to our military doctrine focus: The push behind deploying these systems clearly seems to have been from the top-down through OSD and Secretary McNamara rather than bottom-up from the Services. Due to this type of origin for these systems and especially the fact that the systems were of limited military utility, unmanned, and ground-based, these initial ASAT systems did not capture the enthusiasm of the space cadets within the Services. Moreover, traditional elements within the Services viewed these systems as step-children unworthy of receiving scarce resources. Cumulatively, these bureaucratic pressures moved at cross-purposes and resulted in ASAT systems which were not well supported doctrinally and not well integrated into military plans emphasizing military man-in-space and the high ground potential of space.

Changes in Military Space Organizations and Responsibilities

Following the creation of NASA, continuing organizational changes within the DoD helped to shape the development of U.S. military space doctrine during the remainder of this period. One of the most significant of these changes was the transfer of the von Braun team from ABMA to NASA effective 1 July 1960. This transfer, along with other changes within the Army's space organizations, largely ended Army hopes for developing a major space program within the Service. The second major set of changes

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[173]Steinberg, Satellite Reconnaissance, 78-83; and Stares, Militarization of Space, 80-82. Both Stares and Steinberg speculate that the desire of the Kennedy administration to avoid encouraging an ASAT race and thereby threatening U.S. spysats was the key factor in shaping the severe limitations of these first U.S. ASAT systems. Steinberg also points to the importance of the action-reaction model of the arms race held by Secretary McNamara and other top Kennedy administration figures as another conditioning factor in these developments. The John F. Kennedy Library in Boston has not released a very large number of documents in this and other areas. Moreover, the ad hoc, collegial style preferred by Kennedy generally produced far fewer written descriptions of policy-making deliberations from the NSC and elsewhere than did Eisenhower's more rigid and formalized structures for the NSC and other bodies. Most importantly, FRUS volumes covering the space policy of the Kennedy and subsequent administrations have not yet been published.

involved DoD decisions in September 1959 and March 1961. The first decision gave the Air Force control over virtually all DoD booster development programs and space launches while the second made the Air Force responsible for most DoD space R & D. These evolutionary changes helped the Air Force move into a clear position of dominance in military space. This section will examine the political conflicts involved in these organizational transformations and note the impact of these processes on the continuing evolution of Army, Air Force, and DoD military space programs and doctrine.

In the Fall of 1958, the division of space projects between NASA and DoD was confused and unclear as was the overall balance of power between these two organizations. This confused situation held a great potential for duplication and overlap while presenting an equal danger that important space projects might be overlooked or neglected. The greatest area of confusion and overlap seemed to surround the similar plans and programs of NASA and ABMA. NASA had been created to become the nation's primary space exploration organization and had inherited NACA's infrastructure; but, despite its charter, NASA lacked specific space expertise in many areas, especially in large booster development. The von Braun team at ABMA, by contrast, was the nation's leading booster development group and had been tasked by ARPA to study and design a 1.5 million pound thrust booster which was known as Saturn B, but lacked a specific military rationale for building this huge booster.

In October, Deputy Secretary Quarles and T. Keith Glennan, NASA's first Administrator, worked out a deal designed to resolve this anomalous situation by transferring the Army-sponsored Jet Propulsion Laboratory (JPL) at the California Institute of Technology and the von Braun team at ABMA to NASA.[174] General Medaris and Secretary Wilber Brucker leaped into action and vigorously fought against

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[174]On the Army-NASA struggle in the Fall of 1958 see Armacost, Thor-Jupiter Controversy, 238-42; McDougall, Heavens and Earth, 198; York, Race to Oblivion, 137-38; Divine, Sputnik Challenge, 190-91; Medaris, Countdown for Decision, 243-47; and Logsdon, Moon Decision, 32-33. The von Braun team was officially known as the Development Operations Division of ABMA. According to Medaris (page 244), Quarles "apparently took the attitude that the Army had no business in space, or in large missiles, and that therefore the von Braun team had no business in the Army."

this proposal.[175] Glennan, Brucker, and the NASC finally worked out a compromise by 3 December under which JPL became a part of NASA and the von Braun team remained under ABMA but was to work on the Saturn under contract to NASA.[176]

The continuing struggle of ABMA to remain a major player in the national space program and to retain control over the von Braun team next came to a head in the Summer and Fall of 1959. ABMA had won the first round in retaining von Braun and the Saturn program, but during 1959 Medaris faced increasing difficulties in keeping the von Braun team gainfully employed on the Saturn program or on any other major space project due to severe funding restrictions imposed by DoD on the Saturn and the other ABMA space projects. In an attempt to find a better rationale to sell these space programs, on 20 March the Army organized a task force to study military uses for the Saturn known as "Project Horizon."[177] The Project Horizon Report was completed in June and detailed a comprehensive plan to establish a twelve man lunar outpost by November 1966. This Army lunar plan did not at all have the military focus of General Boushey's moon base plan discussed above and even removed the Army from control of the lunar outpost to emphasize the program's peaceful intent. However, the immediate unstated purpose of the report was to save the Saturn program within the Army and hence the most consistent focus of the report was on the need to build Saturn boosters rapidly, lots of boosters -- the construction of the lunar outpost was to be supported by 149 Saturn launchings or more than five launches per month![178]

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[175]Divine, Sputnik Challenge, 190; and Medaris, Countdown for Decision, 245-47. News leaks of this pending decision (one directly from Medaris) and of threats by von Braun to resign if placed under NASA or if the rocket team were split into pieces put considerable public pressure on the administration concerning this issue.

[176]Divine, Sputnik Challenge, 191.

[177]Logsdon, Moon Decision, 51.

[178]Ibid., 51-52. Logsdon contrasts the Army's estimate of $6 billion for this program with the $24 billion cost for the far less ambitious Apollo Program and notes that five Saturn launches per year, rather than per month, was the normal pace for Project Apollo.

Project Horizon and the Army's other attempts to sell its space expertise at this time did not achieve their desired effect. During 1959, DDRE York joined Deputy Secretary Quarles in the conviction that the Saturn program and the von Braun team did not belong in the Army. York remained convinced that the Saturn B had little military purpose and worked to either cancel this program outright or move it to NASA; moreover, he felt that the von Braun team should either be transferred to the Air Force or, preferably, to NASA.[179]

During the Summer and Fall, York received some crucial support from OSD and Science Advisor Kistiakowsky which aided the eventual success of his protracted bureaucratic struggle with Medaris and Brucker over these issues.[180] The president was eager to hold down the space budget and was supportive of plans to reduce overlap and duplication. Meeting with Kistiakowsky on 29 September, the president "flatly said that ABMA should be put under NASA . . ."; this decision was formalized and publicly announced following a meeting attended by the president, McElroy, Glennan, York, Kistiakowsky, and General Twining on 21 October.[181] After the presidential announcement, the Army and NASA hammered out a transfer agreement in November and legislation on this realignment was submitted to Congress in January 1960. Congress had few problems with the transfer; on 1 July 1960 President Eisenhower presided over the opening of NASA's Marshall Space Flight Center in Huntsville. Writing soon after his retirement, Medaris vented his frustrations about the loss of von Braun and Saturn with a colorful analogy:

> I give great credit to those who engineered this whole project. I do not believe these highly synchronized actions could all have come about by pure accident. The child was first starved, criticized, and deprived of a sense of purpose in life.

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[179]For York's views on these issues see Kistiakowsky, Private Diary, 39-40, 57, and 75-76.

[180]There was little love lost between York and Medaris as the differing accounts of these events in their respective books clearly illustrate. Medaris resigned his commission shortly after losing this final struggle to keep ABMA a major space player.

[181]Kistiakowsky, Private Diary, 100, 125; and Logsdon, Moon Decision, 33.

Then, when the natural parent turned it over for adoption by others, the foster parents promptly forgot all their antagonism and proceeded to satisfy all of the child's wants and desires.[182]

With the loss of JPL and the von Braun team, the Army lost the bulk of its space expertise and no longer had the infrastructure or the stomach aggressively to pursue a major space program. The decline of the Army space program helped to clear the way for Air Force dominance of military space within DoD. Moreover, the demise of the Army space program along with the rise of NASA marked a fundamental change in the character of the U.S. military space program away from military elements with national or even civil space interests towards a more monolithic focus on military space. Both because of the DoD's bureaucratic space restrictions on the Army and because of the outlook and temperament of Medaris and von Braun, ABMA had always had the most far-reaching and ambitious plans for space exploration and exploitation. While most of these Army space plans had a military focus, they were, nonetheless, also more concerned with issues closely related to the national space program in terms of demonstrations of technological feasibility and general exploration than were the plans of the other Services. In other words, the Army had both the traditions and the temperament to view its role in space within a broad exploratory context -- more in terms of the Lewis and Clark Expedition or the work of the topographical engineers rather than solely within a strictly military context. The decline of the Army space program removed much of this broad emphasis from the DoD space program and meant that the U.S. had somewhat more distinct civil and military space programs moving into the 1960s.

Within the DoD bureaucratic structure for military space activities, the Air Force emerged as the big winner in the changes in organizational structures and responsibilities which caused the demise of the Army space program. The Air Force had had the inside track on the military space mission within DoD from before the outset of the space age but these changes helped to make the dominant Air Force space position more clear and consolidated. As indicated above, the Air Force alone among the Services, had

[182]Medaris, Countdown for Decision, 269.

supported the creation of NASA, believing that the rise of this new civilian organization might also help to consolidate the Air Force's hold on military space. The Air Force's hopes in this regard began to play out during 1959.

The Air Force's great friend in court during 1959 was DDRE York. The same desire to cut military space expenditures and consolidate military space organizations and missions which had caused York to take the stand opposed to Saturn B and ABMA described above also caused him to look favorably on the Air Force as a means to consolidate and streamline military space. York was far from an Air Force lackey but his service on the von Neumann Committee, the PSAC, and at ARPA had given him a broad basis from which to evaluate missile and space programs and the confidence to propose sweeping reorganizations of America's space programs. On 15 August, York met with Kistiakowsky and received his support for a plan to cancel the Saturn B, transfer the von Braun team from ABMA to NASA, and transfer authority for all military booster development to the Air Force.[183]

York's plan had evolved further by the time York and Kistiakowsky met again on the 26th of August. According to Kistiakowsky's diary for that day:

> It is rather clear that York intends to reduce the role of ARPA and restrict it to the field which is defined by its name. He wants to put all space activities directly into the Air Force except for specific missions to be assigned to the Army and Navy, but even those are to use booster vehicles of the Air Force. He feels that making that program part of the Air Force budget will automatically restrain the wildest boys, whereas at present they simply write fantastic requirements and expect ARPA to take care of them.[184]

Thus, York's proposed changes were designed both to consolidate military space activities and to impose greater Air Force responsibility in proposing space plans by forcing budgetary tradeoffs between space programs and all other Air Force programs. Following consultations between Kistiakowsky and Eisenhower and between York and McElroy, the president and the Secretary of Defense agreed to implement York's

[183]Kistiakowsky, Private Diary, 39-40.

[184]Ibid., 57.

proposed military space realignment plan rapidly.[185] McElroy publicly announced the changes in the structure of the military space program on 18 September.

Naturally, this maneuvering to consolidate the Air Force's space position by York caused great consternation within the other Services. Navy and Army support for ARPA had been predicated on the ability of this agency to consolidate space projects away from the Air Force and neither of these Services wanted to see ARPA weakened. Moreover, a significant military man-in-space mission now seemed imminent and each of the Services wanted at least some part of this mission. The Army and Navy wanted to avoid being moved away from this most exciting military space prospect and wished to prevent the Air Force from dominating all military space missions. Beginning in Summer 1959, the other Services, for the first time, seriously proposed the creation of a unified space command with the responsibility for development and production of all space vehicles and boosters. During August and September, both the Army and the Navy strongly supported the creation of a unified space command at JCS meetings but the Air Force, aware of York's plans and anxious to gain more control over the military space mission, opposed the creation of this command just as vigorously.[186] Secretary McElroy and especially

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[185]Stares, Militarization of Space, 43. On 15 September, Kistiakowsky presented York's proposal to the president as outlined in a working copy of a Memorandum from Secretary McElroy to CJCS General Twining. Ike's initial response was written across the top of his copy: "I think this needs a lot of study. It *appears* to me to be going in the wrong direction." See "Memorandum for the Chairman, Joint Chiefs of Staff, Subject: Coordination of Satellite and Space Vehicle Operations," undated; microfiche document 00515 in Military Uses of Space. Emphasis in original. (Hereinafter Memo, "Coordination of Satellite and Space Vehicle Operations"). Eisenhower's formal approval of this plan is found in Andrew J. Goodpaster, "Memorandum for Brigadier General Carey A. Randall, Military Assistant to the Secretary of Defense," 17 September 1959; microfiche document 00518 in Military Uses of Space. The final version of McElroy's memorandum dated 18 September 1959 can be found in House, Defense Space Interests, 9-10. In addition to the transfer of specific satellite programs from ARPA to the services, this memorandum specified that the Air Force would be given "responsibility for the development, production and launching of space boosters and the necessary systems integration incident thereto . . ." Additionally, the other services were to "budget and reimburse" the Air Force for all launch costs.

[186]Medaris, Countdown for Decision, 254-55; Stares, Militarization of Space, 43-44.

DDRE York moved in to resolve this impasse at JCS and ruled against the Army and Navy. McElroy's 18 September memorandum to the Chairman of the JCS found that "[t]he establishment of a joint military organization with control over operational space systems does not appear desirable at this time."[187]

As might be expected, General Medaris viewed these developments with great alarm. Writing after his retirement, Medaris took exception to the judgement of McElroy and York in the 18 September memorandum cited above that the numbers of satellites expected over the next several years would not be large. He also considered that only a small "bone had been thrown to the other Services by the assignment to each of one satellite mission" and emphasized that even for these missions "the Army and Navy would have to purchase the vehicles and all related services from the Air Force in order to get their satellite into orbit."[188] According to Medaris, the objections of "the Army and Navy were summarily brushed aside" by McElroy acting on York's recommendations and produced a directive which probably was more favorable than Air Force Chief of Staff General White "had considered as a reasonable possibility at that time."[189] Cumulatively, to Medaris this episode was "a classic example" of how the inability of the JCS to agree removes them from the decision-making process and transfers "*operational management*" of the military to "a combination of short-tenure appointed civilian secretaries supported by permanent, professionally unprepared, civil service civilians."[190]

The Air Force's control over military space activities became even more secure shortly after the arrival of the Kennedy administration. During the transition period

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[187]Memorandum, "Coordination of Satellite and Space Vehicle Operations" in House, Defense Space Interests, 10.

[188]Medaris, Countdown for Decision, 254. Under this realignment, primary responsibility for the Courier communications satellite system passed from ARPA to the Army and primary responsibility for the Transit navigation satellite system passed from ARPA to the Navy.

[189]Ibid., 254-55.

[190]Ibid., 255. Emphasis in original.

president-elect Kennedy had asked Dr. Jerome B. Wiesner of MIT (who would become his Science Advisor) to head the Ad Hoc Committee on Space and tasked this group to study the structure for and the direction of U.S. space efforts. Kennedy met with this group on 10 January 1961 and an unclassified version of their report was released the next day.[191] Overall, the report recommended a revitalization of the NASC, called for primary emphasis on space science missions, and strongly warned against attempting to race the Soviets for manned space spectaculars. For our focus, the most relevant portion of the report declared that:

> Each of the military services has begun to create its own independent space program. This represents the problem of overlapping programs and duplication of the work of NASA. If the responsibility of all military space developments were to be assigned to one agency or military service within the Department of Defense, the Secretary of Defense would then be able to maintain control of the scope and direction of the program and the Space Council would have the responsibility for settling conflicts of interest between NASA and the Department of Defense.[192]

While this assessment of a fractionated military space effort was certainly less true than it had been a few years earlier, the new Secretary of Defense, Robert S. McNamara, agreed with the tenor of the Report's recommendations and tasked his office to begin the review of military space organizations which led to Defense Directive 5160.32, "Development of Space Systems," issued on 6 March 1961.[193]

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[191]Stares, Militarization of Space, 60. On the findings and impact of the Wiesner Report see Logsdon, Moon Decision, 71-75. The unclassified version of the Wiesner Report is reprinted in New Frontiers of the Kennedy Administration: The Texts of the Task Force Reports Prepared for the President (Washington: Public Affairs Press, 1961).

[192]New Frontiers of Kennedy Administration, 4-5.

[193]Stares, Militarization of Space, 60-61. Directive 5160.32 and the news release accompanying its release are reprinted in House, Defense Space Interests, 2-4. On the impact of the Wiesner Report and other rationales behind this directive and its coordination and drafting process see the testimony of Deputy Secretary of Defense Roswell L. Gilpatric in Defense Space Interests, 8-23. On the coordination with the JCS see the testimony of JCS Chairman General Lyman L. Lemnitzer in Defense Space Interests, 194-95. Outgoing DDRE York also supported moving space R & D into the Air Force.

Directive 5160.32 clearly spelled out the primary role of the Air Force in space R & D, which, together with its primary responsibility for booster development and space launch granted on 18 September 1959, meant that the Air Force was now specifically granted responsibility for nearly all DoD space programs from inception through launch and could expect to exert operational control over most of these programs as well. The details of Directive 5160.32 indicated that each Service or defense agency would be allowed to conduct "preliminary research to develop new ways of using space technology to perform its assigned function" subject to guidelines established by the DDRE.[194] All space R & D projects which were approved for further development by the DDRE and the Secretary of Defense then became the responsibility of the Air Force. Exceptions to this new space development process would be granted by the Secretary of Defense "only in unusual circumstances."[195] The Army and the Navy were allowed to remain responsible for their primary space programs, the Army Advent satellite communications system and the Navy Transit navigation satellite system, but all future space R & D programs would be subject to the new procedures and would very likely fall under Air Force control. McNamara and OSD also viewed this directive as a way to exert more direct and tighter control over DoD space efforts and believed that centralizing DoD space R & D within the Air Force was the easiest way to gain greater control.

A continuing series of shifts and realignments between NASA, DoD, and the Air Force was also taking place during this time. As indicated above, initial relations between NASA and the Air Force were quite good due to the Air Force's support for NASA's creation; NASA's role in helping to eliminate the Air Force's space competition within DoD; and NASA's early reliance on Air Force facilities, personnel, and expertise. However, as NASA grew in stature and the Air Force became primarily responsible for military space this relationship was more strained and became quite acrimonious over the issue of responsibility and programs for manned spaceflight. In an infamous secret and

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[194]U.S. Department of Defense, Directive 5160.32 in House, Defense Space Interests, 3.

[195]Ibid.

internal memo dated 14 April 1960 which was somehow leaked, General White stated:

> I am convinced that one of the major long range elements of the Air Force future lies in space. It is also obvious that NASA will play a large part in the national effort in this direction and, moreover, inevitably will be closely associated, *if not eventually combined with the military*.[196]

In subsequent Congressional testimony a chastened White emphasized that this combination was merely a possibility and that it was not the desire or intent of the Air Force to arrange such a merger.[197] Congressman Overton Brooks (D.-LA), Chairman of the House Committee on Science and Astronautics, and other Congressmen as well as other concerned members of the late Eisenhower and early Kennedy administrations carefully sought to protect NASA from military encroachment as one would protect a "Sparrow in the Falcon's Nest".[198]

The Air Force was particularly encouraged by the space rhetoric of the Kennedy campaign and the fact that Johnson was now Vice President and would run the Space Council.[199] The space cadets within the Air Force believed that Kennedy would be far more supportive of their plans to build a large manned military presence in space than had Eisenhower. An Air Force "Information Policy Letter for Commanders" from December 1960 played up Kennedy's support for space and attempted to place the new president within the space control school by emphasizing quotes from his campaign:

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[196]Reprinted in House, Defense Space Interests, 92. Emphasis added.

[197]Ibid., 92-93.

[198]The quote is McDougall's Heavens and Earth chapter nine title, see also 312-15. Congressman Brooks wrote Kennedy a three page letter on 9 March 1961 which highlighted his fear that U.S. space policy was being "revised to accentuate the military uses of space at the expense of civilian and peaceful uses." Brooks also called the Defense Space Interests Hearings in March 1961 to further investigate and publicize what he saw as the growing imbalance in U.S. space priorities. Logsdon, Moon Decision, 78-80.

[199]Logsdon, Moon Decision, 67-71. At a meeting on 20 December 1960, Kennedy decided to give Johnson responsibility for the space program and to seek a revision of the National Aeronautics and Space Act making the Vice President the Chairman of the NASC. Congress approved this revision on 20 April 1961.

"[c]ontrol of space will be decided in the next decade" and "[i]f the Soviets control space they can control Earth."[200]

The Air Force was also continuously attempting to build its case on the need for an expanded military space presence. In October 1960, General Schriever had asked Trevor Gardner to chair the "Air Force Space Study Committee" and examine future military options in space. The top-secret Gardner Report was delivered to the Air Force on 20 March 1961 and provided a ringing endorsement of the high ground and space control schools already prevalent within the Service. The Gardner Report basically ignored NASA and called for the new Air Force Systems Command (AFSC) to spearhead an accelerated and very ambitious program including "manned spaceflight, space weapons, reconnaissance systems, large boosters, space stations, and even a lunar landing by 1967-70."[201]

From the Air Force perspective, early 1961 seemed to represent the necessary convergence of domestic political factors, international developments, and technological advancements to finally produce the large manned military space program it had long coveted. Early 1961 undoubtedly represents the absolute high point in terms of Air Force plans and expectations for a large-scale military space effort. Of course, Kennedy did inspire the largest U.S. space program to date with his moon landing challenge of 25 May 1961 -- but this race to the moon was explicitly non-military in character and, as a result, it siphoned resources, talent, and attention away from military space plans.[202]

The Military Impact of Kennedy's Space Policy

The Kennedy administration advanced three major initiatives in space policy: the top-priority prestige-based moon landing race with the Soviets, secret efforts to further

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[200]Reprinted in House, Defense Space Interests, 93.

[201]McDougall, Heavens and Earth, 313. On the Gardner Report see also Stares, Militarization of Space, 72. AFSC was created on 1 April 1960, in part, to consolidate Air Force space activities.

[202]Logsdon's Moon Decision remains the best and most detailed account of the decision-making process behind Kennedy's moon challenge. See also McDougall, Heavens and Earth, chapter fifteen.

protect and legitimize the emerging spy satellite regime, and the space-related arms control process which would culminate in the OST of 1967. While all of these major initiatives significantly impacted U.S. military space programs and doctrine, their primary emphases lay elsewhere and the military impact was generally tangential rather than direct. This section will briefly review the military impact of Kennedy's space policies associated with both his moon landing challenge and his space arms control initiative. Kennedy's policies towards spy satellite legitimization are discussed within the overall context of U.S. spysat policy in the next section.

Kennedy's moon landing challenge, which rapidly grew into Project Apollo, was the single largest and most important U.S. space program of the cold war era.[203] In a very real sense, the final U.S. response to the *Sputnik* challenge was not complete until Neil Armstrong and Buzz Aldrin walked upon the Sea of Tranquility on 20 July 1969. As America's predominant space effort during the 1960s and early 1970s, the moon race completely overshadowed all other U.S. space activities such as the continuing attempts of the Air Force to build a manned military space mission. As NASA's budget grew from $964 million in FY 1961 to $5.1 billion by FY 1964 while the DoD space budget went from $814 million to $1.6 billion for the same period, fears that the DoD would somehow dominate or subvert NASA were completely erased.[204] Most importantly, top DoD officials such as Secretary McNamara and DDRE Dr. Harold Brown also saw NASA's moon race as the highest U.S. space priority and largely viewed Air Force efforts to build a large manned military space presence as an unnecessary duplication of

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[203]Project Apollo was assigned "highest national priority for research and development and for achieving operational capability" by NSAM 144 on 11 April 1962. See National Security Council, National Security Action Memorandum No. 144, "Subject: Assignment of Highest National Priority to the Apollo Manned Lunar Landing Program," 11 April 1962, NSC box, National Archives, Washington.

[204]A table categorizing the various budgets for all U.S. space activities for fiscal years 1959-1982 is found in Colonel Cass Schichtle, USAF, The National Space Program From the Fifties into the Eighties (Washington: National Defense University Press, 1983), 5-6. This table does not include the sizable budgets for black space programs such as the WS-117L.

higher priority NASA's efforts.

Following the initiation of Project Apollo, Secretary McNamara and other leaders within OSD took a cautious and studied position on new military space programs which came to be known as the "building block" approach. Testifying at the NASA authorization hearings for FY 1963 in June 1962, DDRE Brown provided this definition of the building block approach:

> At this stage of development, it is difficult to define accurately the specific characteristics that future military operational systems of many kinds ought to have. We must, therefore, engage in a broad program covering basic building blocks which will develop technological capabilities to meet many possible contingencies. In this way, we will provide necessary insurance against military surprise in space by advancing our knowledge as a systematic basis so as to permit the shortest possible time lag in undertaking full-scale development programs as specific needs are identified.[205]

Later, in response to questioning at these same hearings, Brown seemed to indicate that the building block approach was appropriate for those areas which lacked firm military requirements: "While a firm military requirement for all such [ASAT] systems does not now exist, we are following the 'building block' approach in this area."[206] Further, Brown acknowledged that at the present time he could not define a military requirement for ASATs: "I think there may, in the end, turn out not to be any."[207] For the top DoD officials of the Kennedy administration, the building block approach was generally used as means to stifle the type of major military space efforts envisioned by the Air Force without directly confronting the Air Force on this issue. Indeed, other than the limited, unmanned ASAT systems discussed above and the ongoing non-controversial force enhancement space programs of this period, it is difficult to find any other major types

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[205]Stares, Militarization of Space, 76.

[206]Steinberg, Satellite Reconnaissance, 81.

[207]Ibid.

of military space systems for which Brown or McNamara had identified a specific need.[208]

The mounting frustrations of the Air Force at this constrained approach to military space and emphasis on NASA were vented in a series of letters between Secretary of the Air Force Eugene M. Zuckert and the president in the Summer and Fall of 1962. In his 4 September letter to the president Zuckert noted that "[t]he present planning of the defense space program basically does not envision the necessity or feasibility of an expanded major military operational role in space . . ."; Kennedy agreed in his reply to wait until the Air Force completed its Five Year Space Plan in November before making further decisions on military space issues.[209] However, OSD had apparently already decided on these issues: at a speech before the Aerospace Luncheon Club on 9 October Deputy DDRE John H. Rubel indicated that "[h]enceforth the DoD would emphasize hard military requirements and that proposals which served abstract doctrines about the military role in space would not be entertained."[210] In this clear indication of the continuing and growing emphasis on the sanctuary school of thought, OSD was now warning the Air Force that proposals designed around the high ground or space control schools of thought served only abstract doctrines rather than hard military requirements and would not go forward. This statement is also an excellent indication that the vigorous doctrinal sorting of this period was coming to an end and that the sanctuary

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[208]For an Air Force Association critique of the building block approach and the lack of support from OSD for any major Air Force space program see J.S. Butz, Jr., "Building Blocks . . . But No Building," Air Force/Space Digest 46 (April 1963): 56-66.

[209]Stares, Militarization of Space, 78-79.

[210]Ibid., 79. On this speech see also, Colonel Paul E. Worthman, "The Promise of Space," Air University Review 20 (January-February 1969): 120-127. According to Worthman, Rubel's speech contained a total of four points which "struck the Air Force very hard: (1) in spite of all the studies undertaken over the past five years, no really new ideas for space had evolved; (2) manned military missions in space simply did not make sense; (3) all OSD space systems had to meet clear-cut military requirements; and (4) systems decisions would not be made in response to doctrinal concepts." Worthman also felt that this speech marked the absolute nadir of OSD-USAF relations.

school was emerging as the clear winner despite the protests of the Air Force and the many earlier indications that more militaristic space doctrines might be adopted.

The final Kennedy space policy covered in this section is the quest for arms control in space. The Kennedy administration took what could be termed a "two-track" approach to ASAT development and arms control efforts -- deploying a minimum number of ASATs to mitigate against a Soviet orbital nuclear weapon threat while simultaneously pursuing arms control efforts to ban such weapons in space and thereby removing a major incentive for deploying ASATs.[211] Early in the Kennedy administration, however, efforts to achieve space arms control were severely hampered by a lack of interagency coordination on space policy. Accordingly, on 26 May 1962, Kennedy issued NSAM 156 -- an implicit recognition that different organizations and differing parts of U.S. space policy had too often been moving in opposite directions and a request that the Department of State create a high-level coordinating body for U.S. space policy to address this problem.[212]

The interagency group created as the result of this directive was known as the NSAM 156 Committee. The primary responsibility of this group was to develop policies designed to protect and legitimize U.S. spysats, but this group was also chiefly responsible for creating the U.S. initiatives aimed at banning nuclear weapons from outer space. During the Summer and Fall of 1962 the NSAM 156 Committee was the scene of intense interagency disputes on the desirability of attempting to ban nuclear weapons from space and over the most appropriate political mechanism by which the U.S. might attempt to achieve this goal. The State Department and the Arms Control and Disarmament Agency (ACDA) were the most supportive of a ban. The JCS most strongly opposed such a ban because it precluded military options in space and, further, the JCS objected to the political mechanism of a U.S. unilateral declaratory statement of

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[211]Stares, Militarization of Space, 82.

[212]Ibid., 67-69. See also Raymond L. Garthoff, "Banning the Bomb in Outer Space," International Security 5 (Winter 1980/81): 25-40. A sanitized version of NSAM 156 is available in the NSC box at the National Archives in Washington.

its intent not to station nuclear weapons in space.[213] NSC Action 2454 which resulted from the NSC meeting on 10 July called for further study on this issue and eventually produced NSAM 183 and NSAM 192 on 27 August and 2 October, respectively.[214] NSAM 192 set in motion the informal and formal initiatives which eventually led to the international declaratory ban on placing nuclear weapons or weapons of mass destruction in outer space expressed in UN General Assembly (UNGA) Resolution 1884 (XVIII) on 17 October 1963.[215]

For our purposes, it is useful to note that "NSAM 192 represented, possibly for the first time, the willingness of the US government to conclude an arms control agreement with the Soviet Union that did not make inspection or verification a necessary prerequisite."[216] This willingness to obtain an unsecured agreement with the Soviets on banning nuclear weapons from space over the objections of the JCS was an illustration of the administration's general de-emphasis on military space programs in favor of peaceful and civil uses of space. It was also an expression of the administration's judgements that nuclear weapons in space: lacked military utility, were not required by U.S. military space doctrine, and were better dealt with through this declaratory ban than via ASAT weapons.

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[213]Stares, Militarization of Space, 82-86; and Garthoff, "Banning the Bomb," 27-31.

[214]Stares, Militarization of Space, 83-87; and Garthoff, "Banning the Bomb," 27-31. Sanitized versions of these two NSAMs are available in the NSC box at the National Archives in Washington. NSAM 183 requested the development of a coordinated U.S. government position so that the U.S. space program could be "forcefully explained and defended at the forthcoming sessions of the UN Outer Space Committee [COPUOS] and the General Assembly." NSAM 192 indicated the president's approval of the recommendations in the ACDA memorandum "A Separate Arms Control Measure for Outer Space," which was the product of the Committee of Principals meeting on 19 September.

[215]Stares, Militarization of Space, 86-90; and Garthoff, "Banning the Bomb," 31-36. UNGA Resolution 1884 (XVIII), in turn, became the basis for the OST of 1967. The process of achieving this ban was at first derailed by and then substantially accelerated by the fallout from the Cuban Missile Crisis.

[216]Stares, Militarization of Space, 86-87.

Programs and Organizations for Spy Satellites and the Military

In the sections above many references are made to the overriding importance of U.S. spysat efforts and the decisive impact which this policy often had on almost all other U.S. space efforts. This section deals specifically with the development of early U.S. spysat programs and organizations as well as with the interface between these programs and organizations with the military and military space doctrine. The policies, programs, and organizations designed to create and protect U.S. spy satellite efforts were clearly the most important aspects of U.S. space policy at least until the Apollo Program. Despite being highly classified, these top-priority efforts have been the focus of a great deal of analysis and speculation. The volume of this research, along with the recent decisions of the Bush administration to begin lowering classification restrictions for several military space programs and organizations, has allowed a rather comprehensive picture of early U.S. spysat operations to emerge. However, the reader must be aware that the classification restrictions in this area remain the most formidable of those related to any military space programs and that the available data must therefore be viewed with caution.

As indicated in the previous chapter, the Air Force's Ballistic Missile Division was responsible for the WS-117L program when the space age began. The pressures created by the *Sputniks* shock soon resulted in the acceleration of and significant organizational changes to the first U.S. spy satellite programs. Following an article on the WS-117L in the 14 October 1957 edition of Aviation Week & Space Technology which linked the WS-117L together with its classified Pied Piper code name and prime contractors, Eisenhower became very concerned with the ability of the Air Force to manage this top-priority and highly classified program.[217] The NSC granted the highest national priority to the development of an operational reconnaissance satellite in NSC Action Number 1846 on 22 January 1958 but questions remained concerning the structure of the Air Force's

[217]Richelson, Secret Eyes, 20, 26-27.

WS-117L program.[218]

A 7 February 1958 meeting between the president, Killian, Land, and Goodpaster fundamentally shaped the structure of the earliest U.S. spysat efforts. The president had been impressed with the ability of the CIA to develop the U-2 rapidly and secretly. Ike decided to make the CIA, rather than the Air Force, primarily responsible for the development of a reconnaissance satellite using the recoverable film method. This program was designated CORONA and was scheduled to be operational by the Spring of 1959.[219] CORONA thus represented a true "crash" program which was expected to produce results more quickly and reliably than the less technologically mature electro-optical data return system being developed for the SAMOS program.[220] This meeting also produced the decisions to use the Air Force's Discoverer satellite program as the cover for the CORONA program and to make the newly-created ARPA responsible for the management of the remaining elements of the WS-117L program.[221]

All three of the satellite systems being developed under the WS-117L program experienced significant technological difficulties before finally becoming operational. The CORONA program began with the liftoff of Discoverer I from Vandenberg Air Force

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[218]Ibid., 26.

[219]Ibid., 26-27. Richard M. Bissell, Jr., CIA Deputy Director for Plans, was given responsibility for CORONA; Bissell had previously directed the development of the U-2. Richelson reports that Colonel Fritz Oder, Director of the WS-117L program, was not at all upset by this new division of responsibilities and had actually already been involved in an effort to get the CIA to take over funding of the recoverable film satellite due to his difficulties in obtaining sufficient Air Force funding for this project.

[220]The SAMOS program was initially code named SENTRY. In November 1958, the DoD revealed that the WS-117L program consisted of three elements: Discoverer (the cover for CORONA), SAMOS, and MIDAS, see "Chronology" in Military Uses of Space, 28.

[221]Richelson, Secret Eyes, 26-27; and Stares, Militarization of Space, 44. Serving as the cover for the CORONA program was the primary mission of the Discoverer program. The program also tested and provided the first detailed information on a variety of satellite design and control configurations as well as covertly testing components for the Transit, MIDAS, and Vela Hotel systems.

Base (VAFB), CA on 28 February 1959 but significant technological reliability problems with the Thor-Agena launch vehicles as well as various control glitches with the CORONA satellites themselves and with the film recovery system prevented any successful film recoveries from the twelve launches between February 1959 and June 1960.[222] Meanwhile, the more technologically demanding SAMOS system was not even ready to begin flight testing and the MIDAS program was experiencing similar large technological challenges. At the White House, Science Advisor Kistiakowsky and others were beginning to suspect that problems with priorities and organizations were causing more difficulties than the technological challenges facing these programs. In particular, Kistiakowsky believed that the Air Force was putting too much effort into the electro-optical data return SAMOS program, which was based upon technologies which he felt would not mature for some time, and that this overemphasis was disrupting the entire spysat effort.[223] By the 26th of May 1960, Eisenhower had also firmly decided that U.S. spysat efforts needed to be closely reviewed; he told Kistiakowsky to set up a committee "side by side with the PSAC" to study what corrective actions might be necessary.[224]

Kistiakowsky and Defense Secretary Thomas S. Gates decided on a study committee composed of three people: Under Secretary of the Air Force Dr. Joseph V. Charyk, Deputy DDRE John H. Rubel, and Kistiakowsky. This group, which came to be known as the SAMOS Panel, reported their recommendations at the NSC meeting on 25 August. The chief recommendation, the immediate creation of an organization to provide a direct chain of command from the Secretary of the Air Force to the officers in charge of each spysat project, was enthusiastically supported by Eisenhower and approved

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[222]Richelson, Secret Eyes, 31-39. VAFB is used primarily to launch satellites into polar orbit -- the type of orbit normally used by almost all photoreconnaissance satellites.

[223]See Kistiakowsky's Private Diary entries for 19 August 1959, 8 December 1959, 5 February 1960, and 26 May 1960.

[224]Ibid., 336.

by the NSC.[225] The president "wanted to make damn sure" that any new structure would not result in Air Force control.[226] Adoption of this recommendation led directly to the creation of the highly classified National Reconnaissance Office (NRO) -- the very existence of which was an official U.S. state secret until September 1992.[227] The NRO was "created as a national level organization with Air Force, CIA, and Navy participation" and Under Secretary of the Air Force Charyk was chosen as the first Director.[228] The creation of the NRO was another vote of no confidence in the ability to the Air Force to manage spy satellite programs through more normal channels. More importantly, the creation of the NRO ended Air Force plans for SAC to operate the SAMOS system and thus moved these most important intelligence data streams away from military operators.[229] Overall, the creation of NRO and the extremely tight control of spysat intelligence data at the highest levels seems to have made these national overhead collection assets responsive to top decision-makers within the government but it also initiated a system whereby this most valuable of all military reconnaissance information was generally not directly available to the military, even during wartime.

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[225]Ibid., 387; and Richelson, Secret Eyes, 46.

[226]Quoted in Richelson, Secret Eyes, 46.

[227]Richelson, Secret Eyes, 46-47. For a sample of the information now officially released about the NRO see, for example, Eric Schmitt, "Spy-Satellite Unit Faces a New Life in Daylight," New York Times, 3 November 1992, p. A16; and Bill Gertz, "The Secret Mission of NRO," Air Force Magazine 76 (June 1993): 60-63. The NRO and its work had been classified at a level above top secret known as specially compartmented information (SCI) which prohibits access to compartmented information without a specific code word clearance and a strict need-to-know.

[228]Richelson, Secret Eyes, 46-47. Suggestions that Bissell become the first NRO Director were rejected primarily because there were no provisions for CIA officers to take line control over DoD personnel. Due to the classification surrounding the NRO, it has not always been clear who was the Director of this organization at various times. Almost all subsequent NRO Directors seem to have followed in Charyk's footsteps by openly serving as Under Secretary of the Air Force and simultaneously secretly wearing the "black hat" as NRO Director.

[229]Richelson, Secret Eyes, 46.

The CORONA system became the world's first operational satellite reconnaissance system following the successful retrieval of the film canister ejected from Discoverer XIV on 19 August 1960.[230] There were apparently three more successful CORONA film retrievals during the remainder of 1960 and the data from these missions together with the images transmitted by the first successful SAMOS satellite launched on 31 January 1961 had a nearly immediate and profound effect on the U.S. view of the U.S.-U.S.S.R. strategic balance.[231] The widespread official and public fears of a significant Soviet lead in ICBMs known as the missile gap had been exacerbated by the *Sputniks* shock and had conditioned many U.S. military space programs, strategic weapons system developments, and overall U.S. responses to the opening of the space age during the late 1950s and early 1960s. Now, the data from these space-based collection systems, together with the more limited data available from U-2 overflights, was finally able to lay the missile gap issue to rest. The first National Intelligence Estimate (NIE) fully to incorporate this spysat data for the current year was prepared in September 1961 and stated that the U.S. believed the Soviets had fewer than ten operational ICBMs -- a far less threatening force than the 500 Soviet ICBMs which had been predicted for 1961 in the November 1957 NIE.[232] The role of spysat data in debunking the missile gap was an early indication

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[230]Discoverer XIV was launched the previous day. CORONA film capsules were designed to reenter and then descend by parachute to be snagged in midair by specially modified Air Force C-119J (and later C-130) aircraft stationed in Hawaii. Richelson reports that the first successfully recovered CORONA film capsule from Discoverer XIII contained no film but that this capsule was presented amid much pomp and ceremony by General White to President Eisenhower at the White House on 15 August 1960. This widespread publicity was not what the NRO or CIA had in mind for this highly classified program.

[231]Richelson, Secret Eyes, 39-43; and McDougall, Heavens and Earth, 329.

[232]For the various official and unofficial predictions of Soviet ICBM strength during the missile gap era see John Parados, The Soviet Estimate: U.S. Intelligence Analysis & Russian Military Strength (New York: Dial Press, 1982), 89; Edgar M. Bottome, The Missile Gap: A Study in the Formulation of Military and Political Policy (Rutherford, NJ: Fairleigh Dickinson University Press, 1971), Appendix A; and Roy E. Licklider, "The Missile Gap Controversy," Political Science Quarterly 4 (December 1970): 615. Many place the date of the end of the missile gap controversy at the 6 February 1961

of just how valuable these new systems could be. Moreover, a major lesson learned from the missile gap controversy pointed to the need to separate intelligence producers from intelligence consumers and seemed to reinforce the wisdom of the decision to create the NRO and thereby preclude this problem with the interpretation of spysat data.[233]

The visible role of the Air Force in U.S. spysat programs was gradually reduced still further following the implementation of new and more stringent security classification policies by the incoming Kennedy administration. During the Eisenhower administration, all details on U.S. spysat programs had been classified but the existence of the WS-117L program had been officially discussed in Congressional testimony and elsewhere while information regarding launches under the DISCOVERER program was freely provided. This policy suited the Air Force because it allowed the Service to highlight its space successes while attempting to build the case for expanded military space operations. Moreover, DoD Directive 5160.34, "Reconnaissance, Mapping and Geodetic Programs," publicly released on 28 March 1961 specified that the Air Force "will be responsible for: 1. Research, development and operation, including payload design, launch, guidance, control and recovery of all DOD reconnaissance satellite systems."[234] However, Kennedy and other top officials within his administration as well as the NRO agreed with the judgement of former Science Advisor Killian that there was a direct correlation between the amount of publicity given to U.S. spysat efforts and the probability of a

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"off-the-record" briefing given by Secretary McNamara after he had received the latest spysat intelligence information on the status of the Soviet ICBM program. At this session, McNamara reportedly stated that there were "no signs of a crash Soviet effort to build ICBMs," and that the U.S. and the U.S.S.R. apparently had "about the same number of ICBMs at present -- not a very large number . . . ." This quote is reprinted in Desmond Ball, Politics and Force Levels: The Strategic Missile Program of the Kennedy Administration (Berkeley: University of California Press, 1980), 90-91.

[233]If Air Force estimates had been removed from the NIE process, the estimates would have corresponded to the actual Soviet ICBM deployments quite closely. In September 1961, McNamara created the Defense Intelligence Agency (DIA), in part, to provide a central clearing house for DoD intelligence inputs into the NIE process.

[234]DoD Directive 5160.34 is reprinted in House, Defense Space Interests, 113-14.

Soviet response to these provocations.[235] Additional factors which added weight to the arguments in favor of increased security requirements for U.S. spysats included: the belief that providing less information about launch and orbital parameters would increase Soviet ASAT targeting difficulties, the increased credence given to Soviet ASAT threats following the shoot-down of Francis Gary Power's U-2 on 1 May 1960, and the desire of NRO Director Charyk to shroud all aspects of U.S. spysat development and operations to the greatest degree possible.[236]

Beginning in 1961, a security clampdown was slowly implemented, first on spy satellite programs and then on all military space efforts. The SAMOS 2 launch on 31 January 1961 was the first to be affected by the Kennedy administration's new publicity guidelines. Assistant Secretary of Defense for Public Affairs Arthur Sylvester and NRO Director Charyk worked out a very terse statement provided to the press following this launch which contrasted significantly with the large pre-launch publicity packages which had been given out previously.[237] The remainder of 1961 saw a gradual tightening of the security classifications with less and less information provided with each successive

[235]Steinberg, Satellite Reconnaissance, 41, 45. As explained to Steinberg in interviews in the late 1970s with former National Security Advisor McGeorge Bundy and former Deputy Secretary of Defense Gilpatric, the primary U.S. motivation in initiating the blackout on spysats was to avoid provoking the Soviets by not publicly "rubbing the Russians' noses" in the fact that we were spying on their closed state from space.

[236]William E. Burrows, Deep Black: Space Espionage and National Security (New York: Berkley Books, 1986), 127-31; Richelson, Secret Eyes, 51-53; Stares, Militarization of Space, 64-65; and Steinberg, Satellite Reconnaissance, 40-42. Other Kennedy administration officials argued that a security clampdown would run counter to official U.S. space rhetoric on the openness of the U.S. space program and the use of space for peaceful purposes. They also argued that such a security policy would mainly serve to keep the American people in the dark because the Soviets were already closely monitoring U.S. spysat programs.

[237]Stares, Militarization of Space, 64. Sylvester and Charyk were mindful of the volume of information provided in the past and deliberately opted for a slow blackout process in the hopes that this would arouse less attention than an abrupt blackout.

launch.[238]

The Air Force chafed at these restrictions and many officers, including General Schriever, continued publicly to press the case for an increased military space program. This continuing public discussion of military space programs by the Air Force greatly irritated President Kennedy and on more than one occasion he called Sylvester directly demanding to know why he had "let those bastards talk."[239] Following these calls, Sylvester's office greatly intensified the screening process required for all public releases on space. As a result of this widespread clampdown, planned speeches by Air Force General Officers were very carefully screened by civilians in Sylvester's office for any references to the SAMOS program and the Winter-Spring 1960-1961 Air University Quarterly Review issue devoted to "Aerospace Force in the Sixties" was heavily censored including the removal of an article entitled "Strategic Reconnaissance" in its entirely.[240]

The final step in this security intensification process was the classified DoD Directive issued on 23 March 1962 known as the "blackout" Directive. According to Stares, the "blackout" Directive:

> prohibited advance announcement and press coverage of *all* military space launchings at Cape Canaveral and Vandenberg AFB. It also forbade the use of the names of such space projects as Discoverer, MIDAS and SAMOS. Military payloads on space vehicles would no longer be identified, while the programme names would be replaced by numbers.[241]

While this Directive may have made it somewhat more difficult for the Soviets to distinguish between different types of U.S. military space programs and launches, it certainly made it much more difficult for the Air Force to sell its preferred space program with the public or Congress.

The final aspect of spysat policy addressed in this section deals with the Kennedy

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[238]Richelson, Secret Eyes, 53. By the time of the SAMOS 5 launch on 22 December 1961, DoD officials would no longer confirm that the SAMOS program even existed.

[239]Stares, Militarization of Space, 64

[240]Steinberg, Satellite Reconnaissance, 43.

[241]Stares, Militarization of Space, 65. Emphasis in original.

administration's policies to protect and legitimize spysats internationally. Early in the Kennedy administration, the State Department was eager to use the COPUOS at the UN to address diplomatically the problems it anticipated in legitimizing U.S. spy satellite efforts internationally. During the summer of 1961, as an attempt to enhance the image of the U.S. as the leading advocate of using space only for peaceful purposes, the State Department sought interagency coordination for introducing a proposed UNGA Resolution which called for all states to provide data on their space launches to the UN. DoD approved this proposal but reiterated that "we should avoid any attempt in the UN to define the limits of outer space or to limit the military use of space."[242] This U.S. proposal for space registration became the basis for UNGA Resolution 1721 (XVI) adopted on 20 December 1961.

Despite the formal coordination of this proposal between State and DoD, it had completely bypassed the new and highly secret NRO. Director Charyk was greatly upset to learn that State had pushed space registration requirements through the UN which were in direct conflict with the space secrecy initiatives being undertaken at DoD. During the Spring of 1962, DoD sought to coordinate with State on the specific types of registration information to be supplied to the UN and generally sought to minimize these voluntary disclosures as much as possible.[243] These DoD efforts were not very successful; State and DoD continued to work at cross purposes on this issue. This conflict highlighted the need for better interagency coordination on space issues and sparked the process which resulted in NSAM 156 and the creation of the NSAM 156 Committee in May 1962.

The Soviet diplomatic offensive against U.S. spysats reached its crescendo at the UN and elsewhere during 1962. The NSAM 156 Committee worked to tighten and strengthen the public rationale for spysats and exploited many approaches to blunt the Soviet offensive. Accordingly, U.S. spokesmen at the UN and elsewhere often forcefully

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[242]Ibid., 67.

[243]Ibid., 67. DoD was particularly interested in not supplying any detailed orbital parameters or the vehicle's purpose to the UN and, further, specified that only vehicles in sustained orbit should be registered.

reasserted and expanded on the basic tenets of the U.S. space policy established under Eisenhower. In a key speech on 3 December 1962 at the UN, Ambassador Gore asserted that:

> It is the view of the United States that Outer Space should be used for peaceful -- that is non-aggressive and beneficial -- purposes. The question of military activities in space cannot be divorced from the question of military activities on earth.
>
> There is, in any event, no workable dividing line between military and non-military uses of space. One of the consequences of these factors is that any nation may use space satellites for such purposes as observation and information gathering. Observation from space is consistent with international law, just as observation from the high seas.[244]

In the face of these coherent arguments and lacking significant allies on this issue, the Soviet diplomatic offensive made a great deal of noise but achieved little substantive headway. The Soviets began dropping their objections as their own spy satellites began to come on line beginning in the Fall of 1962. By September 1963, the Soviets effectively ended their diplomatic offensive against U.S. spysats and accommodated themselves to a bipolar world of space reconnaissance.[245]

Thus, by the end of 1963, U.S. space policy had achieved its highest priority goals as established by NSC 5520 and the creation of the WS-117L program in 1955. By the end of this period, the U.S. had not only successfully developed spysat technology which had already proven capable of providing strategically significant intelligence data but had also established an international regime which legitimized the use of and provided a measure of protection for these intelligence gathering platforms. Spysat developments during this period also consistently moved the military further and further away from control over both the development of these satellites and the interpretation of the intelligence data they produced.

For our focus, the most significant impact of these policies was the creation of a continuing deep schism between the black and white worlds of military space activities

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[244]Ibid., 70-71.

[245]Ibid., 71.

-- basically between the NRO and all other military space organizations. Because the Air Force is the Service most involved in both the black and white space worlds, it is the Service most affected by this schism. The rationale behind U.S. spysat policies is certainly understandable and the development of an organizational schism is probably inevitable in these circumstances, but for the Air Force as an organization, the impact of this schism is, nonetheless, the most significant and unpleasant bureaucratic result of these policies. The schism between the black and white worlds of Air Force military space activities has made the development of coherent and comprehensive white world Air Force space doctrine much more difficult by siphoning away talent, resources, and energy into the black world while preventing a cross-flow of data and systems between the two worlds. Moreover, because the Air Force does not develop the doctrine for the black world, the doctrinal requirements for these two worlds may often be moving in opposite directions as illustrated by NRO Director Charyk's efforts to end all publicity for Air Force space missions at the same time the Air Force was attempting to publicize its need for a larger space force. The impact of this schism is discussed further in relation to other developments in the chapters below. Cumulatively, the pressures of this schism have induced a type of unhealthy institutional schizophrenia within the Air Force in relation to space and military space doctrine.

Plans and Programs for Military Man-in-Space

The primary factor which characterizes this period and separates this part of the cold war from all other periods examined in this study is the fact that for most of this period much of the military desired to build a large manned military presence in space and often believed that such a presence in space would be established soon. Based upon historical analogies, the military believed that man was an essential part of any program designed to exert control over space or to exploit the high ground potential of space. The Air Force was at the vanguard of this outlook towards military man-in-space and developed the first comprehensive U.S. plans for manned space programs. The Air Force pushed hard to obtain approval for its manned space program prior to the establishment of NASA; however, in August 1958 Eisenhower assigned primary responsibility for manned spaceflight to NASA. Project Mercury and the race for the first man in orbit captured America's attention but, meanwhile, the Air Force continued to campaign for a large military space mission. Indeed, the Air Force believed that its prospects for a significant manned presence in space were very bright as the Kennedy administration came into office. It soon became clear, however, that the enthusiasm for space of Kennedy and his administration was limited to spy satellites and the moon race. As the Kennedy administration progressed, the Air Force fought an increasingly difficult losing battle to establish a manned military space presence due to staunch opposition from OSD and the constraints of the security blackout described above. The coup de grace for these early Air Force manned military spaceflight dreams came on 10 December 1963 when Secretary McNamara canceled the X-20 program. This section will examine the implications of the developments outlined above and discuss their impact on the development of military space doctrine.

Serious Air Force interest in manned spaceflight was made evident by 1956 when a number of studies and reports on this topic were issued by RAND, WDD, ARDC and other Air Force organizations.[246] As with other space plans, the *Sputniks* shock accelerated and energized these first Air Force man-in-space plans. During November 1957, AFBMD Commander Major General Schriever, ARDC, and Air Force Headquarters all requested that engineering studies and feasibility plans for possible man-in-space missions rapidly be completed.[247] By 3 January 1958, Schriever had proposed a comprehensive AFBMD plan for investigating the feasibility of manned spaceflight and launching lunar probes beginning in fiscal year 1959.[248] Moreover, on 31 January 1958, Deputy Chief of Staff for R & D Lieutenant General Donald L. Putt adopted a space race attitude in a letter to the ARDC Commander which requested that ARDC expedite its evaluation of plans and proposals for an manned satellite vehicle and asserted that it was "vital to the prestige of the nation that such a feat be accomplished at the

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[246]See reports listed in "Early AF MIS Activity," 1-3; microfiche document 00446 in Military Uses of Space.

[247]Ibid., 5-7.

[248]Ibid., 10-11.

earliest technically practicable date -- if at all possible before the Russians."[249] This letter also specifically requested that ARDC evaluate whether the Dynasoar program or a manned satellite program would be the fastest approach to achieve the first manned spaceflight.[250]

ARPA quickly recognized the extent of previous Air Force planning for man-in-space and ceded DoD R & D in this area to the Air Force. On 28 February 1958, ARPA Director Johnson wrote Air Force Secretary Douglas and indicated that the Air Force had ". . . long term development responsibility for manned space flight capability with the primary objective of accomplishing satellite flight as soon as technology permits."[251] With this ARPA encouragement, on 19 March the Under Secretary of the Air Force sent ARPA a projected budget requirement of $133 million for the Air Force man-in-space program for fiscal year 1959 and on 2 April General White obtained approval for the Air Force's manned space project from the JCS.[252] The Air Force, noting that the administration had submitted its civilian space agency legislation to Congress, redoubled its efforts to obtain formal approval and specific budgetary allocations for its man-in-space project as quickly as possible from ARPA and OSD but no formal authorizations were forthcoming.

The most important of the Air Force's early plans for man-in-space entitled "USAF Manned Military Space System Development Plan" (MISS) was released by AFBMD on 25 April. The ultimate objective of the plan in this report was to "achieve an early capability to land a man on the moon and return him safely to earth."[253] The plan was divided into four phases: "Man-In-Space-Soonest," "Man-In-Space-

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[249]Ibid., 14.

[250]Ibid.

[251]Ibid., 18.

[252]Ibid., 20-21; and Logsdon, Moon Decision, 29.

[253]"Early AF MIS Activity," 22; microfiche document 00446 in Military Uses of Space.

Sophisticated," "Lunar Reconnaissance," and "Manned Lunar Landing and Return". The first manned orbital flight was planned for April 1960 and the four phases were scheduled to be completed in December 1965 at a cost of only $1.5 billion![254] By the end of May, the MISS Plan had been briefed to all appropriate Air Force headquarters, ARPA, the Secretary of the Air Force, and the Planning Board of the NSC; but, despite general agreement on the urgency of this type of project and with the Air Force's proposed approach, formal approval to start the program was still withheld.[255] In May, June, and July the Air Staff fully expected that approval for MISS would soon be granted, energetically continued to sell the plan, and directed AFBMD to continue preparing work statements and contractor selections. Finally, following another briefing to ARPA on 25 July, Director Johnson indicated that the Air Force's MISS Plan would not be approved at this time and spelled out the reasons why he believed that future approval was unlikely including: the opposition of scientists to man-in-space programs, the fact that NACA was already considering a similar but independent program which could not proceed much further until after NASA was established on 1 October, and his belief that the NASC would eventually establish a joint NASA-ARPA manned space program.[256] In retrospect, the Spring and Summer of 1958 represented a brief window of opportunity for the Air Force to gain primary responsibility for developing the first U.S. manned spaceflight capabilities. The Air Force eagerly jumped at this opening with a comprehensive (but perhaps too ambitious and certainly too optimistic financially) plan which ultimately floundered due to national uncertainties surrounding NASA's creation and ambivalence over manned spaceflight (let alone military manned spaceflight).

With the creation of NASA pending and the Air Force's MISS plan shot down,

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[254]Ibid., 23, 28. The April 1960 date was based on a revised plan using Atlas boosters.

[255]Ibid., 25-27. AFBMD had produced its fourth version of its Man-In-Space Development Plan by this point; the largest revisions included the proposal to use Atlas rather than Thor boosters and to use the Lockheed Agena booster being developed for the WS-117L program as the second stage.

[256]Ibid., 31-32.

the largest space questions facing the U.S. in the Summer and Fall of 1958 were whether the U.S. should attempt a manned space race with the Soviets and which organization, NASA or DoD, should direct this effort. In July, OSD produced a memorandum designed to bolster its case in this regard which concluded that "there is a military necessity for the acquisition of a maneuverable man-in-space capability" which might offer "substantial military economies" and that DoD already possessed the "space technology," "physical plant and production base" for such efforts.[257] On 29 July, NACA Director Dr. Hugh Dryden met with ARPA Director Johnson and Secretary McElroy to discuss the future management of manned space programs but this group was unable to resolve their organizational differences on this issue.[258]

As the result of the failures to resolve this problem at lower levels, the issue of which organization should control manned spaceflight was referred to the president in mid-August. Killian and Dryden had strongly urged the president to make NASA primarily responsible for the manned mission and this approach also seemed to match with Eisenhower's concerns with space for peaceful purposes and his desire to avoid costly space races such as the Air Force seemed to be proposing.[259] Accordingly, Eisenhower formally gave NASA primary authority over U.S. manned spaceflight efforts in August and by November this effort had evolved into Project Mercury.[260] As McDougall indicates, the Air Force's greatest doctrinal weaknesses during this

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[257]U.S. Department of Defense, Office of the Secretary, "Military Requirements for Man-In-Space," July 1958, 3; microfiche document 00449 in Military Uses of Space.

[258]"Early AF MIS Activity," 33; microfiche document 00446 in Military Uses of Space. Logsdon, Moon Decision, 30.

[259]Logsdon, Moon Decision, 30; McDougall, Heavens and Earth, 200; and Divine, Sputnik Challenge, 153.

[260]Glennan and Johnson signed a NASA-DoD Memorandum of Understanding (MOU) on Project Mercury on 20 November 1958. According to the terms of the MOU: DoD was to cooperate with NASA on the conduct of the program, NASA was to "make full use of the background and capabilities existing in the" DoD, and ARPA was to contribute $8 million in FY 1959 funds to NASA. This MOU is reprinted in Senate, Governmental Organization for Space, 524-25.

bureaucratic struggle were its overemphasis on the high ground approach to space and recurring inability to demonstrate convincingly a strategic necessity for military man-in-space:

> even if space technology did have military implications, the USAF failed to demonstrate immediate military missions for manned spaceflight that required that they do the basic R & D. Instead, USAF reveries of rocketing pilots in "aerospace planes" to "orbital bases" for purposes that could be better fulfilled with instrumented satellites only convinced Eisenhower and his lieutenants that the USAF had to be reigned in, not encouraged.[261]

The rejection of the MISS Plan and the assignment of primary responsibility for manned spaceflight to NASA did not by any means end Air Force efforts to build a large manned military presence in space. These developments did, however, help to shift Air Force attention away from the race-driven non-maneuverable manned capsule approach it had proposed in the MISS Plan (an approach derided as "Spam in a can") towards the more militarily useful X-20 Dynamic Soaring or Dynasoar piloted approach to manned space vehicles.[262] From the demise of the MISS Plan until the end of 1963, the Dynasoar program was the leading Air Force manned spaceflight initiative and manned spaceflight was the Air Force's top space priority. The concept of dynamic soaring is an excellent example of how a military system might operate within the single aerospace medium in a militarily useful manner.

The concepts behind the X-20 and even the origins of the program itself were nearly as old as ballistic missiles. The idea of an antipodal bomber, a manned ballistic vehicle designed to skip off the earth's atmosphere to achieve intercontinental range, was developed in 1943 by Dr. Eugene Sanger under von Braun and General Walter Dornberger at Peenemunde. The dynamic soaring concept was not pursued during the war, but in the early 1950s after Dornberger joined Bell Aircraft Company, Dornberger

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[261]McDougall, Heavens and Earth, 200.

[262]The psychological aspects of the institutional preference of the Air Force for piloted spaceflight and the disdainful attitude of USAF test pilots towards the capsule approach to manned spaceflight are best captured in Tom Wolfe, The Right Stuff (New York: Bantam Press, 1980).

and Bell made herculean efforts to sell this concept to the Air Force.[263] By 1955, Bell's dynamic soaring study and design projects had been granted $1 million in DoD funds and were also backed by an additional $2.3 million from six other aerospace firms willing to ante-up company funds for the prospect of a large Air Force manned space program.[264] Between 1954 and 1957, a number of organizations produced studies and plans on the dynamic soaring concept including: Bell's BOMI (bomber-reconnaissance) and BRASS BELL (reconnaissance) projects, the seven contractor project ROBO (bomber), and the government HYWARDS (research system) project.[265] In November 1957, ARDC issued System Development Directive 464 which marked the official start of the Air Force's Dynasoar program.[266] On 14 November 1958, the Air Force and NASA signed a MOU outlining the extent of NASA's "advice and assistance" on this program.[267] During 1959, the Air Force planned on creating a series of dynamic soaring vehicles based upon the knowledge gained from the Dynasoar I program.[268] By 1960, DoD had formally

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[263]In Congressional testimony in May 1958, Dornberger claimed to have made 678 presentations on the Dynasoar concept to the Air Force and other organizations between 1951 and 1958. See Claude Witze, "Let's Get Operational in Space: Walter Dornberger -- Space Pioneer and Visionary," Air Force Magazine 48 (October 1965): 80-88.

[264]McDougall, Heavens and Earth, 339.

[265]Department of the Air Force, Air Force Systems Command, Aeronautical Systems Division, "Review and Summary of X-20 Military Application Studies," Secret Report, 14 December 1963, 1; microfiche document 00450 in Military Uses of Space. (Hereinafter "Summary of X-20 Studies").

[266]Ibid; and Stares, Militarization of Space, 130.

[267]This MOU is reprinted in Senate, Governmental Organization for Space, 525. The MOU spelled out a very limited role for NASA. The official name of the program at this time was "Air Force system 464L hypersonic boost glide vehicle (Dynasoar I)."

[268]See testimony of Civilian-Military Liaison Committee Chairman William Holaday in Senate, Governmental Organization for Space, 526-29. The Dynasoar II program (also known as Mrs. V) was a classified program designed to investigate a more sophisticated and militarily useful dynamic soaring vehicle. This classified program apparently did not produce any hardware and is not discussed in open sources during the 1960s.

approved step one (suborbital research) of a four step Dynasoar development program designed to achieve full operational capability by 1966.[269]

During the Kennedy administration the prospects for the Dynasoar program waxed and then waned as did the prospects for a major U.S. manned military presence in space. Dynasoar designs and plans became more finalized in 1961 and called for a fairly small, single-seat, delta-winged space glider vehicle to be launched atop a Titan III booster and land like an airplane.[270] In FY 1962 DoD gave the X-20 a healthy $100 million and, moreover, DoD approved a budget totaling $921 million for the program through 1969.[271]

Soon, however, the X-20 program ran afoul of McNamara's systems analysis approach and his fears of provoking an action-reaction arms race in space. After McNamara refused to accelerate the program even after receiving an unrequested extra $85.8 million from the House Appropriations Committee for FY 1962, funding was cut to only $130 million for FYs 1963 and 1964 and the first scheduled flight was slipped to 1966.[272] Next, McNamara's systems analysts "showed that a modified Gemini might perform military functions better and more cheaply than the X-20."[273] This finding

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[269]"Summary of X-20 Studies," 1-2; microfiche document 00450 in Military Uses of Space. See also Stares, Militarization of Space, 130; and McDougall, Heavens and Earth, 340. DDRE York questioned the military utility of Dynasoar. He believed that "its ostensible purposes could all be achieved more readily and more cheaply by other means." He deliberately limited Dynasoar development to step one only and saw it as a "contingency program". York, Race to Oblivion, 129-30.

[270]McDougall, Heavens and Earth, 340; "Chronology" in Military Uses of Space, 33. Development of the Titan III booster was tied directly to the launch requirements of the Dynasoar program; DDRE Brown granted approval for the Air Force to go ahead with this Titan upgrade on 13 September 1961. A mock-up of the Dynasoar vehicle was built by Boeing in 1961.

[271]McDougall, Heavens and Earth, 340. The Dynasoar program was designated as the X-20 in 1962.

[272]Ibid.; and Stares, Militarization of Space, 130.

[273]McDougall, Heavens and Earth, 340.

prompted McNamara to attempt to gain a large role for the Air Force in Project Gemini, a move which NASA Administrator James E. Webb successfully parried by citing the impact of such a restructuring on the nation's highest-priority Apollo Program. Instead, on 23 January 1963, Webb and McNamara signed an agreement to allow DoD experiments on Gemini missions. During this time the Air Force also proposed a plan to procure some of NASA's Gemini spacecraft under a program referred to as Blue Gemini.[274]

The creation of the DoD Gemini Experiments Program and studies on the military usefulness of a space station which would evolve into the Manned Orbiting Laboratory (MOL) program raised the question of the need for the X-20 and placed additional pressures on the X-20.[275] In October 1963 the PSAC compared the relative military

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[274]Stares, Militarization of Space, 79. DoD eliminated the Blue Gemini and Military Orbital Development System (MODS) programs from the Air Force budget in January 1963. The NASA-DoD experiment program was officially titled Program 631A, "DOD Gemini Experiments Program," and called for 18 experiments to be run on Gemini flights between October 1964 and April 1967 for a cost of $16 million. The experiments were programmed for areas such as satellite inspection, reconnaissance, satellite defense, and astronaut extravehicular activity. Colonel Daniel D. McKee, "The Gemini Program," Air University Review 16 (May-June 1965): 6-15; and Cantwell, "AF in Space, FY 64," 31-36; microfiche document 00330 in Military Uses of Space.

[275]NASA and DoD conducted an intricate dance with one another during 1963 over the issue of future manned space stations which greatly impacted the X-20 and other Air Force man-in-space plans. In November 1962, the Air Force had completed a study on a limited military space station known as the MODS. Based upon the MODS concept, Webb and McNamara discussed the possibility of a joint station project and on 27 April 1963 agreed that neither organization would initiate station development without the approval of the other. McNamara pressed Webb for a commitment to a joint program but Webb did not want to make any pledge which might sidetrack Apollo. Finally, after intervention by Vice President Johnson and the NASC, in September NASA and DoD agreed that, if possible, stations larger and more sophisticated than Gemini and Apollo would be encompassed in a single project. Following DDRE Brown's recommendation to McNamara on 14 November that the X-20 be canceled and replaced by studies on what would become the MOL program, Brown next attempted, unsuccessfully, to coordinate a joint NASA-DoD station. NASA, wary that its space turf might be threatened by the fairly large and sophisticated station Brown favored, suggested that DoD pursue a smaller and less sophisticated space *laboratory* rather than a space station. DoD accepted at least

utility of the Gemini, X-20, and MOL programs and judged that the X-20 held the least potential.[276] By this time, according to the editor of Missiles and Rockets, the X-20 had been "reviewed, revised, reoriented, restudied, and reorganized to a greater extent than any other Air Force program."[277] On 10 December 1963, Secretary McNamara publicly announced the cancellation of the X-20 program and at the same time assigned primary responsibility for developing the MOL to the Air Force.[278]

Air University Quarterly Review and Air Force/Space Digest Positions

The strength and depth of the Air Force's commitment to the X-20 program, manned spaceflight, and space issues more generally during this period are perhaps best indicated by reviewing the treatment of these space issues in the Air Force's official journal, Air University Quarterly Review (AUQR) and in the nongovernmental Air Force Association's Air Force/Space Digest (AF/SD). After covering the Air Force testimony at the Johnson Hearings very carefully in its Spring 1958 issue, the entire Summer 1958 issue of AUQR was devoted to "The Human Factor in Space Travel." This issue touted the Air Force's extensive and path-breaking experience with space medicine and asserted that the Air Force was fully capable of performing militarily significant missions in space by "making man and hardware an effective and compatible system" in this new and hostile environment.[279] Several articles in this and subsequent issues of AUQR emphasized historical analogies between the opening of space and the opening of previous new frontiers and especially highlighted the importance and decisive impact of military

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the semantic importance of this distinction in initiating MOL studies for an independent military station. See Cantwell, "AF in Space, FY 64," 16-23; microfiche document 00330 in Military Uses of Space.

[276]McDougall, Heavens and Earth, 340.

[277]Ibid., 341.

[278]Between 1957 and 1963 the X-20 program consumed $400 million, almost the same amount spent on Project Mercury. The MOL program is discussed in the next chapter.

[279]The quote is from Major General Lloyd P. Hopwood, "The Military Impact of Space Operations," AUQR 10 (Summer 1958): 142.

force in many of these historical situations. The AUQR editors selected an article entitled "The Military Potential of the Moon" to address the issues raised in the late 1950s by the public debate over the military utility of the moon.[280] Following a quasi-technical review of the environmental factors involved, this article concluded that the type of lunar doomsday base proposed by General Boushey was technologically achievable and militarily useful:

> It is hard to escape the conclusion that there is military sense to General Boushey's concept of a lunar-based missile force. Viewed in terms of site hardness and employment capability, the concept is sound; it does not violate military or physical principles. It may even be sound in terms of the more popular and demanding criteria of cost, particularly if some significant degree of lunar autarky is achievable. If deterrence does indeed involve "The Delicate Balance of Terror" that the title and text of [Albert J.] Wohlstetter's brilliant paper suggest, than the lunar-based deterrent represents the sort of imaginative thinking that is indispensable to a favorable balance.[281]

Beginning in the 1960s, AUQR articles built upon this doctrinal foundation with more varied and sophisticated arguments. Many went beyond the need for just mechanical military force in space to highlight the necessity for the human brain in space. Arguing against the trends towards automatic systems and the notion of "push-button warfare," Major General James Ferguson of AFSC indicated that:

> [a]s the space age matures, I believe that the trend from manned to unmanned vehicles will be reversed. The reason is quite simple. Automatic mechanisms of any kind, following the patterns built into them in advance, have a certain rigidity of behavior that by its very nature is slow to recognize and respond to the rapidly changing circumstances in a military situation. The environment of war, including preparations to conduct or deter it, is highly fluid. The most maneuverable combat forces almost invariably are the most successful.[282]

These and similar arguments regarding man's flexibility and judgement added an

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[280]Singer, "Military Potential of the Moon," 31-53.

[281]Ibid., 52. This passage footnotes Wohlstetter's "The Delicate Balance of Terror" article in the February 1959 edition of Air Force.

[282]Major General James Ferguson, "Manned Craft and the Ballistic Missile," AUQR 12 (Winter and Spring 1960-1961): 255.

important dimension to the development of the Air Force's doctrinal requirements for military man in space.

Writing as a Major in 1961, Richard C. Henry (who would become Commander of the Space and Missile Systems Organization [SAMSO] in 1978), helped to inject some much needed restraint and perspective on the Air Force role in space. Henry first noted that the aerospace concept "is inescapably valid. But for day-to-day military operations it will become true only after we have systems that can operate in space in the same full sense that systems now operate in the atmosphere."[283] Henry next focused on developing what is probably the first open exposition of "environmental doctrine" for space.[284] Henry summarized part of his environmental doctrine section by providing a comparison of the relative advantages and disadvantages for orbital systems:

> Advantages
>
> An orbiting system has line-of-sight access.
> An orbiting system can be dispersed and hidden in the large volume of space.
>
> Disadvantages
>
> An orbiting system is immobile.
> An orbiting system is vulnerable, once found.
> An orbiting system is transient, which complicates the application of force within a specified period of time.
> An orbiting system represents energy already expended, which complicates the cost problem.
>
> Advantage or disadvantage
>
> The time-distance problem for the delivery of force is of a different magnitude and nature than with terrestrial weapons systems.[285]

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[283]Major Richard C. Henry, "The Immediate Mission in Space," AUQR 13 (Fall 1961): 31.

[284]Ibid., 33-43. The term environmental doctrine refers to Drew's doctrine tree model discussed in the doctrine section of chapter two above.

[285]Ibid., 38-39. Henry conceded that the disadvantages seemed to outweigh the advantages but argued that access was the single most important tactical factor. Control of access would provide a capability to deny space to others. Further, "control of access to all nations is a tool never before available."

Henry indicated that "manned recoverable spacecraft" and a space station were the two near-term military requirements in space.[286] In summary, he found that the immediate military mission in space was

> to achieve a proficiency in the Air Force in the fundamental capabilities for operation in space, to determine how these capabilities may be exercised in military applications, and to integrate these capabilities into definable hardware. All of these are prerequisites to effective military space operations.[287]

Henry was thus concerned that the Air Force set about its own "building block" program for advancing its environmental doctrine for space and creating the basic hardware needed to explore, test, and further refine its space doctrine. As such, Henry's approach was light-years removed from the extreme high ground approach annunciated by General Boushey and others.

Generally speaking, most of the views expressed in AF/SD during this period were even more strident in their support for large Air Force space programs and the need for an immediate Air Force manned military mission in space.[288] The November 1961 issue of Space Digest reprinted the presentations of many leading space luminaries from the AFA's "Space and National Security" Symposium held in September 1961. Dr. Edward Welch, Executive Secretary of the NASC, indicated that "[t]he advantages of men in space vehicles seem to me to be obvious. There are observations, maneuvers, actions, and inactions concerning which decisions can be made by men and cannot be made by instruments alone."[289] At this same forum, General Schriever stated that

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[286]Ibid., 43-44. Henry also argued his preference for winged entry and reentry from space.

[287]Ibid., 44.

[288]Beginning in June 1959, Air Force, the official publication of the Air Force Association (AFA), was changed to reflect the growing importance of space issues to the Air Force. The new magazine was Air Force/Space Digest where Space Digest comprised the second part of each issue and was virtually an independent publication.

[289]Dr. Edward C. Welsh, "Peaceful Purposes: Some Realistic Definitions," AF/SD 44 (November 1961): 74.

"[m]ore emphasis on manned spacecraft is required."[290] Overall, the tenor of this symposium and of the AFA at this time, not surprisingly, was very similar to that of the Gardner Report which had been delivered to the Air Force in March 1961.

1962 and 1963 undoubtedly represent the most outspoken period for the AFA and AF/SD on the issues of Air Force space programs and manned spaceflight. As the movement away from military space in OSD and in other parts of the Kennedy administration became more evident during this time, the AFA redoubled its efforts to make its case more strongly. One of the most polemical articles of this period, "How Our Space Policy Evolved," was written in 1962 by AF/SD Senior Editor Claude Witze. Here, Witze attacked nearly every aspect of U.S. space policy including what he saw as the naivety of the space policy crafted by Eisenhower and Killian, the virtual impossibility of using space primarily for peaceful purposes, and the political and technical weaknesses of NASA along with its propensity to steal space programs from the Air Force.[291] While Witze was more restrained in his assessments of Kennedy's space policies, this article also made clear that Witze and the AFA were becoming increasingly dissatisfied with the pace and direction of Kennedy's military space efforts.

At this time, new themes were also emphasized by AF/SD in attempts to build the case for military man-in-space. The possibility that Soviet superiority in space could be used to lock the U.S. out of space, raised by Henry in 1961, was strongly reiterated by Major General James Whisenand in 1962:

> [t]he troublesome thing about a military space gap -- should one develop -- is that it might be possible for the one who gets there first to preempt the activities of one who would run second, without a direct attack, and without necessarily starting a war. If a hostile power develops the basic capabilities I have outlined -- the capability to maneuver, to rendezvous, dock, reenter, and so forth -- it would seem evident that these capabilities might be exploited to deny

[290]General Bernard A. Schriever, USAF, "Needed: Manned Operational Capability in Space," AF/SD 44 (Novemeber 1961): 80.

[291]Claude Witze, "How Our Space Policy Evolved," AF/SD 45 (April 1962): 83-92.

our use of space for any purpose whatsoever . . . [292]

The argument regarding the need for military man-in-space to build the capabilities to avoid being denied access to space and thus losing the high ground benefits of space is quite tautological but it does represent some further evolution of Air Force thinking on the requirement for manned space forces.

The April 1963 edition of AF/SD contained a large section on "Space and the Cold War" which included articles by Secretary of the Air Force Zuckert and Air Force Chief of Staff General LeMay. In this issue, General Ferguson called for the U.S. to develop "[m]ilitary patrol capabilities for the space region [which] could provide on-call protection for US space activities."[293] In another article in this issue, Major General Leighton Davis, Commander of the Air Force Missile Test Center at Cape Canaveral, was interviewed and took exception to the OSD "building block" approach to military space programs:

> "There are a couple of hookers in that philosophy," he says. "First, scientific projects have different characteristics than those needed in the military. For example, we must have a quick scramble capability -- reducing pad time to the minimum. Second, the Air Force needs experience in operating space vehicles. We can't define clearly now the characteristics we will need in space. We need 'stick-time' -- in the Dyna-Soar, the Gemini, or whatever -- to find out what can be done and to improve our vehicles accordingly."[294]

Cumulatively, these articles and statements make the doctrinal commitment of the AFA and the Air Force to manned spaceflight abundantly clear.

What is less clear is whether many of these doctrinal building efforts helped to produce important rationales for military man-in-space, build more coherent general military space doctrine, or were very effective in influencing the development of U.S.

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[292]Major General James F. Whisenand, USAF, "Military Space Efforts: The Evolutionary Approach," AF/SD 45 (May 1962): 55.

[293]Lieutenant General James Ferguson, USAF, "Needed: Military 'Stick Time' in Space," AF/SD 46 (April 1963): 46-54.

[294]Allan R. Scholin, "Cape Canaveral -- From Matador to Dyna-Soar: USAF's Space-Age Veterans," AF/SD 46 (April 1963): 81.

national space policy at this time. Throughout, the Air Force's greatest difficulty in building coherent doctrine for military man-in-space related to its fuzzy thinking on exactly what tangible military benefits would result from manned operations in this new medium which could not be realized as well or better through unmanned operations. Directly related to this difficulty in making convincing arguments on military man's role in space was the even more fundamental problem in specifying what were the most realistic and tangible military benefits to be gained via any types of military operations in space. Of course, all of these issues also related directly to the four schools of thought on military space operations. Because most of the top civilian decision-makers in the Eisenhower and Kennedy administrations were primarily committed to spysats and the sanctuary school and many of the top military space doctrine makers of this era were primarily committed to the high ground school there was a reduced chance for dialogue or significant doctrinal growth during this period. By the end of this period, this doctrinal conflict was resolved in favor of the civilian position on space as sanctuary as it must be in the U.S. system but the need for much further refinement of and conceptualization on U.S. military space doctrine would remain.

Applying the Comparative Framework and Addressing the Research Questions

Having completed the comprehensive analysis of the major developments related to the evolution of U.S. military space doctrine during this period, the comparative framework can now be used to draw theoretical judgements about these developments. The comparative framework is used to evaluate whether national security considerations or organizational behavior considerations were more important in conditioning military space doctrine outcomes at this time. Applying the comparative framework for this period strongly supports the importance of national security inputs in conditioning almost all doctrine outputs. Judgements in some doctrinal areas are difficult to draw due to the vigorous doctrinal sorting and the divergent positions on doctrine between the civilian decision-makers and the military during this period. The process of making these judgements and evaluations will help us gain a better focus on and appreciation for the broad sweep of doctrinal development during this period and prepare us for the upcoming task of comparing the doctrinal developments from all periods during the cold war.

Applying the Comparative Framework

1) Overall U.S. space policy during this second period of the cold war definitely remained organized around the overriding national security importance of spy satellites and hence this policy strongly embraced the space as sanctuary school of thought. Of course, organizational behavior inputs during this period were important in pushing military space doctrine to attempt to focus on the opposite extreme -- the space as high ground school. Moreover, the genuinely uncertain security implications of this new medium and the highly classified nature of the highest priority U.S. space policies regarding spy satellites made the development of coherent doctrine much more difficult. Thus, we witnessed the vigorous doctrinal sorting of this period. Most importantly, however, in virtually every instance during this period where the overall U.S. space policy emphasis on space as sanctuary came into direct conflict with the military's preferred doctrine based on space as high ground the military's preferred doctrine of high ground was clearly overridden by the overall space policy emphasis on sanctuary. This conclusion is most clearly illustrated by the fact that at the end of 1963, despite years of concerted efforts, the U.S. military still had no prospects for actually developing space systems capable of supporting, demonstrating, or even seriously examining the implications of a space as high ground doctrine. Thus, this first hypothesis very clearly supports the importance of national security inputs in determining the outputs of military space doctrine related to the sanctuary school of thought.

2) Space systems during this period were classified on the basis of national security considerations rather than on the basis of organizational considerations. The most clear illustration of the dominant strength of national security considerations versus organizational behavior inputs in this area was the 1962 DoD security blackout policy on all military space systems. Because spysat programs and launches had already gone black, this additional blackout policy could provide only a marginal supplement to the existing security protections for spysats but the directive was still implemented over the strenuous objections of the Air Force. This DoD security blackout overrode important Air Force concerns such as its basic organizational autonomy and its ability successfully to sell its space competence in order to build a larger space mission. This policy also

placed elements within the Air Force such as NRO Director Charyk in the difficult bureaucratic position of having simultaneously to promote the blackout to provide additional security for spysats while, under his other hat as Under Secretary of the Air Force, knowing that such stringent security measures would stifle white world space doctrine and system development. The doctrinal outputs of this period very clearly support the importance of national security inputs in conditioning military space classification systems designed to support national security strategy considerations.

3) Civilians did intervene strongly in the doctrine development cycle during this period and the military space doctrine of this period did, eventually, come to reflect the perceptions of top civilian leaders on international relations and the efficacy of space weapons. The best examples for this hypothesis also relate to the overriding importance of the spysat programs and policies of this period as discussed in hypothesis area number one above. Additionally, Eisenhower's perceptions and beliefs on a rather limited military potential of space were reflected during the deliberations for NSC 5814/1 and in his subsequent policy statements. The perceptions of Kennedy and McNamara on the military potential of space are far less well documented but can be inferred by the civilian emphasis of the moon race, their building block approach to military space systems, their space arms control initiatives, and the very limited OSD directed ASAT deployments of this period. Of course, to the extent that the Services, and the Air Force in particular, were able to maintain space doctrines which did not correspond well with overall national space policy, these doctrines would serve as examples of the strength of organizational inputs in this hypothesis area. However, few of these types of doctrines or systems appear to have survived to the end of this period: military moon base plans did not survive the initiation of the civilian moon race, the more militarily significant ASAT plans and programs favored by the military were deferred to deploy circumscribed ASAT systems with very limited military utility, and no major military man-in-space programs capable of significantly investigating the space control or high ground concepts were in place following the cancellation of the X-20. Thus, the bulk of evidence in this area also supports the importance of national security inputs in developing doctrinal outputs which correspond to the space perceptions of key involved civilian space leaders.

4) The final hypothesis area, concerning the degree of innovation in doctrine during this period, is the most difficult to evaluate. The civilian leadership did intervene strongly in the doctrine development cycle during this period but it is difficult to identify many instances where this intervention led to innovative doctrine. Aspects of the U.S. policy towards spysats such as the security blackout were innovative but the basic thrust of these policies had been developed prior to *Sputnik*. Other civilian leadership interventions which seem to have produced what could be considered innovative approaches to doctrine would include: the establishment of the NRO, Kennedy's space arms control initiatives, or McNamara's ASAT deployments. In most cases during this period, however, the civilian leadership was busy blocking the often innovative high ground doctrinal approaches being offered by the military. While many of these approaches may have been innovative, they did not often match with the overall U.S. space policy emphasis on space as sanctuary for the protection of spysats and therefore were not supported by the civilian leadership. Thus, in this hypothesis area, there are not clear links between national security inputs and innovative space doctrine during this period.

The second part of the comparative framework uses table two from chapter two to examine the relationships between the actual doctrinal outcomes of this period with the predicted doctrinal outcomes from the table. With the missile gap issue, the Berlin crises, the U-2 incident, and the Cuban Missile Crisis, this period definitely ranks as a period of high perceived tension and table two is therefore appropriate for this time. Most of the actual doctrinal outcomes during this period match quite closely with the doctrinal outcomes predicted by balance of power theory as listed in table two: Under protest, military space doctrine adopted to the space as sanctuary school; space security classification levels were set as required by national security strategy; military space doctrine was highly integrated with national security strategy and national space policy; and the military space doctrine of this period was somewhat innovative.

Contrast this high degree of correspondence between the balance of power predictions and the actual outcomes for this period with the lower degree of correlation between the predicted outcomes from organizational theory and the actual doctrinal outcomes: While the military strongly attempted to build doctrine based on high grou and space control concepts, they were not allowed to build the necessary syste support these doctrines; space system security classification levels reflected na security strategy considerations rather than organizational preferences; there was a hig degree of integration between military space doctrine and national security strategy; and there was a high degree of space doctrine innovation within the military but these innovative doctrinal approaches were generally blocked by civilian intervention in the doctrine development cycle.

Thus, while the actual doctrinal outcomes of this period do not match the predicted doctrinal outcomes of balance of power theory exactly, they do match quite closely and certainly are a closer match than the predicted outcomes from organizational theory. Some of the greatest areas of divergence between the predicted outcomes and the actual outcomes seem to be associated with the grey areas caused by the doctrinal separation between the sanctuary school held by most top civilian policy makers and the high ground school held by most top military leaders during this time. Of the many difficulties in building coherent military space doctrine discussed above, none was more important than the conceptual problems caused by this wide gulf between the differing perceptions of the civilian and military leadership concerning the relationships between space and national security.

<u>Addressing the Research Questions</u>

Next, this final section for this chapter presents the major findings associated with the three other research questions. Accordingly, this section first reviews the major relationships between military space doctrine and the doctrinally-oriented aspects of U.S. space policy during this period. Next, the major findings concerning the relationships between specific organizations and specific doctrinal preferences at this time are summarized. Finally, this section discusses the applicability of the airpower development historical analogy for the spacepower developments during this period.

During most of this period, for almost all major space-related issues, military space doctrine and U.S. national space policy had different perspectives and goals. U.S. national space policy continued to be completely dominated by the secret policies and goals associated with spy satellites such as the public emphasis on space for "peaceful purposes" and the open and secret efforts to create a legal regime which would make space a sanctuary for spy satellites. The continuing high-levels of U.S.-U.S.S.R. tensions and the development of the missile gap issue meant that the type of intelligence data which these systems might provide was needed more badly than ever during this time. Meanwhile, however, these same pressures along with organizational behavior considerations drove the military to look very seriously at ways in which the new medium of space might be used as a new high ground to enhance U.S. security. Thus, as these two divergent bodies of thought about the security implications of space developed and this period progressed, the largest conceptual gap of the entire cold war era developed between the mainstream thinking of civilian decision-makers and the major perspectives of military leadership on the security implications of space. Moreover, the secret and hidden rationale behind much of Eisenhower's space policy made the doctrinal sorting of these divergent positions more difficult because the military generally did not understand why its proposals were not taken as seriously as they might have been in the absence of these top-priority secret policies. The difficulties surrounding this sorting process were also exacerbated due to the unclear security implications and technical challenges presented by both high ground military space plans and by spy satellites themselves. Additionally, military thinking about space had not yet reached the level of sophistication or the comprehensive approach to the security implications of space which Eisenhower's space policy had developed. With this underlying conceptual gulf, it is little wonder that the civilian decision-makers and the military agreed about little concerning military space plans and programs during this period. Finally, it is also important to reiterate how completely the civilian decision-makers' doctrinal preference for space as a sanctuary for spy satellites dominated over military high ground doctrine for space by the end of this period.

The first major space-related organizations of the cold war era were created during this period and important interrelationships between these organizations and particular emphases in military space doctrine emerged as well. The structure and tenor of NASA, the single most important space organization created by the U.S. during the cold war era, was primarily the product of Eisenhower's space for peaceful purposes focus salted with a bit of the military's concerns about the high ground implications of space. NASA's doctrinal preferences developed along with its stature; it moved from being a small, timid, and vulnerable organization eager to please the Air Force to being the clearly dominant space bureaucracy little concerned with Air Force space plans or doctrinal preferences.

Eisenhower's outlook on space strongly influenced other distinct changes in U.S. space-related organizations. The desire of Eisenhower and McElroy to avoid the type of interservice rivalry of the Thor-Jupiter development period prompted the creation of ARPA. However, ARPA's tenure in charge of military space efforts left few doctrinal legacies. Likewise, Ike's desire to emphasize "peaceful purposes" in space and strong aversion to possible duplication and interservice rivalry were important factors in the decision to strip the von Braun group away from ABMA. Of course, this action mooted the military space doctrine preferences of leading Army space advocates such as Secretary Brucker and Generals Medaris and Gavin and meant that the Army would not find a way out of its new look bureaucratic limitations through space. Finally, the creation of the NRO was also a direct response to Eisenhower's and Kistiakowsky's emphasis on space as a sanctuary and perceptions that the Air force was not handling spy satellite developments very well. The actual space doctrine preferences of the highly classified NRO are not specifically or openly discussed but given the NRO's mission they would clearly seem to line up squarely within the sanctuary school. Indeed, attempting to judge the significant but hidden bureaucratic impact of the NRO on both the white and black space worlds is among the most difficult areas for military space doctrine analysis during the cold war.

The relationships between military space doctrine and organizations within DoD were also very important during this period. The Air Force-OSD relationship was a key factor in this regard. As discussed in Worthman's table and elsewhere above, ARPA and OSD generally took a studied and cautious approach to space which contrasted sharply with the Air Force's strong desire to explore military man-in-space and high ground applications. OSD's previously cautious outlook became far more pronounced under

Secretary McNamara and was a reflection of the systems analysis driven building block approach to space and McNamara's fears of an action-reaction arms race in space. Air Force space doctrine positions were among the most complex and varied of any single organization and related to the various Air Force internal bureaucratic dilemmas related to space. The Air Force's primary areas of focus at this time were on military man-in-space, exploring high ground applications, and the aerospace concept. Despite these ambitious goals, much Air Force thinking on space during this time lacked focus and conceptual clarity, perhaps because the Air Force did not have a specific space organization responsible for doctrine development and space operations advocacy. The Air Force's major space organizations during this period, AFSC and AFBMD, were characterized primarily by a technical or R & D outlook rather than an operations or doctrine focus.

Finally, this chapter closes with a discussion of the major relationships between spacepower developments during this period and the airpower development historical analogy. In this earliest period of the space age, many military leaders and space policy analysts briefly commented on the possible applicability of the airpower development historical analogy for describing the likely course of spacepower development. However, given the very limited actual spacepower developments at this time, these references to the two developmental paths were generally not detailed or specific. Nevertheless, the airpower development historical analogy provided a widely employed conceptual tool for placing early spacepower developments in context. Comparing the actual spacepower developments of this period with the three critical steps in airpower development reveals that the spacepower developments did not take any of these steps at this time. There were no major proposals or plans to demonstrate new types of force application from space. The specific high ground space proposals of this period such as General Boushey's doomsday moon base plan were not strongly supported and did not come close to beginning the process of actually developing the types of hardware necessary to support such a plan. Finally, during this period, there were few calls from within the services to create an independent space force. Of course, the first of the critical steps in airpower development did not take place until eighteen years after the opening of the air age and it is, therefore, unlikely that early spacepower developments could meet these very stringent tests during this earliest period of the space age.

For this crucial period of the cold war, the most important military space doctrine inputs came from the top-down and were national security considerations. The secret nature of many of these top national space priorities along with the uncertain security implications of the opening of the space age combined to make the development of coherent military space doctrine very difficult during this period. Denied the tools necessary to actually explore the implications of its preferred space control and high ground doctrines, by the end of this period, the military was forced, by default, to adapt to the national space policy emphasis on space as sanctuary. The next chapter reviews the progress of this military adaptation to the space as sanctuary school and also examines the political and technical developments which eventually weakened the attractiveness and robustness of the space as sanctuary school of thought.

CHAPTER FIVE: SANCTUARY SUPREME

Overview

The differences in the overall character of the U.S. military's basic outlook towards space and national security between the last period and this period are the largest and most distinct for any two successive periods during the cold war. Whereas during the previous period the preferred space doctrine of the military emphasized space as the high ground and attempted rapidly to build a large manned military presence in space, during much of this period, the military generally accommodated itself to the civilian leadership's preference for the sanctuary school of thought on space and largely dropped its quest for a large manned military presence in space. Moreover, during the course of this period, the military's general perception of the relationships between space and national security changed -- instead of seeing space as a critical national security challenge and an important, dynamic, and growing military arena, the military came to view space as a relatively unimportant and stagnant strategic backwater which was best left undisturbed. Thus, this period generally is marked by relative doctrinal calm and a de-emphasis on military space issues which contrasts sharply with the distinct focus on military space issues and vigorous doctrinal sorting of the previous period. For much of this period, the U.S. military was preoccupied with the war in Vietnam and generally devoted little time or attention to military space considerations.

Of course, it would be an oversimplification to present an image of the military rapidly and completely switching its preferred doctrine to the sanctuary school of thought on space at the beginning of this period and then remaining fixed in this position throughout the remainder of the period. In reality, the views of the military on the strategic value of space during this period closely followed the parabolic arc of general U.S.-U.S.S.R. relations in the era of detente. Thus, the military gradually moved away from its high ground view of space during the initial part of this period as the superpowers reached first the OST of 1967 and then the SALT I agreements of 1972. The period between the SALT I agreement and the Apollo-Soyuz Test Project (ASTP) of 1975 represents the apogee of the arc and the closest military embrace of the sanctuary school of thought on space during the cold war. Thereafter, a combination of many factors at the end of this period gradually prompted the military to move away from the sanctuary school and again see greater military utility in space. Some of the major factors which conditioned this doctrinal movement included: the resumption of Soviet ASAT testing in 1976, the failure of ASAT arms control, the military prospects for the Space Transportation System (STS or Space Shuttle), the significant and growing force enhancement capabilities of existing space systems, and the general souring of detente at the end of this period.

This general parabolic arc of U.S.-U.S.S.R. relations and overall U.S. military perceptions on space are illustrated by the discussion of the doctrinal impact of several specific space systems or developments in this chapter. First, the military inputs to as well as the doctrinal impact of the OST are analyzed. Next, this chapter examines how the demise of the MOL program, the military's only manned space program during this period, helped to move subsequent doctrinal developments further towards resignation and the sanctuary school. The framework for the sanctuary school was completed following the codification of and reliance on NTMV in the SALT I agreements. However, this framework was seriously weakened by the end of this period following the resumption of Soviet ASAT testing, new U.S. ASAT deployment plans, and the failure of superpower ASAT negotiations. Finally, these major developments are further illuminated and defined by their relationships to the limited ongoing doctrinal developments within the Air Force and the Air Force Association as described in Air University Review and Air Force/Space Digest during this period.

Overview of Major Doctrinal Inputs and Considerations

In this section, the parabolic arc of military space doctrine during this period is further illustrated by briefly introducing each of the major developments related to the evolution of U.S. military space doctrine discussed below. The focus is on the most clear and most important instances where either national security or organizational behavior inputs may have had a decisive impact on doctrinal issues. Generally speaking, many of the trends in doctrinal development during this period are somewhat difficult to analyze using the model from chapter two. National security inputs remained a crucial element in the development of overall national space policy and in continuing to create policies for spysats which fundamentally impacted all other space policies. However, much of the problem in attempting to categorize doctrinal inputs and outputs for this period comes from the difficulty in trying to weigh a negative influence -- in other words, in trying to evaluate what restraining effect these secret spysat programs and policies had on slowing the gradual evolution of military space doctrine away from the sanctuary school. Organizational behavior inputs were important at times during this period but they seldom seemed to be the dominant factor in conditioning doctrinal outcomes. Moreover, continuing and largely unguided technological improvements in space systems often seemed to have as much of an impact on doctrinal outcomes during this period as did national security or organizational behavior inputs. Cumulatively, these incremental technological improvements resulted in the emergence of a significant space-based force enhancement capability by the end of this period but many of these capabilities were not well understood or utilized at this time. Clearly, then, because the inputs into the evolution of military space doctrine during this period were multidimensional and non-discrete, it is sometimes difficult to assess the relative impact of these factors.

The development and the terms of the OST reflect the top-down national security space considerations of the Kennedy and Johnson administrations as well as the organizational interests of the State Department and the NSAM 156 Committee. These interests were advanced and led to the treaty despite the different national security concerns and organizational interests held by the DoD and the Air Force. As the most significant space-related arms control agreement of the cold war era, the OST strongly conditioned the development of subsequent military space doctrine by foreclosing significant military options in space. Most importantly, after the OST the type of high ground space-based strategic forces and deterrence plans which had been advanced by the Air Force and others were no longer viable and non-nuclear strategic defense remained the only major space-based, high ground strategic option possible under the treaty.

The development and demise of the MOL program is another illustration of top-down decision-making but in this case it is less clear that national security considerations were the primary inputs shaping these developments. Unfortunately, security classifications cloud any analysis of the decision-making processes involved in the MOL program. If one assumes that U.S. national security considerations mandated that the U.S. deploy an improved photoreconnaissance capability in the late 1960s or early 1970s and that the capabilities of the NRO's KH-9 and the Air Force's MOL were roughly comparable, then the development and demise of the MOL program can be seen mostly in organizational behavior terms as a bureaucratic competition between the NRO and the Air Force. Air Force organizational interests moved it to structure and to attempt to sell the MOL based on its intelligence gathering capabilities rather than as the toe hold on manned military space missions it had long sought. NRO organizational interests apparently resulted in strong opposition to manned reconnaissance platforms in space and it advanced the KH-9 as a better solution to the nation's growing intelligence needs. Finally, the organizational interests of the Johnson and Nixon administrations were not well served by the MOL program and when the chance to save money by eliminating this program was presented, the Nixon administration jumped at this opportunity. Overall, the MOL example may illustrate that the space-related, bottom-up organizational interests of the DoD and the Air Force have difficulty successfully competing in a bureaucratic struggle with the organizational interests of the NRO.

The SALT I agreements and the era of detente provided the final top-down national security impetus for moving military space doctrine towards the sanctuary school of thought. The importance of space as a sanctuary for NTM was predicated on the enabling role these NTM had played in facilitating strategic arms control negotiations not dependent upon OSI and also on the critical role space-based NTMV would play in compliance verification for these agreements. While the terms of these agreements did not explicitly provide much legal protection for space-based NTM, the agreements did see NTM as highly important and strongly implied that they were the most important military use of space. Clearly, based on the role of space-based NTMV in the SALT I agreements and given the general prospects of detente, the U.S. military had almost no incentive to examine military space doctrines which might undercut the sanctuary school of thought on space during the middle of this period.

The military space plans, programs, and reorganizations of this period reflected primarily organizational behavior considerations but they generally had little impact on overall space doctrine development. The creation of the Space and Missile Systems Organization (SAMSO) within AFSC perpetuated the R & D mindset within the space development community and the general developer-user split within the white world of space systems. Most significantly, it was bottom-up, incremental, technology-push type of improvements to military space systems during this period rather than any type of a priori doctrinal guidance which created the significant force enhancement capabilities emerging by the end of this period. These incremental technological improvements matched well with SAMSO's organizational preferences but the capabilities created were not well understood outside the space development community and were not well integrated into larger military planning or doctrine.

Spy satellite developments during this period again illustrated the power of top-down national security inputs. President Lyndon Johnson was able to launch an NTMV-based arms control process despite the initial opposition of the intelligence community to using these space-based intelligence gathering assets in this way. Soon, the all-important arms control-NTMV symbiosis drove the development of a space-based intelligence gathering system which was optimized for NTMV and not responsive to military requirements, especially at the tactical level. Moreover, the pervasive space as sanctuary mindset encouraged the development of a very fragile space-based intelligence gathering system where satellite survivability was not a major concern. Clearly, this NTMV and arms control inspired sanctuary mindset extended well beyond the NRO and impacted overall DoD and Air Force space thinking in fundamental and subtle ways throughout this period.

The military played an important role in the development of the STS and this role again illustrated the overriding impact of spysat considerations on all other military space applications. The approach of space shuttle operations prompted elements within the Air Force led by Secretary Hans M. Mark again to envision manned military space operations. Meanwhile, other elements within the Air Force (led by the NRO) were much more ambivalent about the shuttle and opposed aspects of STS operations for the same reasons they opposed the MOL. This split remained unresolved at the end of this period. Undoubtedly, had the Air Force more directly controlled STS developments, Air Force support and doctrine for use of the STS would have been more clear.

President Jimmy Carter's space policy statements at the end of this period marked a return to deliberations on military space policy at the highest levels of the government and highlighted concerns with ASAT, satellite survivability, and the military potential of the STS. Carter's Presidential Directives (PDs) 37 and 42 were motivated by top-down national security considerations and were also driven by the cumulative impact of the incremental technological improvements in space systems throughout this period. Carter's two-track approach to ASAT is an excellent illustration of both national security and organizational behavior inputs combined together into one policy. Additionally, the focus on these issues at the highest levels of the government was an excellent example to and incentive for the military to reexamine its military space plans and doctrine more closely.

Finally, the course of ASAT developments during this period is another telling reflection of the state of military space doctrine during this period. For ASAT developments during this period, top-down national security inputs from civilian decision-makers were decisive in shaping these programs and completely dominated over military plans, doctrines, or organizational behavior considerations in this area. For example, Secretary of Defense Robert S. McNamara rapidly established and then even more quickly canceled the Program 505 ASAT system in accordance with his personal views on ASAT requirements. Likewise, the Air Force's considerable bottom-up efforts to upgrade the Program 437 ASAT system or to produce a new replacement met with no success but Deputy Secretary David Packard's recommendation to phase out Program 437 generated immediate results. Additionally, note that it was President Gerald R. Ford's NSDM-345 rather than any Service initiative which revived U.S. development of an operational ASAT system. Overall, it is remarkable how little Air Force doctrinal support the development of a non-nuclear ASAT capability received during this period. This lack of attention to this area is undoubtedly another reflection of the strength of the NRO and the sanctuary school of thought in shaping Air Force space thinking at this time.

Analysis of Major Developments Related to U.S. Military Space Doctrine, 1964-1978

The Development of and Military Impact of the OST

The OST is the most important space-related arms control agreement of the cold war era. The terms of this agreement and the regime it represents impact on potential military operations in space in important, fundamental ways and prohibit significant military options. For example, the OST bans development of most of the extreme military space plans described in the previous chapter such as General Boushey's doomsday moon base plan. This section outlines the military's role in the bureaucratic processes which led to this agreement and examines the military impact of the treaty. In particular, this section focuses on the doctrinal avenues which were foreclosed by the treaty and the subsequent doctrinal impact of this international law approach to defining the relationships between space and national security.

As outlined in chapter four, the superpowers had advanced several different space arms control initiatives beginning prior to the opening of the space age. Most of these earliest initiatives, such as the Eisenhower-Bulganin exchanges, seemed to be designed more for political posturing than as serious negotiating positions. The Cuban Missile Crisis provided an important impetus for many U.S.-Soviet arms control efforts and space-related arms control efforts were no exception to this trend. By 1963, the Kennedy administration had concluded that the U.S. could achieve significant space-related national security objectives via arms control and the NSAM 156 Committee had developed the U.S. negotiating positions which laid the groundwork for the OST. Despite the opposition of the JCS, the NSAM 156 Committee and the Department of State advanced U.S. positions at the UN which led to UNGA Resolutions 1884 and 1962 in October and December of 1963. UNGA Resolution 1884 (XVIII) of 17 October was an international declaratory ban on placing nuclear weapons or weapons of mass destruction in outer space. UNGA Resolution 1962 (XVIII) of 13 December 1963 "signaled a breakthrough in the evolution of space law."[1] Specifically, UNGA Resolution 1962 declared:

> outer space free for exploration by all and out of bounds to national sovereignty; space activities to be carried on for the benefit and in the interest of all mankind in accordance with the UN Charter and international law; states to bear responsibility for all their national space activities, whether carried on by government or nongovernmental agencies; states to be guided by principles of cooperation and mutual assistance, with "appropriate international consultations" to precede any activity potentially harmful to peaceful uses of space; spacecraft to remain under the jurisdiction of the launching state, with the latter accepting liability for any damage caused to foreign property by accidents; astronauts to be regarded as "envoys of mankind" and rendered every assistance in case of peril.[2]

Thus, UNGA Resolution 1962 was clearly a very significant and wide-ranging statement which dealt with civil, commercial, and national security aspects of space.

During the Johnson administration, the State Department and the NSAM 156 Committee continued their efforts to achieve even more significant space-related arms control agreements. The State Department held that the U.S. should negotiate an international space treaty based on the precedent of the 1959 Antarctic Treaty in order to codify the principles in UNGA Resolutions 1884 and 1962 more formally. DoD and JCS generally opposed this initiative and specifically opposed further restrictions on national sovereignty in space or on celestial bodies and rejected positions which would require the U.S. to release more data on its space vehicles.[3] Moreover, the JCS counseled caution in negotiating a space treaty due to the psychological impact such an agreement might have on general U.S. military exploitation of space and especially urged

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[1]Walter A. McDougall, . . . the Heavens and Earth: A Political History of the Space Age (New York: Basic Books, 1985), 274. This resolution is officially titled "Declaration of Legal Principles Governing Activities in the Exploration and Use of Outer Space." According to McDougall, UNGA 1962 "ratified the role of the COPUOS as the formative body for space law" and represented a Soviet retreat towards the space law principles advanced by the U.S.

[2]Ibid. McDougall's quotations are from the resolution.

[3]Ibid., 415.

that "the provisions of the treaty should not preclude the conduct of intelligence activities deemed essential to U.S. security."[4] However, by 11 March 1966, State had watered down its original position on several of these issues enough to win DoD acceptance of a preliminary draft treaty.[5] On 5 April, National Security Advisor Walt W. Rostow wrote a memorandum to the president which recommended that the U.S. rapidly propose a "Celestial Body Treaty" in order to score international public relations points by advancing this proposal before the Soviets tabled their own draft treaty on this issue.[6] Accordingly, President Johnson publicly outlined the basic provisions of the U.S. draft treaty on 7 May.

On 16 June, both the U.S. and the U.S.S.R. submitted draft treaties on regulating activities in outer space to the UN. The original Soviet proposal was much more comprehensive than the American proposal; negotiations between July and December resolved the differences between the two proposals and resulted in treaty language acceptable to the UN.[7] The UNGA endorsed the agreement on 17 December and by 27 January 1967 the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies was open for signature. Sixty-two states initially signed the OST and the agreement went to the U.S. Senate for advice and consent to ratification on 7 February.

Many provisions of the OST echo UNGA Resolution 1884 and especially UNGA Resolution 1962. The treaty purports to "contribute to broad international co-operation in the scientific as well as the legal aspects of the exploration and use of outer space for

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[4]Paul B. Stares, The Militarization of Space: U.S. Policy, 1945-1984 (Ithaca: Cornell University Press, 1985), 101. This JCS memorandum to Secretary McNamara was dated 23 November 1965.

[5]McDougall, Heavens and Earth, 416.

[6]Stares, Militarization of Space, 101-2.

[7]McDougall, Heavens and Earth, 416-17. Until October, the Soviets insisted on equal rights to foreign soil for space tracking sites, by essentially stating that if a state allowed a NASA tracking site it must also allow equal access for a Soviet tracking site within its territory.

peaceful purposes."[8] To these ends, provisions in the OST: reaffirm the principle of freedom of use of outer space, make activities in space subject to international law including the UN Charter, and stipulate that the use and exploration of space "shall be carried out for the benefit and in the interest of all countries" while outer space itself shall be the "province of all mankind."[9] Most importantly for our focus, several sections of the treaty have direct military relevance. Article II indicates that "[o]uter space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[10] The most specific military prohibitions are found in Article IV:

> States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.
>
> The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purpose shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies shall also not be prohibited.[11]

Cumulatively, these provisions would seem to preclude significant military operations on the moon or other celestial bodies and to restrict military space options in earth orbit and elsewhere.

The most detailed public discussions of the terms of the OST and its military impact took place during the Senate hearings on advice and consent to ratification during

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[8]U.S. Arms Control and Disarmament Agency, Arms Control and Disarmament Agreements: Texts and Histories of Negotiations, 1982 Edition (Washington: GPO, n.d.), 51. This quotation is from the preamble to the treaty. "Peaceful purposes" are not further defined in the OST.

[9]Ibid.

[10]Ibid., 52.

[11]Ibid.

March and April 1967. Although the U.S. had already accepted nearly all of the provisions of the OST either through unilateral policy statements or support of UNGA resolutions 1884 and 1962, the Senate nonetheless closely questioned the administration witnesses and carefully considered the political and national security impact of a treaty formalizing these positions. As a result of this close questioning, a more complete picture of the United States' understanding of several key provisions of the OST and of general U.S. space policy emerged. In the end, the testimony of the administration witnesses as well as the terms and purpose of the OST proved unanimously acceptable to the Senate in a vote of 88-0 in support of ratification on 25 April.

Several military space issues were clarified during the hearings. Many senators were concerned with how the U.S. would verify the OST prohibition of nuclear weapons and weapons of mass destruction from space. In response to questioning on this issue, administration witnesses highlighted several important U.S. space policy positions: First, while the U.S. could not presently or in the near term future determine with high confidence the purpose or content of any individual space object, U.S. national technical means of verification (NTMV) were asserted to have the ability to detect larger-scale deployments of nuclear weapons or weapons of mass destruction in space before they became "militarily significant."[12] Second, this U.S. difficulty in identifying the purpose and function of space objects would exist whether or not the U.S. ratified the OST.[13] Third, as CJCS General Earle G. Wheeler reemphasized several times during his testimony, despite these potential verification difficulties, the U.S. would prefer to rely upon its NTMV to address the verification issue rather than attempting to create an

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[12]On this issue see, for example, the prepared statement of Deputy Secretary of Defense Cyrus Vance in U.S. Congress, Senate, Committee on Foreign Relations, Treaty on Outer Space: Hearing before the Committee on Foreign Relations, 90th Cong, 1st sess., 1967, 80-81, 94. (Hereinafter SFRC, OST Hearings). When pressed further on this issue, Vance indicated that he would find ten or more unidentified and potentially harmful space objects as a cause for concern.

[13]See, for example, the statement of CJCS General Wheeler in ibid., 84.

international on-site inspection regime for objects in space.[14] And, fourth, Secretary of State Dean Rusk asserted that while the U.S. was confident in its ability to adequately verify the OST prohibition on nuclear weapons and weapons of mass destruction, that "[t]he treaty does not inhibit, of course, the development of an antisatellite capability in the event that should become necessary."[15]

Other testimony on the OST helped somewhat to clarify what was meant by the term "weapons of mass destruction." Deputy Secretary Vance indicated that this term "would include such other weapons systems as chemical and biological weapons . . ." or future systems "which would have the capability of mass destruction such as that which would be wreaked by nuclear weapons."[16] Finally, these hearings also gave CJCS Wheeler the opportunity to emphasize that the Chiefs were concerned with aspects of inspection and verification in the OST and were worried that the psychological impact of the OST might cause a diminution of U.S. military space efforts. The JCS therefore specifically called for "intensified U.S. efforts to develop capabilities to detect and verify the orbiting of nuclear weapons or those threatening mass destruction" as well as a general "increase in our military efforts in space not prohibited by the treaty."[17]

The OST certainly marks an important constraint on the development of military space doctrine during the cold war. By banning nuclear weapons and weapons of mass destruction from space and prohibiting military installations on the moon and other celestial bodies, the terms of the OST essentially foreclose the possibility that space could

[14]See Wheeler testimony in ibid., 91-92, 97-98. Although not discussed in open session, this preference for NTMV rather than an international on-site inspection regime for space presumably was due to U.S. concerns with the possibility of Soviet close inspection of U.S. spy satellites. Note also that the terms of the OST draw a distinction between the inspection provisions for facilities on the moon or other celestial bodies ("open to representatives of other States Parties to the Treaty on the basis of reciprocity") and the inspection provisions for objects in space (none specified).

[15]Ibid., 26.

[16]Ibid., 100.

[17]Ibid., 84-85.

openly serve as the high ground for deterrence or actual warfare at the strategic level. After the ratification of the OST, the U.S. military had very little incentive to consider space plans or doctrines based upon the high ground school of thought at the strategic level in terms of space for strategic deterrence or strategic offense, although the possibility of space for non-nuclear strategic defense remained open.

The more subtle influences and implications of the OST were perhaps just as significant. As discussed in chapter four above, the UN declaratory ban on nuclear weapons in space of October 1963 was the first instance where the U.S. was willing to declare such an unenforceable and non-verifiable ban. This, coupled with the lack of enforcement and verification mechanisms in the OST, signaled that the U.S. was not overly concerned with the security implications of nuclear weapons in space. And if the U.S. was not overly concerned with the verification mechanisms for guarding against even potential nuclear weapons in space, how important could other types of weapons or systems in space be? The very limited verification provisions in the OST and the divergence between inspection procedures for space versus the moon or other celestial bodies also seem to point again to the overriding importance of U.S. spy satellites in shaping all other space applications and policies. Additionally, many commentators have stated that the OST should be seen primarily as an international public relations effort because it basically only codified the space developments to date and only banned those military options in which the superpowers had little interest. However, this interpretation does not sufficiently underscore the significant restraining effect of the OST on the U.S. military's plans and programs for space. Cumulatively, then, the OST was the most clear message to date to the military that the U.S. civilian leadership did not believe that space held a great deal of military utility, except as a sanctuary for spysats, and that space doctrines and systems which did not match with this approach would not be treated seriously.

Later in 1967, Secretary McNamara revealed that the Soviets had been testing a new type of ballistic missile delivery system known as a fractional orbital bombardment system (FOBS). During 1965 and 1966 the Soviets had conducted a series of tests in which an SS-9 ICBM launched a payload into an orbital trajectory which was then de-orbited before the completion of one orbit. The apparent purpose of this system was to allow ballistic missile attacks on the U.S. from the south rather than via the normal ballistic trajectory over the north polar regions. Such a system would afford the Soviets greater flexibility in attack planning and allow an approach towards the U.S. from the direction with the least strategic surveillance. Following McNamara's 3 November 1967 public announcement that the Soviets had developed a FOBS, he attempted to downplay its significance by stating that this system did not pose a major new strategic threat to the U.S. or violate the OST since the payloads were not in sustained orbit.[18] Secretary McNamara did not publicly reveal that the JCS and the Air Force, in particular, regarded the FOBS as a considerable security concern as a possible first-strike weapon which would be able to avoid much of the U.S. early warning system by attacking from the south.[19] Overall, the announcement of this new type of system did arouse considerable concern within the U.S. and illustrated that the OST would hardly be the last word on the security implications of space.

The Development and Demise of the MOL Program

The Manned Orbital Laboratory was undoubtedly one of the single most important military space projects of this period. Announced on 10 December 1963 at the same time as the cancellation of the X-20, the MOL quickly took the place of the X-20 and became the cornerstone of Air Force efforts to build a significant military man-in-space presence. Accordingly, in the earliest part of this period, the Air Force put a great deal of energy,

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[18]Stares, Militarization of Space, 99-100.

[19]Gerald T. Cantwell, "The Air Force in Space, Fiscal Year 1968, Part II," Secret History, Office of Air Force History, October 1970, 2-6; microfiche document 00337 in U.S. Military Uses of Space, 1945-1991: Index and Guide (Washington: The National Security Archive and Alexandria, VA: Chadwyck-Healey, Inc., 1991). (Hereinafter Cantwell, "AF in Space, FY 68, Pt 2"). Many sections of this report remain classified but the sanitized version still conveys the general concern of the Air Force with the potential of the FOBS and reveals Air Force plans to counter the FOBS with improvements in early warning systems such as 440L forward scatter over-the-horizon (OTH) radars and Program 949 (Defense Support Program) infrared launch detection satellites.

effort, and funding into the MOL. Meanwhile, the MOL rapidly emerged as the DoD's only military man-in-space program. Numerous technical and especially political problems soon beset the MOL program and the project was repeatedly cut back and stretched out in the late 1960s. The Nixon administration officially canceled the MOL on 10 June 1969. Left without any military man-in-space programs, the military became more resigned to the sanctuary school of thought on space and came to view plans and doctrines calling for military man to help control space or to exploit the high ground potential of space as increasingly irrelevant.

The roots of the MOL program can be traced back at least to the "Global Surveillance System" proposed by AFSC in November 1960.[20] As described in chapter four, the more direct inspiration for the MOL came from the MODS space station first proposed by the Air Force in June 1962, the 1963 DoD-NASA deliberations over the possibility of building a joint space station, and the cancellation of the X-20. In his Posture Statement for FY 1965, Secretary McNamara generally remained unconvinced of a specific need for military man-in-space but indicated that the time had come for U.S. military man-in-space efforts to "be more sharply focused on those areas which hold the greatest promise of military utility."[21] Accordingly, he had canceled the X-20, expanded the small-scale testing of the Mach 5-25 flight regime through the unmanned ASSET vehicle, initiated the DoD Gemini Experiments Program, and proposed the MOL as a "much more important step" for investigating the possible military utility of man-in-space.[22]

During 1964 and the first half of 1965, the MOL program was subjected to intense scrutiny by OSD and underwent several design and program application changes.

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[20]Jeffrey T. Richelson, America's Secret Eyes in Space: the U.S. Keyhole Spy Satellite Program (New York: Harper & Row, 1990), 83.

[21]U.S. Congress, House, Committee on Armed Services, Fiscal Years 1965-1969 Defense Program and Fiscal Year 1965 Defense Budget: Hearing before the Committee on Armed Services, 88th Cong., 1st sess., 1964, 104.

[22]Ibid., 104-6. The quotation is from page 106.

By mid-1965, specific missions and station designs were firmed up. Most importantly, the MOL applications added in 1965 were designed to turn the MOL into a formidable reconnaissance outpost with a large 90-inch telescope and huge signals intelligence (SIGINT) antennas to be assembled on orbit alongside the station.[23] At a press conference on 25 August 1965, President Johnson formally approved the development of the MOL. The MOL design at this time called for a configuration approximately 54 feet long and 10 feet in diameter consisting of a Gemini B capsule attached to the 41 foot long laboratory. The MOL was to be launched into polar orbit from VAFB atop a Titan III-C booster.[24] The entire program was originally scheduled to include five manned flights of the MOL beginning in 1968 at a cost of $1.5 billion.[25] The overall objectives of the MOL program as approved in August 1965 were to:

> a. learn more about what man is able to do in space and how that ability can be used for military purposes.
> b. develop technology and equipment which will help advance manned and unmanned space flight, and
> c. experiment with this technology and equipment.[26]

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[23]Stares, Militarization of Space, 98; and Richelson, Secret Eyes, 85. Richelson indicates that the MOL telescope camera system would have had a resolution of approximately nine inches and was designated as the KH-10. A depiction of construction of a 100 foot diameter SIGINT antenna as a proposed MOL experiment is found in J. S. Butz, Jr., "MOL: The Technical Promise and Prospects," Air Force/Space Digest 48 (October 1965): 44-45.

[24]Richelson, Secret Eyes, 85; and Executive Office of the President, National Aeronautics and Space Council, Report to Congress on Aeronautics and Space Activities, 1965 (Washington: GPO, 31 January 1966), 49-50. (These annual reports are hereinafter cited as President's Space Report, year of report). The MOL astronauts would transfer into the shirtsleeve environment of the laboratory via a hatch through the heat shield of the Gemini B capsule. The MOL was designed for 30 day missions. At the completion of the mission, the astronauts would transfer back into the capsule and reenter while the station itself would eventually also reenter and burn up. The Titan III-C had originally been developed to launch the canceled X-20.

[25]President's Space Report, 1965, 50.

[26]Ibid., 49. These three objectives in the President's Space Report for 1965 were considerably less detailed and ambitious than the six MOL objectives which Secretary

The Air Force directed the MOL program and the Navy was a minor partner in the effort.[27] The initial Air Force support for this program was unmistakable. In Congressional testimony in early 1965, Deputy Chief of Staff for R & D Lieutenant General James Ferguson indicated that the "MOL would provide the space testing and evaluation facility which we have long sought. We consider it to be the keystone of our future space program."[28] Earlier, Ferguson had simply identified the MOL as the Air Force's "most important space program."[29] More generally, Ferguson highlighted the need for the MOL due to the Air Force belief "that man is the key to the future in space, and that certain military tasks and systems will become feasible only through the discriminatory intelligence of man."[30]

Soon, however, the MOL ran into substantial technical and very difficult political problems. An unmanned Gemini B capsule was successfully tested and recovered from space on 3 November 1966 but design changes and technical difficulties with the laboratory portion of the MOL caused delays and weight increases in this portion of the hardware. Due to the greater weight of the laboratory, the booster configuration for the MOL was redesigned for more thrust and designated as the Titan III-M.[31] More

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McNamara and DDRE Harold Brown had outlined in Congressional testimony in early 1965. See, for example, the statement of Brown in U.S. Congress, Senate, Committee on Armed Services and Subcommittee on Department of Defense of the Committee on Appropriations, Military Procurement Authorizations, Fiscal Year 1966: Hearings before the Committee on Armed Services and the Subcommittee on Department of Defense of the Committee on Appropriations, 89th Cong., 1st sess., 1965, 413-14.

[27]Richelson, Secret Eyes, 91-92. The original MOL schedule called for Navy MOL astronauts to conduct extensive ocean surveillance and submarine tracking experiments during the fourth mission.

[28]U.S. Congress, House, Committee on Armed Services, Hearings on Military Posture, Fiscal Year 1966: Hearings before the Committee on Armed Services, 89th Cong., 1st sess., 1965, 1229.

[29]Ibid., 1219.

[30]Ibid., 1228.

[31]Richelson, Secret Eyes, 90.

significantly, the political support for the MOL began to erode from all quarters. The Johnson administration was facing the impact of the buildup of the war in Vietnam on its great society programs and had little time or inclination to focus on MOL. MOL also suffered from a lack of strong support within Congress where space attention was focused on the growing Apollo costs and the upcoming moon landing. Even within the Air Force, the MOL began to face serious questioning as the war in Vietnam heated up and resources were required for this conflict and for more traditional development programs such as the C-5A transport aircraft. With this decline in political support, funding for the MOL began to be cut well below the levels required to keep the program on its original schedule. By early 1969, the first manned MOL mission had been slipped to 1972 while the total projected cost of the program had risen from $1.5 billion to $3 billion.[32] Despite these difficulties, in February 1969 incoming Secretary of Defense Melvin R. Laird endorsed a comprehensive review of the MOL program which "concluded that the continuance of the program is fully justified by the benefits to our defense posture anticipated from MOL; and that all MOL objectives established by the President in 1965 can now be met with a six- rather than a seven-launch program."[33] Additionally, the Nixon administration initially requested $525 million for the MOL in FY 1970.[34]

The Nixon administration quickly and completely reversed its initial support for the MOL. President Richard M. Nixon was eager to limit the budget and the MOL

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[32]Ibid., 101-2.

[33]Quoted from prepared statement of Air Force Chief of Staff General John P. McConnell in U.S. Congress, Senate, Committee on Armed Services, Authorization for Military Procurement, Research and Development, Fiscal Year 1970: Hearings before the Committee on Armed Services, 91st Cong., 1st sess., 1969, 956. This cutback meant that the MOL program would now include only four manned missions rather than the five originally planned.

[34]Ibid., 957.

program soon emerged as "an ideal target for OMB."[35] The actual decision to terminate the MOL program was apparently made at a White House meeting of OMB representative Robert Mayo, National Security Advisor Henry A. Kissinger, and President Nixon.[36] As they made clear in subsequent Congressional testimony, Secretary Laird and the JCS were not consulted prior to this decision.[37] The public announcement of the cancellation of the MOL program came on 10 June 1969. A total of $1.4 billion was spent of the MOL program, making it one of the most expensive military programs ever prematurely terminated as of that date.[38]

The cancellation of the MOL must also be viewed within a broader context than just the budgetary concerns of the Nixon administration. Shortly after entering office, Nixon had established a Space Task Group (STG) comprised of Vice President Spiro T. Agnew, Acting NASA Administrator Thomas O. Paine, Secretary Laird, and Science Advisor Lee A. DuBridge.[39] Nixon tasked the STG to complete a comprehensive review of the future plans of the U.S. space program.[40] The STG national-level review was supported by reports from working groups at the departmental level. The DoD working groups in support of the STG studied future military space plans and budgets and again raised the issue of the military utility of the MOL in an era of constrained budgets. More specifically, a report for the STG prepared by Walter Morrow of MIT's Lincoln Laboratory "declared that no significant increase in space spending was necessary to meet

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[35]Quoted from an unnamed "senior Air Force officer" in Stares, Militarization of Space, 159.

[36]Richelson, Secret Eyes, 102.

[37]Ibid.

[38]Ibid.

[39]Secretary Laird was represented by Air Force Secretary Robert C. Seamans, Jr. at STG meetings.

[40]On 15 September 1969, the STG presented Nixon with three very ambitious options for the civil space program. Nixon eventually chose the far less ambitious goal of developing the STS as the nation's primary post-Apollo space policy objective.

DOD requirements and that an annual military space investment of about $2 billion would suffice through the 1970s."[41] Thus, when in competition for scare space program funds, the MOL did not necessarily do well even in DoD sponsored analyses.

The most significant factor in the demise of the MOL program, however, was the growing belief that unmanned spy satellites could perform the primary mission of the MOL as well or better than the MOL and at a lower cost. According to Richelson, the NRO and CIA had been leery of the idea of a manned reconnaissance system from the outset. They reasoned that a manned system might present more of a provocation to the Soviets, that the contributions of manned operators in space would not be all that significant when balanced against the costs and requirements of life support systems, and that any accident involving MOL astronauts might set back the whole space-based intelligence gathering process unacceptably.[42] Moreover, beginning in 1965 the NRO had begun development of the United States' fourth generation photoreconnaissance satellite known as the KH-9 or "Big Bird" -- a system originally planned to serve as a backup to the MOL.[43] In the late 1960s with the [illegible] ram already in jeopardy, the NRO now argued that the [illegible] abiliti[illegible] system would make the

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[41]Jacob Neufeld, "The Air Force in Space. 1969-1970," Secret History, Office of Air Force History, July 1972, 4; microfiche document 00338 in Military Uses of Space. (Hereinafter Neufeld, "AF in Space, 69-70"). The overall military input to the STG, "DOD Programs, Options, Recommendations," was largely shaped by the Air Force and outlined four primary military space objectives: "(1) information gathering; (2) deterrence; (3) limiting enemy damage to the nation; and (4) support of Allied forces." This report also grouped possible future space efforts into three categories: 1. Improvements on existing and planned mainstream space systems, primarily for force enhancement. 2. Systems responsive to "significant technological or engineering advances, changes in national policy, or the emergence of new threats" such as a deep space command post. And (3) "undefined" systems such as earth illumination systems or weather modification systems. Ibid., 2-4.

[42]Richelson, Secret Eyes, 103.

[43]Ibid., 105; Stares, Militarization of Space, 160; and William E. Burrows, Deep Black: Space Espionage and National Security (New York: Berkley Books, 1986), 228-29. Big Bird was originally designated as program 612 and became program 467 in 1968.

MOL unnecessary. It is not possible in open sources to trace the exact impact of this argument on the decision to cancel the MOL but it was undoubtedly the clincher given the development paths of both programs and subsequent events. The first KH-9 was launched from VAFB atop a Titan III-D on 15 June 1971.[44]

The saga of the demise of the MOL program served as another painful lesson to the Air Force and the military that their preferred military space doctrines and programs would not come to fruition. The loss of the MOL hit the Air Force very hard because: it was the Air Force's only attempt to establish a major manned military space program during this period, the Air Force had planned to use the MOL as the basis to build a larger manned military space presence, and the MOL program had been specifically tailored primarily to support the space as sanctuary school but had still been rejected. After the Air Force's plan to use men in space to support the nation's highest priority military space mission was not approved, it was very unlikely that any other military man-in-space program would be approved. For a number of years after the cancellation of the MOL, the Air Force largely lost interest in high ground and space control doctrines and basically considered the development of a significant manned military space presence a lost cause. Stares summarizes the organizational impact of the loss of the X-20 and the MOL programs upon the Air Force during this period very well:

> With the cancellation of the Dynasoar and MOL, many believed in the Air Force that they had made their "pitch" and failed. This in turn reduced the incentives to try again and reinforced the bias towards the traditional mission of the Air Force, namely flying. As a result, the Air Force's space activities remained a poor relation to tactical and strategic airpower in its organizational hierarchy and inevitably in its funding priorities. This undoubtedly influenced the Air Force's negative attitude towards the various ASAT modernization proposals put forward by Air Defense Command and others in the early 1970s. The provision of satellite survivability measures also suffered because the Air Force was reluctant to propose initiatives that would require the use of its own budget to defend the

[44]"Launch Listing," in Military Uses of Space, 100. The Titan III-D launch vehicle for the KH-9 was very similar to the Titan III-M designed to launch the MOL. General spysat developments during this period are discussed in a separate section below.

space assets of other services and agencies.[45]

NTMV, ABM Systems, and the SALT I Agreements

The SALT I agreements consisting of the Treaty on the Limitation of Anti-Ballistic Missile Systems (ABMT) and the Interim Agreement on the Limitation of Strategic Offensive Arms (IA) certainly represent one of the most important milestones in arms control during the cold war because they were the first major and comprehensive strategic arms control agreements ever reached between the superpowers. These agreements attempted to codify and take advantage of MAD as the basis for strategic stability between the superpowers. The signing of these agreements on 26 May 1972 also officially signaled the arrival of the era of detente between the superpowers. For our purposes, the most important aspects of these agreements deal with two areas: 1. The central role of spy satellites in enabling these negotiations, in verifying the agreements, and in motivating the legitimization of NTMV found within the agreements; and 2. the unclear prohibitions on space-based ABM systems found in the ABMT. Cumulatively, these agreements can be seen as the final step in conditioning the movement of the U.S. military away from space control or high ground doctrines and towards viewing space as a sanctuary for arms control enabling spy satellites.

The U.S. willingness to pursue strategic arms control negotiations with the Soviets beginning in November 1969 represents major conceptual breakthroughs on several levels. First, these efforts signaled that the U.S. government had generally accepted the action-reaction arms race models and MAD paradigm for strategic planning which had been largely conceptualized and developed by Secretary McNamara in the mid-1960s. The MAD paradigm indicates that strategic forces beyond those required for assured destruction are not politically or militarily useful because a plateau of strategic stability can be achieved when each superpower possesses invulnerable second-strike strategic forces capable of delivering assured destruction and its urban-industrial targets are left undefended. Second, the U.S. entry into these negotiations and the inspection and verification mechanisms of the agreements indicated that the U.S. had judged that its

[45]Stares, Militarization of Space, 242.

NTMV, and its spy satellites in particular, had developed to a point where the U.S. could negotiate a comprehensive strategic arms control agreement which did not rely upon on-site inspection (OSI).[46] This willingness to trust NTMV, rather than insisting on OSI, built upon the verification precedents established in the LTBT and the OST but the SALT I agreements were far more comprehensive and strategically significant than these earlier treaties. Finally, these agreements generally symbolized a new and heightened level of U.S. trust and cooperation with the Soviets both in space and especially on earth.

The specific relationships between space-based NTMV and arms control which are established by these agreements are particularly relevant for this study because they condition all subsequent military space doctrine. Three major issue-areas associated with the relationships between NTMV and arms control are highlighted by SALT I. The first of these issue-areas relates to NTMV as the basic factor enabling arms control. This concept is illustrated by the important provisions on NTMV found in Article XII of the ABMT:

> 1. For the purpose of providing assurance of compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.
> 2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.
> 3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty. This obligation shall not require changes in current construction, assembly, conversion, or overhaul practices.[47]

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[46]Along with the development of more capable U.S. NTMV during the 1960s, the U.S. conception of inspection regimes and verification standards moved away from the rigid and absolute standards which necessitated OSI towards standards based on "militarily significant" violations which NTMV supposedly could monitor, see Robert Joseph DeSutter, "Arms Control Verification: 'Bridge' Theories and the Politics of Expediency," (Ph.D. diss., University of Southern California, 1983), 130-322.

[47]ACDA, Arms Control and Disarmament Agreements, 1982 Edition, 141. This language is repeated essentially verbatim in the IA and is found in most subsequent U.S.-U.S.S.R. arms control agreements such as the 1974 Threshold Test Ban Treaty, the 1976

Article XII is the only discussion of inspection or verification mechanisms in the ABMT and thereby establishes that NTMV are the most important mechanism by which the superpowers can assure compliance with the provisions of the treaty. As such, it is an excellent illustration of the essential, enabling, and symbiotic relationship between NTMV and arms control. This article also helped to close the loop on the superpower disagreements of the early 1960s over whether the concept of peaceful uses of outer space included the right to spy on one another from space. In this context, the exact wording of Article XII is important. Each party is to use NTMV "in a manner consistent with generally recognized principles of international law" which thereby links NTMV both to customary international law based on the prior practices of the superpowers and to the peaceful uses of outer space called for in the OST. In sum, then, these provisions not only highlight the fundamental interrelationship between NTMV and arms control but also help to legitimize NTMV as a peaceful use of space under international law.

A second major issue-area related to the links between NTMV and arms control which is illustrated by the SALT I agreements and other arms control efforts has to do with the direct relationship between NTMV capabilities and the units of limitation in the agreements. Put another way, these units of limitation can only be as precise as can be "seen" by NTMV. The operation of this relationship can be observed in practice by noting that underground nuclear testing was not limited in the LTBT due to difficulties in monitoring these types of tests but that the development of NTMV such as the Vela Hotel satellite series allowed the prohibited area for nuclear testing to be expanded into space. Consider also the improvements in NTMV capabilities implied by the differences in the units of limitation between SALT I and SALT II: In 1972, NTMV was asked to count very large immobile objects such as missile silos and Large Phased-Array Radars; by 1979, NTMV was expected to be able to distinguish between types of ICBMs and to

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Peaceful Nuclear Explosions Treaty, the 1979 SALT II Agreement, the 1987 INF Treaty, and the 1991 START Treaty. Moreover, until supplemented by the OSI and elimination provisions in the INF and START Treaties, NTMV was essentially the only method by which these important agreements were verified. This section focuses on the ABMT but most of the points could also be applied to the IA or any of these other agreements.

count numbers of warheads. The impact of this fundamental relationship between NTMV capabilities and arms control units of limitation was a very important motivation in driving the U.S. aggressively to improve the capabilities of its spy satellites and to optimize these systems for arms control verification purposes throughout the remainder of the cold war.

The final issue-area associated with the relationships between NTMV and arms control focuses on the types of protection for NTMV which are afforded by these agreements. In this case, the exact wording of Article XII is again instructive. The prohibitions on interference with NTMV and on the use of deliberate concealment measures apply only when the NTM are being used to verify compliance with the treaty and are not blanket bans on these type of activities. Thus, the ABMT seems to draw a distinction between the use of NTM for compliance verification (which is supposed to be accepted) and the use of NTM for more general espionage (which is not legitimized by the treaty). Of course, the difficulty in this regard comes in drawing this fine distinction in practice. More specifically, what types of protection are afforded to space-based NTMV as the result of these provisions? An ASAT attack on space-based NTM attempting to verify compliance with the treaty would surely constitute "interference" but how are the parties to judge whether the space-based NTM was engaged in legitimate treaty compliance verification or in unprotected general espionage? Thus, despite the alleged NTM protection these provisions were often thought to provide in the heyday of detente, these provisions in the ABMT should not be seen as constituting an ASAT prohibition or as granting a specific level of legal protection for spy satellites.

The second major issue for our focus raised by the ABMT involves the unclear prohibitions on space-based ABM systems found in the treaty. During this period at the high point of detente, the terms of the ABMT were not generally viewed as controversial or unclear. At this time, the specific prohibition on space-based ABM systems found in Article V seemed very clear: "Each Party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, *space-based*, or mobile land-based."[48] However, while the impact of the ABMT on some of the NTMV-arms control issues raised above is somewhat unclear, the ABMT is a model of clarity on these issues compared with its meaning on prohibiting certain types of ABM systems. During the Reagan administration, the fundamental provisions of the ABMT became mired in controversy. This section uses this opportunity very briefly to examine the controversial portions of the ABMT because the intensity of the debate over the interpretation of the ABMT clearly illustrates the continuing importance of the ABMT on military space systems and doctrine. The debates over the proper interpretation of the ABMT are also largely animated by divergent views over the strategic value of space-based BMD and the general military utility of space.[49]

The controversy specifically revolves around whether or not the ABMT prohibits the development, testing, or deployment of space-based ABM systems based upon so-called "exotic" technologies. The parts of the ABMT most relevant to this debate are Articles II and V and Agreed Statement D. Article II defines ABM systems as follows:

> 1. For the purposes of this Treaty an ABM system is a system to counter strategic ballistic missiles or their elements in flight trajectory, currently consisting of:
>
> (a) ABM interceptor missiles, which are interceptor missiles constructed

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[48]Ibid., 140. Emphasis added.

[49]The ABMT interpretation dispute has generated a large volume of literature and was clearly one of the most important and contentious strategic issues near the end of the cold war. Some of the best and most important sources on this debate and its impact include: U.S. Department of State, Bureau of Public Affairs, Statements by Special Advisor to the President and Secretary of State on Arms Control Matters Ambassador Paul H. Nitze and Legal Advisor Abraham D. Sofaer, "The ABM Treaty and the SDI Program," Current Policy No. 755, October 1985; Abram Chayes and Antonia Handler Chayes, "Testing and Development of 'Exotic' Systems under the ABM Treaty: The Great Reinterpretation Debate," and Abraham D. Sofaer, "The ABM Treaty and the Strategic Defense Initiative," Harvard Law Review 99 (June 1986): 1956-1985; Adam M. Garfinkle, "ABM -- The Wrong Debate," The National Interest, Spring 1988, 76-84; Mark T. Clark, "The ABM Treaty Interpretation Dispute: Partial Analyses and the Forgotten Context," Global Affairs 2 (Summer 1987): 58-79; Strategic Defense Initiative Organization, Report to the Congress on the Strategic Defense Initiative (Washington, GPO, April 1987), Appendix D; and Senator Sam Nunn in the Congressional Record, Daily ed., (11-13 March 1987), S2967-S2986, S3090-S3095, and S3171-S3173.

and deployed for an ABM role, or of a type tested in an ABM mode;
(b) ABM launchers, which are launchers constructed and deployed for launching ABM interceptor missiles; and
(c) ABM radars, which are radars constructed and deployed for an ABM role, or of a type tested in an ABM mode.[50]

Taken together, Articles II and V along with Articles III and IV clearly seem to prohibit testing, development, or deployment of any ABM systems except at each state's declared 100 launcher fixed land-based ABM site and at a maximum of fifteen fixed land-based test launchers located at agreed test ranges (Kwajalein and White Sands for the U.S. and Sary Shagan for the U.S.S.R.).[51]

The debate over the proper interpretation of the ABMT on this issue comes when attempting to reconcile the seemingly clear prohibitions discussed above with the far broader limitations contained in Agreed Statement D:

> In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III of the Treaty, the Parties agree that in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with Article XIII and agreement in accordance with Article XIV of the Treaty.[52]

Taken alone, Agreed Statement D seems to imply that the parties are free to develop and test (and thus to "create") any type (space-based, mobile land-based, etc.) of ABM system (at locations other than the agreed test ranges) so long as these new ABM systems are based on other physical principles (OPP). The Reagan administration contended that this interpretation based on Agreed Statement D was the legally correct interpretation (LCI) of the ABMT because U.S. negotiators were unsuccessful in their attempts to achieve a

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[50]Arms Control and Disarmament Agreements, 139-40.

[51]The provisions in Article III of the ABMT allowed each party two 100 launcher declared ABM sites. This provision was amended to allow each party only one declared ABM site by the Protocol to the ABMT signed on 3 July 1974. Ibid., 162-63.

[52]Ibid., 143. Article XIII establishes and outlines the duties of the Standing Consultative Committee (SCC). Article XIV discusses the provisions for reviewing and amending the treaty.

more comprehensive ban on exotic technologies when the Soviets resisted these efforts during negotiations in 1972.[53]

Many complex issues are raised by this ABMT interpretation dispute including: debates over the military utility of space-based BMD, elements of the MAD versus warfighting for deterrence debate, unanswered constitutional questions concerning the proper role of the Senate in providing advice and consent to treaty ratification and the subsequent responsibilities of the Congressional and Executive branches, questions on the ability of the Executive branch to keep negotiating records secret under Executive Privilege after a treaty has been ratified or to change its interpretation of a treaty, violations of the ABMT found when examining the subsequent practice of the parties, and questions on how to reconcile U.S. constitutional requirements with international law obligations such as those contained in the Vienna Convention on the Interpretation of Treaties.[54] These issues are very important but are well beyond the range of our focus and are not discussed further here.

The two interpretations of the ABMT were briefly examined in this section in order to provide a discussion of these controversial points within the context of the ABMT itself. It is important to recall that these were not major public issues until raised by the Reagan administration in October 1985.[55] Regardless of the "proper" interpretation of the ABMT, for our purposes, the most important aspect of the treaty during this period was its very significant restraining effect on any possible military plans for space-based BMD systems and even on planning for new types of ASAT systems.

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[53]On this issue, see, for example, Stares, Militarization of Space, 166-67. OPP are never defined in the treaty.

[54]For a discussion of these issues, see, for example, Clark, "The ABM Treaty Interpretation Dispute."

[55]National Security Advisor Robert C. McFarlane first publicly revealed the Reagan administration's LCI on the "Meet the Press" television show on 6 October 1985. Note also that the Clinton administration has officially rejected the LCI, see, for example, Thomas L. Friedman, "U.S. Formally Rejects 'Star Wars' in ABM Treaty," New York Times, 15 July 1993, p. A6.

Cumulatively, the SALT I agreements helped to finalize the process of pushing the U.S. military away from the high ground and space control schools of thought. Clearly, the military had very little incentive and no encouragement to look at space in these ways during the heyday of detente.

Military Space Organizations, Plans, and Programs

The conceptual gulf between this period and the last period is very clearly illustrated by contrasting the number of dynamic space plans advanced by the military during the previous period with the nearly complete lack of major space plans during this period. Other than the MOL program discussed above and the limited ASAT plans and programs discussed in a separate section below, there are virtually no major military space plans designed to support high ground or space control objectives which are worth examining at this time. Similarly, during this period there were none of the types of wrenching organizational changes witnessed in the last period, although a few organizational readjustments were carried out at this time. The most significant developments in terms of military space systems during this period were the substantial upgrades in the capabilities of mainstream systems. These upgrades allowed data flows from space operations to become more routine and reliable, thereby enhancing the effectiveness of terrestrial forces tremendously. This section briefly discusses the realignments in space organizations and developments in mainstream space systems to examine how they fit into the military's perceptions of space and national security at this time.

Several fairly minor space-related organizational changes took place during this period. On 1 July 1967 the Air Force created the Space and Missile Systems Organization (SAMSO) by combining Space Systems Division and Ballistic Systems Division. SAMSO reported to AFSC and was the Air Force's primary space and ballistic missile R & D organization throughout this period. This organizational arrangement kept the development, launch, and operation of space systems in the R & D community rather than moving these activities into more operational structures. Thus, this organizational structure clearly perpetuated the split between the space community and the user communities. SAMSO had two primary subordinate organizations: the Space and Missile

Test Center (SAMTEC) responsible for launching satellites and testing ballistic missiles from VAFB and the Eastern Test Range (ETR) at Cape Canaveral; and the Air Force Satellite Control Facility (AFSCF) at Sunnyvale Air Force Station (AFS), CA responsible for controlling military satellites once on orbit.[56] On 1 October 1979 SAMSO was deactivated and its responsibilities were again divided between AFSC's newly recreated Space Division and Ballistic Missile Office.

Another limited space organizational realignment came on 8 September 1970 when DoD revised Directive 5160.32 "Development of Space Systems". The original Directive 5160.32 of 6 March 1961 had assigned the Air Force responsibility for almost all approved space system development beyond the preliminary research stage; this revision included a slight movement back towards more autonomy for each Service in space R & D by indicating that each Service could receive approval from the DDRE to develop "unique battlefield and ocean surveillance, communication, navigation, meteorological, mapping, charting and geodesy satellites."[57] This revision also indicated that the Air Force would remain directly responsible for most space activities including: launch support, launch vehicles, strategic warning and surveillance satellites, and orbital support operations.[58] Overall, this revision reaffirmed Air Force primacy in space but it also

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[56]"SAMSO's 25th Anniversary," Air Force Magazine 62 (August 1979): 48. SAMTEC was established on 1 April 1970. The AFSCF was created on 1 July 1965. For more information on the AFSCF see Master Sergeant Roger A. Jernigan, "Air Force Satellite Control Facility, Historical Brief and Chronology, 1954-1981," AFSCF History Office, 1 January 1982; microfiche document 00290 in Military Uses of Space.

[57]U.S. Department of Defense, Directive 5160.32, "Development of Space Systems," 8 September 1970; cited in Eddie Mitchell, Apogee, Perigee, and Recovery: Chronology of Army Exploitation of Space RAND Note N-3103-A (Santa Monica, CA: RAND Corporation, 1991), 110. The revised Directive was issued by DDRE Dr. John S. Foster, Jr. Prior to this revision of Directive 5160.32, the Air Force was often referred to as the DoD "executive agent" for space although this label had little meaning based on the original Directive 5160.32. On the background and impact of these developments see also the interview with Air Force Assistant Secretary for R & D Grant L. Hansen in Edgar Ulsamer, "How Vulnerable are USAF Military Space Systems?" Air Force Magazine 55 (June 1972): 35-40.

[58]Mitchell, Chronology of Army in Space, 110.

indicated that the Air Force would not be the sole developer or operator of DoD space systems -- a dominant position which the Air Force was now much less interested in than it had been some ten years prior.

The final organizational changes discussed for this period relate to changes in Air Defense Command (ADC). On 15 January 1968, ADC was redesignated as the Aerospace Defense Command.[59] This redesignation reflected the fact that operational control of the Program 437 ASAT system had been transferred from AFSC to ADC in November 1963.[60] However, the general organizational clout of ADC was on the decline during this period due to the relative decrease in the airbreathing threat and growing power of ICBMs and SLBMs within the Soviet strategic arsenal. The inability of ADC successfully to argue the need for improved ASAT systems within the Air Force during this period was partially a reflection of ADC's diminished stature within the Air Force's organizational hierarchy. ADC was deactivated as an Air Force major command on 31 March 1980.[61]

Many types of new and improved satellite systems for early warning and force enhancement came on line during this period. One of the most important of these new systems was the infrared ballistic missile launch detection system for early warning known as the Defense Support Program (DSP). DSP satellites were the successor to the MIDAS program and its offspring in the 1960s.[62] DSP satellites are stationed in

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[59]Charles A. Ravenstein, The Organization and Lineage of the United States Air Force (Washington: Office of Air Force History, 1986), 12.

[60]Stares, Militarization of Space, 122.

[61]Ravenstein, Organization of USAF, 12. The air defense mission was largely assumed by Air National Guard and Air Force Reserve Units while the space defense responsibilities passed to the Aerospace Defense Center.

[62]With the blackout directive of 23 March 1962 the MIDAS program became Program 461. The classified MIDAS follow-on programs of the mid-1960s were apparently designated as Programs 266 and 949. On 14 June 1969, Program 949 was redesignated as Program 647 and given the unclassified DSP nomenclature, see "Space Systems Glossary" in Military Uses of Space, 166-67. Upgraded versions of DSP satellites are in operation today.

geostationary orbit (GSO) and use large infrared telescopes to detect the energy emitted by ballistic missiles during the boost phase of their trajectory.[63] The first successful DSP launch was made by a Titan III-C from the ETR on 5 May 1971.[64] The first complete operational early warning constellation of three DSP satellites was established following the third successful DSP launch on 12 June 1973.[65] Because the DSP constellation is able to provide continuous and nearly worldwide detection of ballistic missile plumes within only 30-90 seconds of launch, this system is designed to deliver the first early warning of a possible ballistic missile attack on the U.S.[66] Along with this critical first early warning mission and its place within NORAD's "dual phenomenology" attack characterization requirements, other sensors on DSP satellites also eliminated the need for the Vela Hotel satellite system for nuclear explosion surveillance.[67] Establishing the DSP satellite system was among the highest priority Air Force space missions during this period. DSP satellites are nearly universally viewed as stabilizing factors in the strategic

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[63]The GSO is located 22,300 miles above the equator, a position where the orbital velocity of a satellite matches the earth's rotation rate and the satellite thus appears motionless above a fixed location on the equator.

[64]"Launch Listing" in Military Uses of Space, 100.

[65]Ibid., 102. The normal operational DSP early warning constellation consists of three active satellites and two spares. The active satellites are usually located over the Indian Ocean, the Eastern Pacific, and Brazil.

[66]DSP satellites apparently cannot detect ballistic missile launches from polar regions very well. On DSP operational capabilities see, for example, Desmond Ball, A Base for Debate: The U.S. Satellite Station at Nurrungar (Sidney: Allen and Unwin, 1987), 22-31; Craig Covault, "Astronauts to Launch Early Warning Satellite, Assess Manned Reconnaissance From Space," Aviation Week & Space Technology, 18 November 1991, 65-69; and Covault, "Recon Satellites Lead Allied Intelligence Effort," Aviation Week & Space Technology, 4 February 1991, 25-26.

[67]Dual Phenomenology refers to NORAD's requirement that the U.S. be able to detect strategic attacks using at least two separate systems with different sensing mechanisms (e.g. infrared and radar). The nuclear detonation (NUDET) sensors on the DSP system are the backup to the NUDET Detection System (NDS) on the GPS satellite constellation. The last satellites in the Vela Hotel series were launched on 8 April 1970, see "Launch Listing," in Military Uses of Space 98.

balance and match well with the space as sanctuary school of thought.

The military's first weather satellite system known as the Defense Meteorological Satellite Program (DMSP) became operational during this period. The first DMSP satellite was launched from VAFB into a circular polar orbit atop a Thor Altair booster on 18 January 1965.[68] The existence of the DMSP was not publicly revealed until 12 March 1973 when Under Secretary of the Air Force (and presumably NRO Director) John L. McLucas indicated that the system could "provide decision-makers with weather data within a matter of minutes of the time it is called from space."[69] Successive generations of the DMSP system have included various improvements which, by the end of this period, allowed field commanders to access DMSP data directly rather than having to go through Global Weather Central at SAC Headquarters.[70] The substantial capabilities of the DMSP provide significant force enhancement both the strategic and tactical level of operations. Generally speaking, the DMSP was also a very non-controversial military space application for force enhancement.

Several types of major military communications satellite systems were fielded during this period. The Defense Satellite Communications System (DSCS), Phase I, was first launched into GSO by a Titan 3-C from the ETR on 16 June 1966.[71] The DSCS, Phase II, was approved in 1968 and first successfully operated from GSO in February

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[68]Ibid., 80. At the time this system was known as Program 417 or the Defense Systems Applications Program. DMSP satellites normally operate in pairs in sequenced circular polar orbits with 12 hour periods at an altitude of approximately 450 miles. In this way, each satellite scans every area on earth once every twelve hours and the pair scans each area once each six hours.

[69]Quoted from Aviation Week & Space Technology, in "Chronology" in Military Uses of Space, 41. The primary reason for this security classification for the DMSP was due to its important function of checking cloud cover prior to orbital sweeps by U.S. photoreconnaissance satellites.

[70]"Space Systems Glossary" in Military Uses of Space, 156. Improved versions of the DMSP system are in operation today.

[71]Ibid., 157. This first launch placed 26 small DSCS I satellites on GSO.

1974.[72] The DSCS provides worldwide coverage for high-priority message traffic of the U.S. government. Towards the end of this period, two major and more specialized military communications satellite systems began to come on line. The first of these new programs, the Fleet Satellite Communications System (FLTSATCOM), was initiated on 27 September 1971.[73] The original FLTSATCOM system provided UHF radio links to surface ships, submarines, and aircraft while later models began to add SHF radio transponders as well. The first FLTSATCOM satellite was launched from the ETR into GSO atop an Atlas Centaur booster on 9 February 1978.[74] The second of these more specialized systems, the Air Force Satellite Communications System (AFSATCOM), was begun in April 1973. The AFSATCOM does not use a dedicated set of satellites, rather AFSATCOM UHF and SHF transponders are located aboard a variety of host satellite systems including FLTSATCOM, DSCS, the Satellite Data System (SDS), and the Lincoln Experimental Satellites (LES).[75] The primary purpose of the AFSATCOM system is to transmit Emergency Action Messages (EAM) from the National Command Authority (NCA) to U.S. nuclear forces. AFSATCOM achieved IOC on 22 May 1979.[76] Cumulatively, these new satellite communications systems revolutionized the U.S. military's command and control system by providing nearly worldwide and instantaneous communications with most types of major U.S. weapons systems.

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[72]Ibid. DSCS 2 satellites operate in pairs.

[73]"Chronology" in Military Uses of Space, 40. SAMSO developed the FLTSATCOM system for the Navy.

[74]"Launch Listing" in Military Uses of Space, 108. The first operational constellation of four FLTSATCOM satellites was completed in October 1980.

[75]"Space Systems Glossary" in Military Uses of Space, 153. The LES system was launched into GSO on 4 March 1978 and provided interim UHF communications until the AFSATCOM system came on line. The first four SDS satellites were launched on 2 June 1976. The SDS apparently performs two other major functions besides serving as a host for AFSATCOM transponders: data relay from KH-11 photoreconnaissance satellites to ground stations and command and control links for other satellite systems.

[76]"Chronology" in Military Uses of Space, 47.

Another type of U.S. military force enhancement capability from space made its debut during this period. On 14 December 1971 a set of ocean surveillance satellites known as the PARCAE or White Cloud system were launched into a high inclination circular LEO from VAFB.[77] The White Cloud system consists of a main satellite and three subsatellites which passively scan the oceans for infrared, radio, and radar emissions.[78] The White Cloud system is designed to use triangulation techniques between the main satellite and the subsatellites to locate Soviet surface and submarine naval forces.[79]

The final major force enhancement satellite program begun during this period was the Global Positioning System (GPS). The roots of the GPS go back to the Air Force's Project 621B begun on 28 November 1969 and the Navy's Timation satellite system first tested in June 1967. In 1973, these two programs were merged into the NAVSTAR GPS program under Air Force management.[80] The GPS provides users highly accurate locational fixes worldwide by employing the time-difference-of-arrival method. Under this method, GPS receivers use triangulation based upon the slight differences between the arrival times of signals from several GPS satellites in known orbital locations to determine their own precise location.[81] The first test GPS satellite was launched on 23

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[77]"Launch Listing," in Military Uses of Space, 100.

[78]"Space Systems Glossary," in Military Uses of Space, 166.

[79]Ibid. The Navy's entire ocean surveillance system consisting of the White Cloud system and its five associated ground stations is designated CLASSIC WIZARD. Two additional sets of White Cloud satellites were launched in April 1976 and December 1977. Improved versions of the White Cloud system remain in operation today.

[80]Ibid., 160.

[81]Under Selective Availability (SA), military users must operate special receivers and codes to access Precise Positioning Service (defined as a spherical error probable [SEP] of 16 meters and a velocity accuracy of 0.1 meter per second) while civilian users without these codes would receive Standard Positioning Service (defined as a SEP of 100 meters). See Joseph Wysocki, "GPS and Selective Availability -- The Military Perspective," GPS World, July/August 1991, 38-40.

June 1977 and the program was originally scheduled to complete its operational constellation of 18 active and 3 spare satellites by the mid-1980s.[82] The secondary function of the GPS is to host the NDS system capable of locating nuclear detonations worldwide with a high degree of accuracy. NDS data would serve as an ideal input to the type of "shoot-look-shoot" nuclear targeting strategies implied by the countervailing strategy of Presidential Directive (PD)-59 and as such it aroused considerable opposition amongst those opposed to nuclear warfighting for deterrence.[83] The GPS offered the potential for revolutionary force enhancement applications but the system was not close to being completed by the end of this period.

Cumulatively, these new and enhanced space systems deployed during this period significantly increased the value of space systems in multiplying the combat effectiveness of terrestrial forces. The depth and amount of the force enhancement capabilities available at the end of this period contrasted sharply with the minimal force enhancement capabilities of the space systems deployed at the beginning of this period. These vastly improved force enhancement capabilities represented the beginning of a revolution in space and terrestrial military operations which was little understood in the late 1970s. Moreover, Air Force and general U.S. military space doctrine was not particularly clear or coherent in guiding the development of these force enhancement capabilities and was not the main driver behind the development of these very significant capabilities. Rather, relatively unfocused, bottom-up, and incremental technical improvements slowly established this growing capability. Unfortunately, the limited space doctrine discussions of this period did not provide any clear guidance on where these technological developments were or should be headed.

The continuing technological improvements in space systems also at times blurred

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[82]GPS satellites are evenly spaced on six circular semi-synchronous orbital planes at an altitude of approximately 11,000 miles.

[83]PD-59, "Nuclear Weapons Employment Policy," was signed by President Carter on 25 July 1980. A version of this directive which is almost completely blanked out is available in the NSC box at the National Archives.

the distinctions between force enhancements at the tactical and strategic levels and thereby raised questions about the fit of space systems into the evolving U.S. nuclear strategy during the end of this period. Recognition of the growing importance of these continuing force enhancement capabilities was also a key factor in fueling the growth of the survivability school of thought on space at the end of this period. As the potential of space systems became more important to warfighting, top civilian and military decision-makers began to realize that the U.S. was becoming increasingly dependent upon space systems and that many space systems would need major survivability improvements to function more reliably in wartime. Finally, the space organizations and the development of space systems during this period also illustrate the continuing split between the space development and user communities. Largely due to security, psychological, and organizational barriers, the white world space development community (primarily SAMSO) was permeated with a non-operational R & D mindset and often knew or cared little about the operational needs and preferences of the space user communities. The space user communities, on the other hand, were fragmented and had different operational needs but had little knowledge of what space-based force enhancement capabilities were or could be available. Given the growing capabilities of space systems, these organizational and doctrinal weaknesses were becoming more evident by the late 1970s and helped to mark the end of this period.

Spy Satellite Developments and the Military

The most direct impact of spy satellites on the military space programs and doctrine of this period was the secret competition between the MOL and the KH-9 described above. However, several other interactions between spy satellite programs and military space plans and programs were also important at this time. As the third, fourth, and fifth generation U.S. photoreconnaissance satellites came on line during this period, U.S. national space policy towards these systems continued to limit military input into the development of these systems and also restricted military access to their products. The U.S. also deployed several generations of sophisticated SIGINT satellites during this time. Overall, this top-priority military use of space continued to shape all other possible U.S. military space applications in both fundamental and subtle ways.

At the beginning of this period, three descendants of the CORONA and SAMOS programs first came on line; these three main types of U.S. photoreconnaissance satellites which first operated during the mid-1960s were the KH-4, KH-7, and KH-8. The KH-4 system was an area surveillance follow-on to the original CORONA program; the third generation KH-7 and KH-8 systems were the first U.S. efforts to develop multi-spectral imaging (MSI) and "close-look" photo capabilities.[84] These systems generally operated in sequence: when a KH-4 spotted something of interest then a KH-7 or 8 would be sent to investigate more closely.[85] Although these systems represented significant improvements in resolution and reliability over their predecessors, as bucket droppers they were unable to provide timely information on fast-breaking events such as the 1968 Warsaw Pact invasion of Czechoslovakia or the Arab-Israeli wars in 1967 or 1973.

As spysats continued to evolve and improve, the organizational arrangements for developing and operating these systems became more strained. At the time of the creation of the NRO and during the earliest operation of U.S. spy satellites, the relationship between the CIA and Air Force was apparently quite smooth. By the mid-1960s, however, this relationship had become more difficult due to three major factors: changed key personnel; differing priorities for satellite design and capabilities, satellite operational control and targeting, and data interpretation; and the MOL debate over the

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[84]Richelson, Secret Eyes, 77-78, Appendix B. The Keyhole (KH) designation specifically refers to the camera system carried aboard these satellites but is generally used to identify the whole satellite system. According to Richelson, the KH-4A CORONA was used 1963-1967 and had a resolution of approximately 10 feet. The KH-4B CORONA was used 1966-1972 and had a resolution of approximately 5 feet. The KH-7 GAMBIT operated between 1963-1967 and was the first U.S. attempt to develop "close-look" capabilities with a resolution of approximately 18 inches. The KH-8 GAMBIT eventually had a resolution of approximately six inches and was a very long lived program, operating between 1966-1984. All of these spy satellites were "bucket droppers" which ejected their film capsules to be recovered in midair using the same technique developed for the original CORONA program.

[85]Ibid., 77-78.

role of manned space reconnaissance.[86] The Air Force had developed the KH-7 and wished to operate this system more independently but this option was apparently closed by the creation of the National Reconnaissance Executive Committee (NREC) in 1965.[87] Continuing debates over the allocation of spysats to specific missions and over differences in data interpretation led to the creation of the Committee on Imagery Requirements and Exploitation (COMIREX) in 1967. COMIREX is responsible for prioritizing and scheduling available intelligence assets against desired targets and also assigns primary responsibility for data interpretation on specific targets to individual agencies.[88]

These new organizational structures had quieted some of the bureaucratic infighting within the black world by the late 1960s but major unresolved issues remained. The most important of these unresolved issues was the debate over the MOL described above.[89] Another important debate at this time was over the types of capabilities required of the fifth generation spysat. Here, the CIA and the Air Force again came into

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[86]Ibid., 79-82. In 1963 Brockway McMillan replaced Charyk as NRO Director and Albert D. Wheelon replaced Herbert Scoville and Bissell as Deputy Director for Science and Technology (DDS&T) at CIA. McMillan and Wheelon apparently hated one another and the NRO at this time was the scene of turf battles "so vituperative that they are still talked about." Quote from page 82. The debate over the reconnaissance utility of the MOL is discussed in the MOL section above.

[87]Membership on the NREC apparently consists of the DCI, the Science Advisor (or National Security Advisor) and a DoD representative. Decisions of the NREC go for approval to the Secretary of Defense and then to the President. If the DCI objects to a decision of the Secretary, he is allowed to take his case directly to the president. The planners on the Joint Strategic Target Planning Staff (JSTPS) at SAC Headquarters who develop the Single Integrated Operations Plan (SIOP) for strategic conflict were particularly interested in controlling their own access to spysat data flows. See Burrows, Deep Black, 205; and Richelson, Secret Eyes, 82.

[88]Richelson, Secret Eyes, 96-97; and Burrows, Deep Black, 204.

[89]The KH-9 or Big Bird which superseded the MOL represented the fourth generation U.S. photoreconnaissance satellite. The huge size of KH-9s allowed them to carry a variety of MSI sensors and ELINT equipment in addition to a large amount of film. The KH-9 is apparently the last U.S. photoreconnaissance satellite to use the film recovery method. KH-9s remained operational well into the 1980s.

conflict -- the CIA's DDS&T was pushing the revolutionary filmless system which would culminate in the KH-11 while the Secretary of the Air Force Office of Special Projects (SAFSP) was recommending an incremental approach known as Film-Readout GAMBIT or FROG.[90] Secretary of Defense Laird initially selected the FROG approach as the follow-on to the KH-9.[91] Apparently, Laird's decision was reversed at a 1972 meeting of the President's Foreign Intelligence Advisory Board which was chaired by Nixon himself.[92] The first KH-11 was launched into a polar orbit from VAFB atop a Titan III-D on 19 December 1976.[93] The decision to develop the KH-11 represented another major bureaucratic setback for the Air Force within the black world but, more importantly, access to the realtime data flows from the KH-11 were even more tightly controlled than the film from previous systems had been and the military had extremely limited access to this product.[94]

Several types of specialized SIGINT satellites were also deployed during this period. Open source information concerning U.S. SIGINT satellites is incomplete and contradictory. However, it does seem clear that the U.S. began various types of SIGINT

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[90]Richelson, Secret Eyes, 126. SAFSP is the Air Force component of the NRO.

[91]Ibid., 126-27.

[92]Ibid., 127-28.

[93]"Laurch Listing" in Military Uses of Space, 106. On 2 March 1978, William Kampiles, a disgruntled former CIA watch officer, sold the Soviets the technical manual to the KH-11. Due to Kampiles' subsequent trial and the information released at the time, the KH-11 is undoubtedly the best publicly understood and least secret of U.S. spysats. The KH-11 uses extremely sensitive Charged Coupled Devices (CCDs) to digitally convert pictures into electronic signals which are then transmitted (through the SDS satellite constellation) and digitally reconverted into pictures at ground stations such as the Defense Communications Electronics Evaluation and Testing Activity at Fort Belvoir, VA. The resolution of the KH-11 is reportedly as sharp as two inches from 160 miles altitude.

[94]Richelson, Secret Eyes, 132. The political decision to tightly restrict the realtime KH-11 data flows was very significant because, technically, these electronic data flows could be widely disseminated to military units worldwide much more easily and rapidly than film could be distributed.

programs during the 1960s. Bamford writes that during the 1960s and 1970s the U.S. launched about three to five small electronic intelligence (ELINT) ferret satellites per year into LEO as piggyback components on photoreconnaissance satellites.[95] The data from these satellites is apparently sent to the Defense Special Missile and Astronautics Center at the National Security Agency (NSA) Headquarters at Fort Meade, MD.[96] On 19 June 1970, a new type of SIGINT satellite, known as Rhyolite, was launched by an Atlas Agena D from the ETR.[97] Technological improvements had allowed the creation of a new generation of SIGINT satellites, also nicknamed vacuum cleaners, to be placed in GSO and still have the required sensitivity to suck up virtually all electromagnetic radiation within their view. A new type of vacuum cleaner known as Chalet or Vortex was launched from the ETR atop a Titan III-C on 10 June 1978.[98] There is virtually nothing in open sources specifically concerning the military's interactions with these SIGINT systems or on other bureaucratic forces shaping these most secret space programs at this time.

Cumulatively, the technological wonders described above and the policies for their use had a profound impact on U.S. military space doctrine and perceptions towards military uses of space during this period. By the time he became president, Lyndon B.

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[95]V. James Bamford, The Puzzle Palace: A Report on America's Most Secret Agency (Boston: Houghton Mifflin, 1982), 196. See also "Launch Listing" in Military Uses of Space. Ferret satellites passively receive broadcast electronic transmissions such as radar signals.

[96]Bamford, Puzzle Palace, 190-91. This space data input center at NSA Headquarters opened in September 1966.

[97]"Launch Listing" and "Space Systems Glossary" in Military Uses of Space, 98, 167-68. See also Desmond Ball, Pine Gap: Australia and the US geostationary signals intelligence satellite program (Sidney: Allen and Unwin, 1988), 14-15. Pine Gap, near Alice Springs, Australia, is apparently the primary ground station for U.S. GSO SIGINT spysats. The Rhyolite system was compromised beginning in 1975 when Christopher Boyce and Andrew Dalton Lee began selling information on this system to the KGB at the Soviet Embassy in Mexico City. See Robert Lindsey, The Falcon and the Snowman (New York: Pocket Books, 1979).

[98]"Launch Listing" in Military Uses of Space, 108.

Johnson had obviously swung far away from his initial position on space as the new high ground. Consider his often cited off-the-record remarks to a group of Tennessee educators in March 1967:

> I wouldn't want to be quoted on this but we've spent 35 or 40 billion dollars on the space program. And if nothing else had come out of it except the knowledge we've gained from space photography, it would be worth ten times what the whole program has cost. Because tonight we know how many missiles the enemy has and, it turned out, our guesses were way off. We were doing things we didn't need to do. We were building things we didn't need to build. We were harboring fears we didn't need to harbor.[99]

President Johnson's remarks obviously refer directly back to the missile gap episode but they also reflect his faith in and enthusiasm for space-based reconnaissance. These sentiments were instrumental in moving Johnson to propose superpower arms control negotiations at the Glassboro Summit three months later.

Interestingly, at this time, the intelligence community was apparently opposed to the possibility of using space-based platforms for arms control monitoring:

> The intelligence community had argued that its sensitive overhead systems could not be employed for monitoring compliance. The community had argued that the use of those systems for verification purposes would require the United States to make its capabilities public to establish that it could verify compliance. It was also argued that signing an agreement to be monitored by intelligence systems would reveal the capabilities of those systems, and that charges of violations would have to be backed up by revelation of the data indicating such violations.[100]

However, as described in the section on the SALT I agreements above, the intelligence community soon came to recognize the benefits of the symbiotic relationship between NTMV and arms control in selling their latest spysat hardware. This symbiotic relationship also contributed directly to the shape of the U.S. spy satellite infrastructure during this period: spysats generally were optimized for their NTMV mission and the entire system was predicated on space as a sanctuary type thinking -- it was not

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[99]Burrows, <u>Deep Black</u>, vii.

[100]Richelson, <u>Secret Eyes</u>, 111.

responsive to military requirements (especially at the tactical level) or very robust in space or on the ground when faced with possible attack. Clearly, these most valuable of military intelligence assets were not very directly useful to the military or designed around military requirements during this period.

The final area within this section briefly examines the continuing organizational schism within the Air Force caused by the bureaucratic structures for developing and operating spysats. With the ascendancy of the sanctuary school during this period, SAFSP came largely to dominate Air Force space thinking at this time and the focus on spysat development came to eclipse other military space applications even within the Air Force. Given the black nature of the dominant plans and programs, this shift in Air Force thinking on space was more subtle than overt and was certainly also conditioned by the cancellation of the MOL and the space-related arms control efforts described above. The divergence of opinion among various Air Force organizations (especially between the black and white worlds) on the military utility of ASAT is undoubtedly the best indication of the continuing schism during this period. Given the vulnerable LEO location, few numbers, and exorbitant costs of most space-based intelligence gathering assets, the sanctuary school met the operational requirements of the NRO very well and the idea of ASAT weapons was an anathema to this group. Of course, other groups within the Air Force such as ADC and other U.S. military groups who were beginning to realize that they were being threatened or targeted by Soviet space systems saw ASAT systems in a very different light. Thus, at this time, the requirements of the black world, even though not openly stated, powerfully conditioned all Air Force thinking on space.

The Military and the Development of the Space Shuttle

Interactions between NASA and DoD were important in the structure and development of the STS program. NASA's decision to pursue a large shuttle vehicle program to serve as the "national" launch vehicle was the agency's primary post-Apollo space program goal. This decision necessitated that the shuttle design be able to accommodate the most important potential users and satisfy the military in particular. Accordingly, DoD was instrumental in setting shuttle payload and performance criteria. Even more importantly, when the STS ran into great political and budgetary problems during the Carter administration, the DoD stepped in to help save the program -- largely due to the Shuttle's projected capability to launch huge spy satellites. Thus, the rationale behind the STS during this period became increasingly militarized and related to spy satellites. By the end of this period, the military could also again entertain plans to develop a manned military presence in space via the STS.

The question of what the U.S. should focus on in space following its triumph in the moon race was the overriding issue for U.S. space policy in the late 1960s and early 1970s. President Nixon created the Space Task Group (STG) in February 1969 to examine this issue.[101] On 15 September, the STG presented Nixon with three options for post-Apollo U.S. civil space plans. Option one called for a manned mission to Mars by 1985 supported by a 50-man space station in orbit around earth, a smaller space station in orbit around the moon, a lunar base, a space shuttle to service the earth space station, and a space tug to service the lunar stations. Option two consisted of all of the above except for the lunar projects and delayed the Mars landing until 1986. Option three included only the space station and the space shuttle, deferring the decision on a Mars mission but keeping it as a goal to be realized before the end of the century.[102] The report estimated that option one would cost approximately $10 billion annually, option two would run about $8 billion per year, and option three would be "only" $5 billion annually.[103] Considering that NASA's budget had peaked at the height of the moon race in 1965 at a little more than $5 billion and that political support for space spectaculars was rapidly eroding, the STG recommendations seemed fiscally irresponsible and politically naive.[104]

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[101]For more on the military inputs to the STG and the members of the STG, see the MOL section above.

[102]Colonel Cass Schichtle, USAF, The National Space Program From the Fifties into the Eighties (Washington: National Defense University Press, 1983), 72-73; and McDougall, Heavens and Earth, 421.

[103]McDougall, Heavens and Earth, 421.

[104]Schichtle, National Space Program, 69.

Meanwhile, the Air Force and NASA had begun coordinating with one another concerning the need for, design criteria, and performance capabilities of a shuttle vehicle. In March 1969, STG Chairman Agnew had directed that a joint DoD-NASA study on a shuttle system be completed to support the overall STG effort.[105] During the Spring of 1969, Air Force Chief of Staff General John P. McConnell was very impressed with the military potential of a shuttle vehicle and even "proposed the Air Force assume responsibility for STS development."[106] Air Force Secretary Robert C. Seamans, Jr., was also impressed with the potential of a shuttle but "he vetoed the proposal that the Air Force take charge of STS development, preferring to await additional study results."[107] In June, DoD and NASA submitted to the STG their coordinated report on the STS which strongly backed the development of a shuttle.[108] By contrast, the Morrow report, which was also prepared for the STG, questioned the technical feasibility of a shuttle and specifically refuted the projected STS launch rates and cost estimates. The Morrow report recommended "the DOD postpone its participation in the system's development pending technical and economic analysis."[109]

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[105]Neufeld, "AF in Space, 69-70," 5; microfiche document 00338 in Military Uses of Space.

[106]Ibid., 6.

[107]Ibid.

[108]Ibid., 6-7. Specifically, "the report concluded that STS development (1) would require no significant 'breakthrough' in technology, (2) could achieve 'a major reduction in the recurring costs of space operations,' and (3) could meet the requirements of both agencies without 'major technical penalty, development risk, limitation on mission flexibility, or cost increase.'" Neufeld is citing the report itself in the interior quotes. The report recommended a $52 million allocation in FY 1970 for design studies. Moreover, the report also: found that the STS could be operational by 1976 for between $4-6 billion, projected a launch rate of 30 to 70 flights per year, and estimated that with 100 uses the STS would lower launch costs per pound into LEO to $50-100 and to $500 into GSO.

[109]Ibid., 7. The Morrow report is also discussed in relation to the MOL in the MOL section above.

DoD and the Air Force acknowledged some of the potential STS difficulties raised by the Morrow report but remained supportive of shuttle development. The military specifications for the shuttle at this time included a 50,000 pound payload capability for launches into a 100 nautical mile (NM) due east orbit, a payload compartment measuring 15 by 60 feet, and a crossrange maneuvering capability of 1500 NM.[110] Some NASA shuttle designs did not meet all of these criteria but NASA quickly recognized the political necessity for strong Air Force support in attempting to sell the shuttle within the administration and agreed specifically to include the Air Force in future STS design and policy decision-making. To formalize this arrangement, on 17 February 1970 the Air Force signed an agreement with NASA which established the joint USAF/NASA STS Committee.[111]

On the basis of the STG report and the recommendations from other space studies during this period, President Nixon moved to formalize U.S. post-Apollo space policy goals in March 1970.[112] Basically, Nixon only endorsed the development of a shuttle

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[110]Ibid., 8. The Air Force's weight and volume requirements for the STS seemed to be driven by projected spysat designs while the crossrange maneuverability requirement was apparently a general military requirement due to safety, survivability, and flexibility considerations. Some critics within NASA and other analysts have charged that these requirements (especially the crossrange criteria) were set too high arbitrarily and caused very significant design changes and later contributed to STS program delays. See, for example, the positions raised in John M. Logsdon, "The Decision to Develop the Space Shuttle," Space Policy 2 (May 1986): 103-19. Professor Logsdon is Director of the Space Policy Institute at George Washington University.

[111]Neufeld, "AF in Space, 69-70," 9; microfiche document 00338 in Military Uses of Space. The creation of this committee did not solve all of the AF-NASA differences over STS design issues. Powerful elements within NASA such as Associate Administrator for Manned Spaceflight, Dr. George E. Mueller, continued to press for a smaller STS design which would not meet all of the Air Force's criteria.

[112]Two of the most important other studies on U.S. post-Apollo space goals which were also completed during this period but not mentioned above were: The overall NASA input to the STG known as the Mueller Report after its Chairman George Mueller; and the PSAC report headed by Lewis Branscomb. The Mueller report stressed a building block approach for the next major civil space programs and emphasized the general utility of a space shuttle for all other projects. The Branscomb report urged that

and left a space station or a Mars mission contingent upon the successful completion of a shuttle program. Of course, this was far less than NASA had hoped for and the agency that had conquered the moon was initially less than enthused about the prospect of building a non-glamorous space truck as its primary post-Apollo mission.[113] Soon, however, NASA came to realize that a space shuttle was the only major program which stood a chance of being approved at this time and the only possible way to preserve at least a part of NASA's integrity in the face of radical cuts in civil space programs and budgets.[114]

Faced with this situation, NASA continued its attempts to design a space shuttle during 1970 and 1971. In late 1970 and early 1971, acting Administrator George M. Low continued Paine's emphasis on the shuttle as a "national vehicle" by moving NASA from concept towards design of a larger and more capable shuttle. Thus, by 1971 NASA was hard at work on what has been described as a "Cadillac" shuttle system -- very large, very capable, and completely reusable, but very expensive to develop.[115] These very capable designs proved to be too expensive, especially after OMB reiterated that NASA

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the U.S. place more emphasis on unmanned versus manned exploration and recommended robotic exploration of Mars. On these two reports and their impact see Hans Mark, The Space Station: A Personal Journey (Durham: Duke University Press, 1987), 31-34.

[113]NASA Administrator Thomas O. Paine resigned in September 1970 over this issue and his general perceptions of a lack of support for NASA within the Nixon administration. See Joseph J. Trento, Prescription for Disaster (New York: Crown Publishers, 1987), 84-99.

[114]NASA's budget (in constant dollars) fell to only 36% of its 1965 peak by the time of its nadir in 1975. The speed of these reductions meant that NASA's budget often was reduced by more than $500 million or more than 10% in constant dollars each year. Moreover, the number of jobs in the civil space sector had dropped from a peak of 420,000 in 1966 to only 190,000 by 1970 and continued down from that point. See Schichtle, National Space Program, 73; and "NASA Budget History," Aviation Week & Space Technology, 16 March 1992, 123.

[115]Alex Roland, "Priorities in Space for the USA," Space Policy 3 (May 1987): 106. and is a former NASA historian.

could expect no more than $6.5 billion to develop the shuttle.[116] Meanwhile, the Air Force remained adamant on its payload and performance criteria and apparently even raised its maximum payload weight requirement to 65,000 pounds.[117] During the remainder of 1971, NASA came up with a revised shuttle design known as the Thrust-Assisted Orbiter Shuttle (TAOS) which seemed to better meet these demanding development cost ceilings and performance criteria.[118] After very intense scrutiny from the OMB during the Fall of 1971, the TAOS design went forward to President Nixon for final approval.[119] Nixon privately decided to approve the full-scale TAOS at the Western White House at San Clemente over the 1971-72 New Year's weekend.[120] James C. Fletcher, the new NASA Administrator, went to the Western White House to brief the president and to be present when the decision to approve the STS was publicly announced on 5 January.

Other than setting the payload and performance design criteria discussed above,

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[116]Logsdon, "Space Shuttle Decision," 107.

[117]Ibid., 108-10 discusses the Air Force's payload and performance criteria. Logsdon indicates that the most important Air Force weight requirement was for the capability to launch 40,000 pounds into polar orbit and that the 15 foot dimension of the cargo bay was a NASA requirement for possible future station construction rather than an Air Force criteria.

[118]The TAOS design moved away from the original designs which called for a vertically stacked booster-orbiter configuration staging in sequence as in all previous spacecraft designs to a horizontally stacked booster-orbiter design where the booster and orbiter engines could be used at the same time. This design also moved the large main fuel tank outside the booster and made this section expendable rather than reusable. The TAOS design lowered the overall size and weight of the vehicle by allowing the space shuttle main engines (SSMEs) to contribute to takeoff thrust but it also greatly increased the technological challenges for designing the SSMEs and introduced the problem of asymmetrical thrust on takeoff. This and other design decisions at this time lowered the development costs for the STS but would also contribute significantly to the much higher than desired STS operations costs.

[119]Logsdon, "Space Shuttle Decision," 112-16, describes the NASA-OMB exchanges during this time in great detail.

[120]Ibid., 118.

the Air Force was not very involved financially or otherwise in the STS program during most of its development period. In 1971, the Air Force agreed that it would not compete against the STS and would forgo the development of any new Expendable Launch Vehicles (ELVs).[121] In April 1972, the Kennedy Space Center (KSC) and VAFB were selected as shuttle launch and landing sites and the Air Force agreed to reconfigure the planned MOL launch complex at VAFB (known as SLC-6) for STS launches into polar orbit.[122] Interestingly, former NASA Administrator Fletcher claimed in an later interview that the Air Force had verbally committed to him during STS development that they would buy the planned fifth and sixth orbiters.[123]

Throughout the remainder of the 1970s, the STS faced difficult technical and political challenges. Three major technical challenges were the most difficult: developing the computer software and interfaces for the orbiter's computer controlled flight system, designing and especially attaching the ceramic tiles for the orbiter's heat protection system, and designing and testing the SSMEs. Politically, the STS faced even more difficult challenges at the outset of the Carter administration. Several powerful individuals and organizations such as Vice President Walter Mondale, the OMB, and the Office of Science and Technology Policy (OSTP) favored drastically cutting back the STS if not canceling the program outright.[124] In the summer of 1977, as the test vehicle

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[121]Ibid., 110.

[122]Major General R. C. Henry and Major Aubrey B. Sloan, "The Space Shuttle and Vandenberg Air Force Base," Air University Review 27 (September-October 1976): 19-26. SLC-6 reconfiguration for STS launches was formally approved by the Aeronautics and Astronautics Coordinating Board in January 1975.

[123]Trento, Prescription for Disaster, 128. I was unable to find any hard evidence of such a commitment. In the wake of the *Challenger* disaster, many varied theories were advanced to explain culpability for the woes of the STS program.

[124]Mondale had helped to make a name for himself in the Senate with his attacks on the "bloated" NASA budgets of the late 1960s and as a leader of Congressional opposition to building the STS. In 1973, President Nixon had abolished the NASC and moved the Science Advisor's office out of the Executive Office of the President (EOP). In 1976, President Gerald R. Ford created OSTP within EOP. Carter's OSTP Director,

Enterprise was about to begin STS approach and landing tests at Edwards AFB, President Carter asked newly appointed NASA Administrator Robert A. Frosch to make a comprehensive evaluation on whether to continue with the STS program.[125] Thus, the stage was set for the most difficult challenge the STS would face during its development process.

At this point, DoD stepped in strongly to defend the STS as a program critical to national security and to play an important role in preserving this program. In July 1977, Dr. Hans M. Mark, who had been Director of NASA's Ames Research Center, became Under Secretary of the Air Force (and NRO Director). As an avid manned spaceflight enthusiast who believed the STS was an essential step towards a future manned space station and future exploration, Mark was instrumental in lining up DoD support for the STS in its time of peril. During November and December of 1977, OMB called a series of meetings on the future of the STS.[126] The OMB had urged that the STS program be converted into a three orbiter test project and that only the KSC launch site be built.[127]

According to Mark, Secretary of Defense Harold Brown was persuasive in making the DoD's need for the STS clear at these meetings:

> [Brown] made the case that at least two launch sites (one on the east coast and the other on the west coast) would be required and that at least four Orbiters would be necessary to meet the requirements of national security. This last argument was based on the fact that the first two Orbiters to be built (OV-102, *Columbia*, and OV-099, *Challenger*) would be somewhat heavier than the following vehicles and would therefore not be capable of carrying the very heaviest national security related payloads. It was therefore necessary to have at least two Orbiters capable of carrying the very heaviest payloads in order to have a backup in case one of these vehicles was lost. This argument carried the day and the decision was reached to build four Orbiters (OV-103, *Discovery*, and OV-104, *Atlantis*, in

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Dr. Frank Press saw government funding for all scientific efforts as a zero-sum-game and was eager to address the deficiencies he perceived in basic scientific research funding by reducing quasi scientific efforts such as manned spaceflight.

[125]Trento, Prescription for Disaster, 149.

[126]Mark, Space Station, 71-73.

[127]Ibid., 72.

addition to the first two) and to continue with construction of the west coast launch site. (The west coast launch site was deemed necessary in order to conduct polar orbiting flights required for national security related missions.)[128]

Although Mark does not highlight another aspect of saving the STS, sometime during this period, perhaps at these OMB meetings, the decision was also taken to make the STS virtually the only launch vehicle for both NASA and DoD.

The outcome of these meetings marked a definite shift in the rationale for the STS program which again illustrates the overriding impact of spysats on all other types of space policy. The STS program which NASA was publicly selling as a way to meet U.S. civil space policy goals and on cost-effectiveness grounds had now been saved within the Carter administration on the basis of its ability to launch huge spy satellites. Moreover, with the pending debate over the ratification of the SALT II Treaty, spy satellites as NTMV took on added significance. On 1 October 1978, President Carter marked the first official break with the blackout policy on spysats promulgated in 1962. In a speech at the KSC, Carter noted that:

> Photoreconnaissance satellites have become an important stabilizing factor in world affairs in the monitoring of arms control agreements. They make an immediate contribution to the security of all nations. We shall continue to develop them.[129]

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[128]Ibid.

[129]Stares, Militarization of Space, 186. According to Richelson, Secret Eyes, 140-43, during early September various agencies within the administration debated how far to go in declassifying spysats. The primary motivation behind the desire to loosen the security restrictions on spysats was publicly to provide administration officials with better evidence of the U.S.'s ability adequately to verify SALT II. Those arguing for greater declassification included Secretary Vance, ACDA Director Paul Warnke, DCI Stansfield Turner, NSA Director Bobby Inman, and NRO Director Mark. Secretary Brown, backed by the JCS and the DIA strongly opposed widespread declassification. The most powerful argument raised by DoD (which apparently won the day) was that the release of one spysat photo would lead to a deluge of Freedom of Information Act (FOIA) requests and thereby tie up the manpower of the intelligence agencies in non-productive activities. On 13 September, the PRC (Space) voted for declassification but only of the fact that the U.S. conducted photoreconnaissance from space -- a "truly minimalist decision" in Richelson's opinion.

Meanwhile, however, the NRO was ambivalent about the prospects of using the STS as its sole launch vehicle: on the one hand, it was already planning the huge spysats which would take advantage of the STS's capabilities; but on the other hand, it did not want to lose control over its launch vehicles, feared the possible disruption of spysat launchings due to accidents with astronauts, and also chafed at the prospect of the increased media attention which NASA involvement would bring.

General Air Force attitudes towards the STS were also ambivalent during this period. While the STS was strongly supported by elements within SAMSO and by Mark (who became Secretary of the Air Force in July 1979), other elements such as SAFSP were less enthusiastic. Mark attempted to push the STS and a general space emphasis on the Air Force.[130] These efforts and the military potential of the STS certainly were important in helping to revive Air Force interest in space and in possible military man in space applications. At the same time, however, the Air Force was very much a junior partner on the STS in terms of funding and effort. Moreover, the Air Force dragged its feet on refurbishing SLC-6 at VAFB for STS operations and in developing the Inertial Upper Stage (IUS) to be used for boosting payloads into higher energy orbits than possible with the STS.[131] In sum, then, although the STS program did reignite some Air Force interest in more ambitious space missions, the level of Air Force support for

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[130]Mark listed "[t]he development of a doctrine and an organization that will permit greatly increased Air Force activities in space in order to take advantage of new technology to enhance communications, reconnaissance, and other vital Air Force functions[.]" as one of the USAF's "three top priorities." Honorable Hans M. Mark, "USAF's Three Top Priorities," Air Force Magazine 62 (September 1979); reprinted as Appendix 3 in Mark, Space Station, 235-36.

[131]It is difficult to apportion blame for delays on elements of the STS program; however, the STS was originally scheduled to be launched from SLC-6 in December 1982 (after "more than forty launches will have taken place from KSC"!) and SLC-6 would barely have been ready for its rescheduled first launch in March 1986 had the *Challenger* disaster not intervened. In practice, there were only five STS flights by December 1982 and a total of only 24 flights prior to the *Challenger* disaster. See Henry and Sloan, "Space Shuttle and Vandenberg," 25; and Edgar Ulsamer, "Slick 6," Air Force Magazine 68 (November 1985): 47-48.

this program by the end of this period did not approach the level of enthusiasm the Air Force had displayed for the X-20 or MOL and this ambivalent support undoubtedly reflected the fact that the Air Force did not control the STS.

Carter Space Policy and the Military

One of the best indications of the general lack of emphasis on military space issues during this period was the fact that between the Kennedy and the Carter administrations there were virtually no major military space policy reviews undertaken at the NSC level.[132] During 1978, the Carter administration developed two comprehensive space policy statements. These policy statements recognized the improvements in military space technology, the growing military importance of space, and specifically dealt with the military potential of the STS. Many key portions of these policy statements remain classified but they do reveal the general tenor of U.S. national space policy at the end of this period. Moreover, these policy statements provide the context within which military space doctrine was beginning to shift back towards more ambitious military goals in space.

The Carter administration arrived in Washington imbued with a Wilsonian sense of idealism and convinced that the cold war and the nuclear arms race could be ended. These sentiments motivated Secretary of State Cyrus Vance's journey to Moscow in March 1977 to present the Soviets with the administration's "comprehensive proposal" for strategic arms control. Just prior to Vance's journey, Carter publicly announced that the U.S. had already proposed ASAT negotiations to the Soviets and, at this same time,

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[132]The lack of attention to military space policy during this "Sanctuary Supreme" period contrasts sharply with the numerous NSC-level military space policy reviews undertaken during the Eisenhower, Kennedy, Carter, and Reagan administrations. President Johnson did not initiate any major space policy reviews. President Nixon created the STG discussed above but this study focused on civil space policy goals and no other major space policy reviews were undertaken during the remainder of his tenure. President Ford authorized renewed U.S. ASAT efforts, but not as a part of a comprehensive review of U.S. military space policy. Thus, it was not until the Carter administration at the end of this period that military space policy again received top-level attention. These findings are based on a review of the document titles in the NSC box at the National Archives.

he secretly issued Policy Review Memorandum (PRM)-23 which directed the NSC Policy Review Committee (PRC) to "thoroughly review existing policy and formulate overall principles which should guide our space activities."[133] The Soviets soundly rejected the administration's comprehensive proposal but did agree to set up various working groups to discuss specific arms control issues, including one for ASAT issues.[134] Thus, early in his administration, Carter set the stage for the U.S. to pursue ASAT arms control and to review space policy comprehensively as called for by PRM-23.

Carter's two-track policy for simultaneously pursuing ASAT development and ASAT arms control began to take definite form by the Fall of 1977. The Vought Corporation was named prime contractor for the Air Force's Miniature Homing Vehicle (MHV) ASAT on 3 September.[135] The Decision Paper from PRM-23 was completed on 23 September. According to the later testimony of UDRE William J. Perry, the PRM Decision Paper required "that we seek a comprehensive ASAT agreement prohibiting testing in space, deployment and use of ASAT capability . . . ."[136] Apparently, the PRM-23 Decision Paper also directed that the administration's comprehensive review of U.S. space policy continue at the highest levels. According to then-NRO Director Mark, the PRC for Intelligence Chaired by DCI Stansfield Turner drafted the space policy statement which became PD-37.[137]

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[133]Stares, Militarization [illegible] 181-82. The quote is from White House Fact Sheet, "U.S. National Space [illegible]y," 20 June 1978, reprinted in President's Space Report, 1978, 98-100.

[134]Stares, Militarization of Space, 182. Carter's ASAT arms control efforts are discussed in greater detail in the ASAT section below.

[135]Ibid., 184.

[136]Ibid. In 1977, the title DDRE was replaced by the title Under Secretary of Defense for Research and Engineering (UDRE) and the responsibilities for this office were expanded to include oversight for weapons production as well as for the development of weapons systems prior to the point of production.

[137]Mark, Space Station, 78-79. Conversely, Stares, in Militarization of Space, 184-85, states that Secretary Brown was responsible for drafting PD-37 and that the delay in

PD-37, "National Space Policy," was signed by President Carter on 11 May 1978.[138] On 20 June a White House Fact Sheet titled "U.S. National Space Policy" was publicly released to explain PD-37.[139] According to the fact sheet, the primary emphasis of PRM-23 "was to resolve potential conflicts among the various space program sectors and to recommend coherent space policy principles and national space policy."[140] PD-37 found that most of the current U.S. space policy problems stemmed from the "stresses among the various space programs[.]" and the classified portion of the directive therefore "concentrates on overlap questions[.]" rather than dealing in detail with long-term space objectives.[141] The fact sheet noted that "[t]he STS will service all authorized space users -- domestic and foreign, commercial and governmental -- and will provide launch priority and necessary security to national security missions while recognizing the essentially open character of the civil space program."[142] The military section of the fact sheet stated that the directive: encouraged lowering space classification levels where possible, directed the Secretary of Defense to develop a plan to use civil and commercial space resources during declared national emergencies, initiated "an aggressive, long-term program" to provide greater survivability for military space systems, and detailed the

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issuing this directive stemmed from "strong criticism from the civilian space agencies for its apparent bias towards national security issues."

[138]A sanitized version of this seven page directive is available in the NSC box at the National Archives. Two pages of this version are deleted entirely and about half of the other pages are deleted.

[139]President's Space Report, 1978, 98-100. Sections of the fact sheet are taken verbatim from the directive; there is virtually nothing in the sanitized directive which is not discussed in the fact sheet. The following section is drawn from the fact sheet rather than the sanitized directive.

[140]Ibid., 98.

[141]Ibid. PD-37 called for another major study to address U.S. long-term and civil space goals.

[142]Ibid., 99.

two-track U.S. approach to ASAT.[143]

Other commentators provide some additional insights into the classified portions of PD-37 and U.S. space policy at this time. According to the later writing of then-NRO Director Mark, the major function of this directive was to provide a "clear statement on the division of responsibility between the secretary of defense and the director of central intelligence for the development and use of data gathered from space."[144] Schichtle states that as a result of PD-37, "NASA was directed to pay virtually all costs associated with the development of the shuttle . . . ."[145] The most specific indictment of PD-37 comes from Edward C. (Pete) Aldridge, Jr. (NRO Director from 1981-85 and Secretary of the Air Force 1986-89) who wrote that President Carter decided in PD-37 "that the Space Shuttle would be the exclusive means for the United States to launch satellites into space."[146] Finally, Mark also states that Director Press and the OSTP played a

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[143]Ibid., 99-100. In the Fall of 1976, President Ford had issued National Security Decision Memorandum (NSDM)-333 which directed that DoD enhance the survivability of its satellites and resulted in increased budgets for this purpose. However, it is unclear whether many satellite survivability improvements had actually been achieved by the time of PD-37, see Stares, Militarization of Space, 169-70.

[144]Mark, Space Station, 79.

[145]Schichtle, National Space Policy, 80. Schichtle's Table 2-1 (page 81) provides a year-by-year summary of DoD shuttle funding which includes funding for the IUS, SLC-6, and operations capability development. According to these figures, DoD spent $1.98 billion (FY 1980 dollars) on the STS from prior to FY 1971 through FY 1984.

[146]E.C. "Pete" Aldridge, Jr., "Assured Access: 'The Bureaucratic Space War,'" Dr. Robert H. Goddard Historical Essay, undated, 1. Offprint provided to author by Office of the Secretary of the Air Force. (Hereinafter Aldridge, "Assured Access"). Aldridge certainly was in a position to know the contents of PD-37 and it is highly plausible that this directive spelled out that the STS would be the nation's exclusive launch vehicle. However, it is interesting to note that, to date, Aldridge is apparently the only major figure to claim that PD-37 specified this clear and exclusive a role for the STS. Aldridge also claims that those individuals in DoD "worried about the 'Shuttle only' space launch policy[.]" were "overruled by those in the Pentagon in leadership positions who were convinced that the only way that Congress would approve the development of the Shuttle would be to tie the Shuttle to the imperatives of launching payloads essential to the security of the United States." (Page 1). What is more clear is that Mark and Aldridge

dominant role on the PRC (Space) in drafting the long-range and civil space goals called for by PD-37 into what would become PD-42.[147]

National Security Advisor Zbigniew Brzezinski signed PD-42, "Civil and Further National Space Policy," on 10 October 1978.[148] Once again, the White House issued a fact sheet to publicly explain this space policy directive.[149] PD-42 stated that the U.S.'s "overarching civil space policy will be composed of three basic components": 1) Evolutionary space activities "pursued because they can be uniquely or more efficiently accomplished in space." 2) "[A] balanced strategy of applications, science, and technology development". And 3) recognition that "[i]t is neither feasible nor necessary at this time to commit the US to a high-challenge, highly-visible space engineering initiative comparable to Apollo."[150] The directive did declare that "[w]e will maintain US leadership in space science and planetary exploration and progress."[151] Unfortunately, the section most directly relevant to military space issues, "Strategy to Utilize the Shuttle," is almost completely deleted from the sanitized directive and only briefly discussed in the fact sheet. According to the fact sheet:

The Administration will make incremental improvements in the shuttle

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held quite different views of the STS; the former was among its very strongest supporters and a leading proponent of the concept of the STS as the "national vehicle," the latter was supportive of the STS as well but he also led the fight to build a backup launcher for critical NRO payloads as discussed in the next chapter.

[147]Mark, Space Station, 80. The PRC (Space) was established by PD-37.

[148]About four paragraphs of this seven-page directive remain classified in the version available in the NSC box at the National Archives.

[149]White House Fact Sheet, "U.S. Civil Space Policy," 11 October 1978, reprinted in President's Space Report, 1978, 100-103.

[150]Zbigniew Brzezinski, Presidential Directive/NSC-42, "Civil and Further National Space Policy," 10 October 1978, 1-2, NSC box, National Archives, Washington. Mark strongly opposed the inclusion of the no Apollo-like initiatives provision in this directive and argued unsuccessfully with Press for the removal of this provision, see Space Station, 80.

[151]PD-42, "Civil and Further National Space Policy," 5.

> transportation system as they become necessary. Decisions on extending the shuttle's stay time in orbit and future upper stage capabilities (e.g., the reusable space tug and orbital transfer vehicle) will be examined in the context of our emerging space policy goals. An interagency task force will make recommendations on what future capabilities are needed.[152]

Thus, PD-42 reflected both the traditional uneasiness of the scientific community with space spectaculars and recognized the growing importance of space for the U.S. in many sectors.

Overall, Carter's national space policy directives are important both for their content and because they indicate that military space issues were once again receiving top-level attention.[153] In terms of their content, their focus on the growing military importance of space, on the need for greater satellite survivability, on the two-track approach to ASAT, and on the military potential of the STS, these policies all illustrate that at the national level the sanctuary school of thought on space was beginning to weaken. The full exploitation and protection of U.S. spysat capabilities apparently remained the top priority but these other military space issues were also deemed important enough for inclusion in these directives. Moreover, the fact that these military space issues were again the subject of top-level discussion could not escape the attention of the military and was undoubtedly another factor in moving the military to reconsider its doctrine on the military uses of space at the end of this period.

ASAT Developments and ASAT Arms Control

At the beginning of this period the U.S. had the limited operational ASAT capability provided by the Program 505 and 437 ASAT systems described in chapter four. Following the deployment of these systems, neither the DoD nor top civilian

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[152]President's Space Report, 1978, 102. The task force was to submit its recommendations to the PRC (Space) by 1 August 1979.

[153]A final major space policy initiative of the Carter administration was PD-54, "Civil Operational Remote Sensing," signed by Brzezinski on 16 November 1979. This directive set out a management structure for the Department of Commerce in operating the LANDSAT system and set as a goal "the eventual operation by the private sector of our civil land remote sensing activities." (Page 2). A sanitized version of this directive is available in the NSC box at the National Archives.

leadership was very interested in aggressively pursuing new ASAT capabilities and by the early 1970s these deployed systems gradually withered away into non-operational status. Efforts on the part of ADC and SAMSO to develop new ASAT capabilities to replace Program 437 were not approved within the Air Force and no major funding was sought for actual development of new systems. Meanwhile, the Soviets developed a non-nuclear co-orbital ASAT which was initially tested between 1968 and 1971. Towards the end of this period, U.S. recognition of the growing significance of military space systems and of the vulnerability of these systems prompted the U.S. to look again at the need for an ASAT system. Following the resumption of Soviet ASAT testing in February 1976, President Ford issued NSDM-345 on 18 January 1977 which authorized the U.S. to develop a new non-nuclear ASAT system. President Carter attempted to take a two-track approach to the ASAT issue by entering into ASAT negotiations with the Soviets while simultaneously continuing the development of the ASAT system authorized by Ford. However, by the end of this period, ASAT negotiations had broken down and the increasing U.S.-U.S.S.R. tensions made the prospects for ASAT arms control very dim.

The limited and temporary nature of the ASAT systems authorized by Secretary McNamara is well illustrated by the history of these systems once deployed. The Army's Program 505 was declared operational on 1 August 1963 but the system was dismantled less than four years later. The Nike Zeus missiles in this system were apparently only tested seven times between 1964 and 1966.[154] On 23 May 1966, a JCS message informed the Army that Secretary McNamara had decided "to phase out Project 505 expeditiously"; the program was terminated by 1967.[155] Apparently, McNamara's decision was motivated primarily by a desire to avoid duplication of the more capable

[154]Stares, Militarization of Space, 119. Stares also notes that these tests were apparently conducted by Bell Laboratory and McDonnell-Douglas employees rather than by Army personnel.

[155]Ibid., 120.

Program 437 ASAT system.[156]

The Air Force's Program 437 ASAT system fared little better. Program 437 became operational on 10 June 1964. Between 1964 and 1970, sixteen Thor missiles were launched from Johnson Island in support of this program but only six were "combat test launches" or actual ADC tests of the alert Program 437 ASAT system while the remaining launches tested various different related systems.[157] In December 1963, NRO Director Brockway McMillan requested that the Air Force develop a plan to use the Program 437 system as the basis for a "super-SAINT" satellite inspection system which was eventually designated Advanced Program 437.[158] Then, in May 1964, AFSC sought permission to develop a non-nuclear ASAT capability based on the Thor launcher in a project known first as Program 437 Y and then as Program 922.[159] None of these Air Force efforts were sufficient to revitalize U.S. ASAT efforts in the changing political climate of this period; on 4 May 1970 Deputy Secretary of Defense David Packard indicated that the Air Force "should phase down the [437] system by the end of FY '70

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[156]Ibid. In the late 1960s and early 1970s there was limited discussion of the residual ASAT capability of the Army's Safeguard ABM system but the cancellation of Program 505 marked the end of the Army's first and last operational dedicated ASAT system of the cold war period.

[157]Ibid., 123-25.

[158]Ibid., 125-26; and Burrows, Deep Black, 142-43. The concept behind the 437 (AP) system was to launch a camera system for a close pass by the target satellite and then recover the film using the same method as the CORONA system. McMillan was said to be very interested in closely inspecting Soviet reconnaissance satellites as a way of determining their capabilities but McNamara apparently expressly prohibited testing the 437 (AP) in this manner. The 437 (AP) system was tested four times in 1965-1966.

[159]Stares, Militarization of Space, 126-29; and President's Space Report, 1964, 45. Ling Temco Vought was chosen as the primary contractor on Program 922 in June 1967 and $20 million was allocated to the program for FY 1968. OSD canceled Program 922 in 1969. None of the other Air Force ASAT or related BMD programs of this period (the Special Defense Program and Program 893) survived into the system development phase.

or as soon thereafter as possible."[160] Although Program 437 remained nominally operational until 1 April 1975, Packard's decision in 1970 marked the effective end of this program and of operational U.S. ASAT systems during this period.[161]

The cancellation of its new ASAT development programs in the late 1960s and the curtailment of Program 437 did not completely end Air Force interest in developing new non-nuclear ASAT systems. The primary impetus behind attempting to develop new ASAT systems during the early 1970s came from ADC and this effort received some support from SAMSO. On the basis of earlier studies, in April 1971 ADC proposed an air-launched, direct assent ASAT known as Project SPIKE. This system was to be launched from an F-106 interceptor and use a modified Standard AGM-78 anti-radar missile with an explosive warhead.[162] By September, SAMSO joined ADC in proposing this system to the Office of the Assistant Secretary of the Air Force for R & D but the proposal went no further and received no funding for FY 1973.[163] Low level ASAT research efforts did continue throughout the 1970s, including work on the infrared guidance systems and kinetic kill components eventually used in the MHV ASAT system.[164] In ASAT related efforts during this period, the Air Force continued to upgrade its space surveillance capabilities and first operated elements of the global Ground-based Electro-Optical Deep Space Surveillance System (GEODSS).[165] In order

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[160]Stares, Militarization of Space, 127. In this same memo, Packard suggested that the Army and the Air Force "consider the possibilities for a U.S. non-nuclear capability against Soviet satellites," Stares 202.

[161]Ibid., 127. On 1 October 1970, the missiles and launch crews were removed from Johnson Island to VAFB and the reaction time for the system was increased from 24 hours to 30 days.

[162]Ibid., 202.

[163]Ibid., 202-3.

[164]Ibid., 204-5.

[165]Ibid., 212. See also, Burrows, Deep Black, 265-67. Burrows claims that the GEODSS can spot basketball sized objects in GSO. Five worldwide sites were planned for the GEODSS.

to integrate and use these improved space surveillance capabilities more effectively, NORAD created the Space Defense Operation Center (SPADOC) on 1 October 1979.[166]

Soviet ASAT development efforts during this period provided an important impetus for the U.S. to continue examining its own ASAT programs and satellite survivability efforts. The first "*full* and unambiguous" Soviet ASAT test took place during October 1968 although several elements of this system and other ASAT related components had been tested as early as 1963.[167] This earliest Soviet co-orbital system employed a modified SS-9 ICBM booster with a radar-guided explosive warhead.[168]

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[166]Stares, Militarization of Space, 212; Burrows, Deep Black, 267-68. SPADOC is located within NORAD's Cheyenne Mountain Complex near Colorado Springs, CO. "The SPADOC had its origins in a March 1979 memorandum of Dr. Gerald P. Dinneen, Assistant Secretary of Defense for Communications, Command, Control, and Intelligence. Assistant Secretary Dinneen envisioned the SPADOC 'as a centralized management and operations center,' initially with limited capabilities, but able to expand as weapons systems became operational and space defense capabilities increased." SPADOC's mission has expanded to provide operational control for U.S. ASAT, space surveillance, and satellite survivability missions. The quotation above is from USAF Space Command, "History of SPACECOM, 1 January-31 December 1982," 60; microfiche document 00309 in Military Uses of Space.

[167]Stares, Militarization of Space, 136. Emphasis in original.

[168]Ibid.; and Burrows, Deep Black, 268-69. The Soviet co-orbital system is normally launched into an orbit with the same inclination as the target satellite at a slightly higher or lower altitude (known as a grazing orbit). The ASAT vehicle then uses radar tracking to maneuver itself within close range of the target satellite over the course of one or two orbits around the earth. The Soviet system apparently employs metal pellets propelled by an explosive warhead as its kill mechanism. An artist's rendering of the Soviet ASAT system attacking a satellite is reprinted in U.S. Department of Defense and U.S. Department of State, "Soviet Strategic Defense Programs," (Washington: GPO, October 1985), 15. In 1964, the Soviets created the PKO (anti-space defense) section of the PVO Strany Air Defense Forces; PKO is apparently responsible for both the Soviet ABM and ASAT systems. Note also that *dedicated* ASAT systems such as the Soviet co-orbital system or the U.S. MHV receive a great deal of attention but are only one of at least four broad categories of potential ASAT weapons. The other categories include: 1) systems with residual ASAT capabilities such as ABM systems or possibly modified nuclear armed ballistic missiles; 2) ground-based lasers; and 3) electronic warfare. On the complete Soviet strategic defense network and the place of ASAT within this system, see "Soviet Strategic Defense Programs," 7-16. On the particular strengths and weaknesses

Between October 1968 and December 1971, the Soviets conducted seven tests of their radar guided ASAT system; generally, five of these tests are deemed to have been successful.[169] The Nixon administration did not publicly discuss these Soviet ASAT tests for several years; indeed, according to Stares, the first public official U.S. recognition of the Soviet system was not made until the Soviets were listed as having an "Orbital Antisatellite System" in a table for the FY 1972 Congressional hearings.[170] The Soviets suspended their dedicated ASAT testing for slightly more than four years following their December 1971 test. The rationale behind this test hiatus remains unclear but undoubtedly relates to "a combination of budgetary, political, and technical factors."[171]

In February 1976, the Soviets resumed their dedicated ASAT testing, beginning a thirteen launch test series which lasted until June 1982.[172] This resumption of Soviet ASAT testing, coming on the heels of other evidence that the fruits of detente were less than originally expected, caused considerable consternation within the Ford administration, especially after it recognized that the U.S. did not have a well developed

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of different types of ASAT approaches see, for example, Nicholas L. Johnson, The Soviet Year in Space, 1987 (Colorado Springs: Teledyne Brown Engineering, 1988), 78-81.

[169]There is a great deal of disagreement over what constitutes a "successful" ASAT test and this disagreement illustrates both the difficulties in performing and monitoring these type of operations and, more importantly, reflects differing perceptions on the military utility of ASAT within the differing schools of thought on space. See Stares, Militarization of Space, 136-40; and Burrows, Deep Black, 268-69.

[170]Stares, Militarization of Space, 162. The Soviet tests were the object of a good deal of speculation within the aerospace press throughout this time.

[171]Ibid., 155. See Stares, 146-155 for a discussion on the general motives behind the Soviet ASAT system.

[172]Burrows, Deep Black, 268.

policy towards ASAT or satellite survivability at this time.[173] During 1970, the Nixon NSC had authorized a working group study of the Soviet ASAT system and possible U.S. responses.[174] Apparently, there was a great deal of disagreement within this working group over why the Soviets had initiated their ASAT system and how the U.S. ought to respond; the working group did not submit its report to the NSC staff until 1973.[175]

Thus, in the face of resumed Soviet ASAT testing, the Ford administration moved more forcefully to redress this situation. Following a series of studies for the NSC staff and confirmation from DoD that their efforts to remedy U.S. satellite vulnerability had not proceeded very far, Ford issued NSDM-333 in the Fall of 1976.[176] NSDM-333 directed DoD to work harder to solve its satellite vulnerability problems and resulted in the creation of a separate Systems Program Office (SPO) for Space Defense Programs at SAMSO and in increased funding for these types of efforts.[177] The Buchsbaum Panel completed its report in late 1976 and concluded that a U.S. ASAT would not enhance the

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[173]The vulnerability of U.S. DSP satellites in GSO to being "blinded" by Soviet ground-based lasers was apparently first demonstrated in September and October 1975, adding to U.S. concerns about the survivability and utility of its military space assets. See Stares, Militarization of Space, 169; and "Chronology," in Military Uses of Space, 41.

[174]Stares, Militarization of Space, 162-63. The working group was chaired by Manfred Eimer, Assistant Director for Intelligence in the DDRE Office.

[175]Ibid., 163-65. According to Stares, this report was buried during the Watergate Crisis and did not lead to any formal NSC action, although it may have prompted greater concern with satellite survivability.

[176]Ibid., 168-70. These studies included: a 1975 panel headed by Charles Slichter from the University of Chicago which studied "ways of improving and safeguarding the flow of information to and from commanders in the field"; and another panel chaired by Solomon Buchsbaum which specifically studied the problem of satellite vulnerability during 1976. Deputy National Security Advisor Lieutenant General Brent Scowcroft briefed the results of these panels to President Ford who became "very concerned" with this issue and "asked the DoD for their own analysis."

[177]Ibid., 170, 176-78. NSDM-333 was not available in the NSC box at the National Archives.

survivability of U.S. satellites by deterring use of the Soviet ASAT because the U.S. was more dependent upon space than the Soviets.[178] However, the report also concluded that a U.S. ASAT could be used to counter the threat to U.S. forces posed by Soviet space-based targeting systems and that the development of a U.S. system could serve as a "bargaining chip" in possible U.S.-U.S.S.R. ASAT arms control negotiations.[179] In one of the final acts of his presidency, on 18 January 1977 Ford signed NSDM-345 which directed the DoD to develop an operational ASAT system.[180]

The development of President Carter's overall space policy is discussed in the section above; the remainder of this section discusses Carter's policy towards ASATs and especially focuses on the U.S.-U.S.S.R. ASAT arms control efforts of this period. As discussed in the section above, by the Fall of 1977, the Carter administration had explicitly moved into a two-track position on ASAT as indicated by the 3 September decision to name Vought as the prime contractor on the HMV ASAT system and the 23 September Decision Paper from PRM-23. Working groups were set up within the

[178]Ibid., 170.

[179]Ibid. Stares' analysis of these developments during the Ford administration seems to be based almost completely upon interviews with former "senior" officials who wished to remain anonymous rather than upon harder documentary evidence. The primary Soviet space-based targeting systems which concerned the U.S. at this time were the nuclear powered Radar Ocean Reconnaissance (RORSAT) and the ELINT Ocean Reconnaissance (EORSAT) systems first deployed in 1974.

[180]Ibid., 171. Ford apparently was "very upset and concerned about the relaxed approach of the Defense Department" towards developing a new ASAT system and felt "the only thing to do was to issue a formal directive." According to Donald Hafner, an analyst with the NSC ASAT Working Group during 1977-78,: "Secretary of State Kissinger argued that the U.S. should redress any asymmetry in ASAT capabilities between the two sides before any arms control restraints were considered. The directive [NSDM-345] by the Ford Administration to go ahead with the MHV system did call for a study of arms control options, but it did not include any concrete proposal for inviting the Soviets to ASAT talks. Kissinger may have felt it was premature to make such a proposal; or indeed, he may not have favored negotiations at all." Donald L. Hafner, "Averting a Brobdingnagian Skeet Shoot: Arms Control Measures for Anti-Satellite Weapons," International Security 5 (Winter 1980/81): 50-51. NSDM-345 also was not available in the NSC box at the National Archives.

administration to attempt to hammer out a U.S. position for the upcoming negotiations.[181] It soon became apparent, however, that major disagreements within these working groups would make the development of a coordinated U.S. position on ASAT very difficult. The primary battle lines were drawn between State and ACDA on the one hand and the JCS and OSD on the other with the former favoring a comprehensive ASAT ban and the latter looking to avoid such comprehensive measures and proposing "rules of the road" for space instead.[182] This considerable divergence of opinion was not resolved at the working group level and Carter apparently directed that a date be set for negotiations as a means to encourage compromises within the administration.[183] This tactic did not work and the U.S. delegation entered the first round of talks without a formal negotiating position.[184]

U.S. and Soviet negotiators met for three rounds of ASAT talks: 8-16 June 1978 in Helsinki, 23 January-16 February 1979 in Bern, and 23 April-17 June 1979 in Vienna. Apparently, the two sides were far apart on most issues during the first two sessions and by the third session the sides had drawn closer together but mainly by limiting the depth and scope of what they were trying to accomplish. Some of the controversies which have

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[181]Apparently, two working groups were the primary location of the major deliberations on this issue: the Antisatellite Negotiating Working Group chaired by the Director of NSC Policy Analysis, Victor Utgoff; and the DoD Executive Committee for ASAT Arms Control headed by Walter Slocombe (principle assistant secretary of defense for international security affairs in OSD). No agreements resulted from these negotiations and there is virtually no unclassified documentation regarding either the development of U.S. negotiating positions or of the actual negotiations themselves. The analyst must, therefore, ask why certain aspects of these deliberations have been leaked and what possible bureaucratic or personal ends these leaks may serve. See Stares, Militarization of Space, 193; and John Wertheimer, "The Antisatellite Negotiations," in Albert Carnesale and Richard N. Haass, ed., Superpower Arms Control: Setting the Record Straight (Cambridge, MA: Ballinger Publishers, 1987), 142.

[182]Stares, Militarization of Space, 194-95; and Wertheimer, "Antisatellite Negotiations," 142-43.

[183]Stares, Militarization of Space, 195.

[184]Ibid., 196.

publicly emerged include debates over: an ASAT ban versus limitations or rules of the road; the degree of protection afforded to third-party satellites; long versus short testing moratoria; and how to deal with systems having residual ASAT capabilities -- for example, the Soviets insisted that the U.S. STS then under development be included as an ASAT system.[185] By the third session, both sides had apparently tabled draft agreements which only covered provisions on "no use" of ASAT weapons but even at this longest negotiating session they were unable to reach closure on this most basic issue.[186]

Both sides expected that the negotiations would continue but several factors intervened. Most importantly, President Carter and General Secretary Leonid I. Brezhnev signed the SALT II Treaty on 18 June 1979 -- from that point until the invasion of Afghanistan, the Carter administration was consumed with attempting to get public support for and Senate advice and consent to ratification of the treaty and the ASAT negotiations along with many other issues were placed on the back burner. The breakdown of U.S.-U.S.S.R. relations following the invasion of Afghanistan and the arrival of the Reagan administration with its initial lesser enthusiasm for arms control spelled the end of the ASAT negotiations.

These ASAT negotiations were the most militarily focused space-related arms control efforts of the cold war era; as such, these negotiations offer important general lessons about ASAT arms control issues and the general prospects for space-related arms control. First and foremost, the failure to reach any agreement at these negotiations highlights the extreme conceptual and operational difficulties involved in attempting to reach a significant ASAT arms control agreement. The unresolved doctrinal conflicts regarding the military utility of space and the considerable overlap between civilian and military space systems and infrastructures contribute directly to the amorphous nature of military space issues and to the lack of clarity regarding the proper scope or object of ASAT arms control. ASAT arms control involves extremely difficult issues in many

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[185]Ibid., 197; and Wertheimer, "Antisatellite Negotiations," 145-46.

[186]Stares, Militarization of Space, 198-99.

areas such as: whether the objective should be to ban the development and testing of dedicated ASAT systems or to create confidence- and security-building measures (CSBMs) such as rules of the road and keep out zones; conceptual and verification problems related to systems with significant residual ASAT capability and the significant military potential of even a few covert ASAT systems; and questions concerning whether the scope of the negotiations should cover some superpower satellites, all military satellites, or all (including third-party) satellites.

As Stares details, the ASAT negotiations also highlight difficulties with two-track approaches to arms control. Two-track approaches are seemingly attractive for dealing with divergent positions within an administration but they may actually impede progress towards eventual resolution of policy differences by creating committed constituencies behind each track which oppose the compromises which may be required to create coherent policy. Stares argues that the U.S. two-track approach to ASAT arms control legitimized and perpetuated the MHV ASAT system -- a system which he believes had value only as a bargaining chip. Finally, the ASAT negotiations also highlighted what Ashton Carter refers to as "the basic paradox of ASAT arms control": the inverse relationship between ASATs and the incentive to place very threatening military systems in space.[187] Clearly, space weapons cannot be divorced from the natural offense-defense interrelationships and trade-offs inherent in all strategic thinking. Thus, analysts not only must consider the supposedly destabilizing effects of ASATs on stabilizing space systems such as those which provide the hotline, early warning, or NTMV for arms control but also must consider the possibly stabilizing effects of ASATs in discouraging the development of potentially destabilizing space missions such as force targeting and space-to-earth force application. This basic paradox, together with the major conceptual difficulties outlined above call into question the overall desirability of ASAT arms control.

Finally, we must consider the direct interrelationships between ASAT weapons

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[187]Ashton B. Carter, "Satellites and Anti-Satellites: The Limits of the Possible," International Security 10 (Spring 1986): 68.

and the military during this period. In this regard, two important points stand out: First, virtually all of the major ASAT developments at this time were initiated by civilians and imposed from the top-down rather than coming up from the Air Force or the other Services. McNamara created two ASAT systems and then canceled one of them. Next, OSD ordered the Program 437 ASAT phased out despite the considerable Air Force efforts to upgrade this system. Then, later in this period, it was the civilians within the Ford and Carter administrations who strongly pushed satellite survivability measures and the creation of a new ASAT system on a largely disinterested Air Force and DoD. While elements within DoD and the Air Force had already been supportive of these ideas and other groups rapidly warmed to these concepts, these elements had not been not strong enough to sustain a drive to create these new programs from the bottom-up. The second major point regarding the interrelationships between the military and ASATs is that not only were there no weapons per se in space more than twenty years into the space age but also that the military had largely acquiesced to this situation. In contrast with other technologies rapidly adapted to warfare during the twentieth century (most notably the airplane), the superpowers had shown a great deal of restraint in deploying weapons technology in space. Considering this contrast with other new militarily significant technologies, it is remarkable that the U.S. military and Air Force, in particular, was so lukewarm towards ASAT or other space weapons ideas for most of this period.

Air University Review and Air Force Magazine Positions

Contrasting the volume and type of space-related articles in Air University Review (AUR) during this period with the volume and type of articles from the previous period is another excellent indication of how different these two periods are in terms of Air Force thinking on space. Generally, during this period, the editors of AUR viewed space primarily through the sanctuary school of thought lens when they thought about space at all. Clearly, space was not a major focus of AUR during this period; the six years of the previous period generated about the same volume of space-related articles in AUR as the entire fifteen year period from 1964 through 1978. Moreover, with the exception of a few articles dealing with high ground or space control concepts at the beginning and the end of this period, the tone of the space-related articles which were printed during this period generally reflect the mainstream, sanctuary school of thought. The examples below help to illustrate these general trends in AUR at this time.

It is interesting to note that what is probably the strongest attack on U.S. national space policy found in AUR during this period was written by a civilian. The article by Dr. Robert Puckett of the University of Virginia in the March-April 1965 issue of AUR concluded that "both the Eisenhower and Kennedy Administrations maintained an inadequate conception of the political and military potential of outer space."[188] Puckett asserted that this inadequate conception of space potential stemmed from the overemphasis on the "peaceful" aspects of space which "have fashioned the whole tenor of American national space policy."[189]

> The dominant [U.S.] political conception of outer space has been that it is a new frontier, a "blank page" totally free from the influence of international "power" politics. Therefore the Government has seemed to believe that in outer space the world has a last chance to reach towards the goal of peace. In accordance with this view, the United States has continually attempted to prevent an arms race in space by seeking to bar the use of weapons of mass destruction there and to reach various international agreements regulating the use of space.
>
> These U.S. efforts have given rise to a serious policy confusion which has undercut the premises of our national space policy. The Government has assumed that if the "peaceful" aspects of space are emphasized and the military role in space is downgraded, the Soviet government will not feel impelled to concentrate on military space systems. Such an assumption seems highly questionable.[190]

Puckett also criticized the OSD "building block" approach to military space systems and noted that the Air Force "has objected to what it considers to be the overemphasis on the necessity of proving a military requirement for each space project."[191] Finally, Puckett charged that the skewed priorities of U.S. national space policy and the emphasis on

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[188]Dr. Robert H. Puckett, "American Space Policy: Civilian/Military Dichotomy," AUR 16 (March-April 1965): 50.

[189]Ibid., 47.

[190]Ibid.

[191]Ibid., 48.

Apollo meant that the U.S. might face a "military space gap".[192] Overall, since this is the only major critique of U.S. national space policy in AUR during the early part of this period, it is questionable how strongly these views were held within the Air Force or whether many elements within the Air Force considered the civilian and peaceful emphasis of U.S. national space policy to be a major impediment to the development of more relevant military space systems and doctrine in the same way as Puckett viewed these issues.

The only AUR issue completely devoted to space concerns during this period was the May-June 1965 "Space Operations Issue".[193] General Schriever, then-Commander of AFSC, wrote the introductory article for this issue. Here, he asserted that "[s]pace is an area of vital concern to the military strategist."[194] He found two specific reasons for the U.S. to be concerned with space: first, the unique advantages of space for military operations such as "extreme altitude, very high speeds, long flight duration, and extremely accurate predictability of flight path[.]"; and, second, the contributions which space progress makes to "a nation's leadership in technology and to its national prestige."[195] After warning that, to date, the Soviets had always been ahead of the U.S. in space developments, Schriever concluded by indicating that this special issue was "an effort to assist a wide Air Force professional audience in preparing for possible space operations."[196]

Unfortunately, the remainder of the articles in this Space Operations Issue generally focused on quite narrow technical concerns or reviewed specific space programs

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[192]Ibid., 49-50.

[193]By contrast, two complete issues of Air University Quarterly Review during the previous six year period had been entirely devoted to space matters.

[194]General Bernard A. Schriever, "The Space Challenge," AUR 16 (May-June 1965): 3.

[195]Ibid. Schriever's list of four space attributes seem to be directly and somewhat inappropriately drawn from attributes of aircraft.

[196]Ibid., 4.

rather than dealing with broader national space policy or military space doctrine issues. This lack of comment on these overarching issues no doubt reflected the impact of the blackout directive and the censorship imposed on the Winter-Spring 1960-1961 AUQR issue which also had been entirely devoted to space issues.[197] Thus, while some of these articles can contribute to our analysis and understanding of certain military space programs, overall, despite the space focus of this issue, it does little to help illuminate the state of Air Force space doctrine at this time.

Following the Space Operations Issue, there was only a smattering of articles on space-related issues in AUR for the entire remainder of this period. An interesting article in 1969 attempted to review and place the Air Force's role in space in context. Paul Worthman places the turning point in Air Force space orientation at the arrival of the Kennedy administration in 1961.[198] By 1961, the Air Force had amassed a large and effective space support infrastructure and had been given bureaucratic responsibility for most space missions within DoD; but, according to Worthman, from the outset of their tenure McNamara and other officials in OSD showed clear signs that they intended to scrutinize military space spending and missions very carefully.[199] Indeed, he quoted then-Secretary of the Air Force Eugene M. Zuckert as saying privately that he welcomed McNamara's space directive of March 1961 but also that he believed the Air Force getting these new space R & D assignments could turn out to be "like getting a franchise to run a bus line across the Sahara Desert."[200] For Worthman, the huge gulf between Air Force and OSD thinking on the utility of space was not rooted in completely different schools of thought on space so much as it was the "product of a fundamental difference

[197]On this censorship, see the spy satellite section of chapter four above.

[198]Colonel Paul E. Worthman, "The Promise of Space," AUR 20 (January-February 1969): 120-127.

[199]Ibid., 124.

[200]Ibid.

in functional and managerial outlook between the OSD and the Air Force."[201] Worthman also presented a table which contrasts these differences between these two groups as follows:

The 1961 Air Force Spacemen	The 1961 OSD Spacemen
Enthusiastic and zealous for space	Sober, cautious, conservative
Long experience in military space work	New in military space work
Eager to sponsor multiple solutions to a single space problem	Determined to select a single best solution, in advance
Advocates of a total space systems concept	Believers in an R & D demonstration concept[202]

Overall, though, Worthman is upbeat and maintains that after the period of Air Force-OSD conflict between 1961-1963, the Air Force adjusted well to the continuing "demanding external management and reorientation of goals in conformity with broadened national space objectives."[203]

An excellent example of the continuing changes in AUR's space focus for the 1970s is the 1973 article touting the political benefits of the upcoming ASTP entitled "Keynote of the 1970s: Joint Ventures into Space".[204] This article probably represents the closest AUR embrace of the sanctuary school of thought on space. Later in the 1970s, however, the various pressures on the sanctuary school were reflected in several articles in AUR and elsewhere. By this time, the problems with the survivability of U.S. satellites were being recognized more widely. In 1977, former AUR Associate Editor

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[201]Ibid.

[202]Ibid.

[203]Ibid., 125. Of course, Worthman's optimistic outlook for Air Force space prospects was partially based on the soon to be canceled MOL program.

[204]Philip O. Davis and William G. Holder, "Keynote of the 1970s: Joint Ventures into Space," AUR 23 (September-October 1973): 16-29.

Richard Hansen discussed several factors concerned with offensive and defensive satellite operations.[205] Hansen also highlighted the military potential of the STS and indicated that the "question of what agency should be the long-term operator of the STS, when NASA has completed its development role, needs to be answered."[206] By this time even the Army, which had almost completely forgotten about space, also reentered the growing discussions on the military utility of space and the vulnerability of U.S. satellites.[207]

For our focus, the most important article in AUR during this period is "National Military Space Doctrine" written by Morgan Sandborn in 1977.[208] At the outset, it is important to note that this short article was located in the back of the journal under the "in my opinion" heading and should not, therefore, be seen as carrying the official sanction of the AUR editors or the Air Force. Sandborn first takes issue with the oft heard statement that "space is not a mission; it's a medium."[209] Conceding that this one sentence may be the "best summary of what our national military space doctrine consists of today," Sandborn asserts that this "essentially negative comment falls considerably short of delineating a positive doctrine or approach to a military potential of inestimable value."[210] Sandborn next outlines the four basic reasons for using space as discussed in "recent official speeches and writings on space doctrine".[211] These four basic reasons include: "uniqueness, economics, functional effectiveness, and force effectiveness

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[205]Lieutenant Colonel Richard Earl Hansen, USAF, (Ret.) "Freedom of Passage on the High Seas of Space," Strategic Review 5 (Fall 1977): 84-92.

[206]Ibid., 91.

[207]Colonel William W. Brown, US Army, "The Balance of Power in Outer Space," Parameters, Vol. 7, No. 3, (1977): 8-15.

[208]Colonel Morgan W. Sandborn, "National Military Space Doctrine," AUR 28 (January-February 1977): 75-79.

[209]Ibid., 75. This sentiment is also often expressed as "space is not a mission; it's a place."

[210]Ibid.

[211]Ibid., 76.

enhancement."[212] Sandborn asserts, however, that these four rationales for military space missions are "superficial" and "lead one to view space as a medium which is used primarily, if not exclusively, for the enhancement of terrestrial forces."[213] After asserting that current military rationales for space are incomplete, Sandborn asks how this situation might be rectified but finds that neither DoD Directives or JCS Publications address space doctrine.

Thus, Sandborn arrives at his primary point: the need for a separate space command. Because of the Air Force's extensive space background and because it is the only Service to have thought doctrinally about space, Sandborn favors creating this separate space command within the Air Force.[214] To Sandborn, the environmentally driven requirements for a separate space command are very clear:

> It is recognized that the technologies and operational procedures required to operate effectively in each medium are unique. It requires a separate, unique, and dedicated effort to ensure that each is used most effectively. The services' roles and mission in space have become obscure, creating overlaps and allowing certain other potentials to be ignored.[215]

Extending this logic, Sandborn even writes that an Air Force space command "could well develop into a space force when future requirements demand such a specialized and large-scale effort."[216] Finally, Sandborn asserts that the creation of an Air Force space

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[212]Ibid. Uniqueness refers to missions which can only be performed from space such as global ballistic missile launch warning. Economics dictates that space should be used when it is a less expensive way of accomplishing a particular mission such as satellite communications. Functional effectiveness refers to missions such as meteorology which are performed more effectively from space. Force effectiveness enhancement relates to the ability of space systems to improve the effectiveness of terrestrial forces.

[213]Ibid.

[214]Ibid., 77-78. The Basic Aerospace Doctrine of the Air Force contained in Air Force Manual (AFM) 1-1 at this time did contain a limited treatment of the space mission. The space doctrine content of AFM 1-1 is discussed in greater detail in the space doctrine statements section of chapter six below.

[215]Ibid., 77.

[216]Ibid., 78.

command would help to solve the two most "glaring problems" in space today: "[i]t would bring some coherence to the organization and operation of current and projected space systems such as the Space Shuttle[.]" and it would allow AFSC "to return to its primary mission of research and development."[217] Overall, Sandborn's strident tone and sweeping recommendations attempted to move military space thinking back towards the space control and high ground schools of thought and certainly marked a definitive break with the Air Force's mainstream thinking on space during most of this period. In hindsight, it is also clear that there was a groundswell of growing and intensifying support for many of the views expressed by Sandborn and that these were ideas that could no longer be ignored by the Air Force.

A final article in AUR from this period provides several additional insights. In 1978, Charles MacGregor and Lee Livingston, also writing in the "in my opinion" section, generally agreed with Sandborn's "excellent article".[218] The authors stated that the Air Force had been inattentive to space doctrine and noted that "[i]n a complete reversal of the usual situation" the civilian leadership at DoD now seems "to understand the significance of military space systems better than the professional military."[219] Worse, the authors (who spent the previous three years lecturing at Air University Schools) found that most Air Force officers "do not know, nor in many cases do they care to know, the details of our military satellite systems, even though these systems may make the difference over tomorrow's battlefield."[220] They indicate that three factors contribute to this general level of space ignorance within the Air Force officer corps:

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[217]Ibid.

[218]Lieutenant Colonel Charles H. MacGregor and Major Lee H. Livingston, "Air Force Objectives in Space," AUR 29 (July-August 1978): 59-62. The quote is from page 61.

[219]Ibid., 60. As this study points out, it is certainly questionable whether this situation represents a "complete reversal" of the normal pattern of civilian-military interactions on military space developments.

[220]Ibid., 60.

first, satellites are not airplanes; second, no single organization has responsibility for space; and, third, much information on space systems is classified.[221] The authors find that the "net effect" of this situation "is that the United States is operating with a badly flawed military posture regarding space."[222] In conclusion, the authors "wholeheartedly agree with [Sandborn's] assessment and recommendations concerning the need for a separate space command" and also assert that "we must have the active participation of the operating commands in formulating requirements and shaping the evolving doctrine."[223] Thus, by the end of this period, there is in AUR at least an initial recognition that the importance of military space is growing and that current organizations and doctrine for space may be inadequate for the challenges ahead.

The transformations of Air Force Association positions on space found within Air Force/Space Digest (AF/SD) and Air Force Magazine (AFM) during this period are even more pronounced. The AFA moved from its extreme space boosterism of the previous period to a nearly complete neglect of space issues by the end of this period. These publications were awash with space articles during the 1960s, but by the 1970s space-related articles had slowed to a trickle. Moreover, these remaining articles were less likely to express strong opinions outside mainstream, sanctuary-focused space thinking. The most clear indication of the declining relevance of military space issues for the AFA came when the AFA formally marked its de-emphasis of space by ending publication of Space Digest in February 1971 and changing the name of its publication to simply Air Force Magazine.

Early in this period, the AFA continued its strong support for a major manned military space presence by rapidly shifting gears from the X-20 to the MOL. Thus, Associate Editor William Leavitt strongly pushed the case for the MOL prior to President Johnson's 25 August 1965 decision to proceed with the program and highlighted the

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[221]Ibid., 60-61.

[222]Ibid., 61.

[223]Ibid.

support for the MOL found in the June 1965 report from the Military Operations Subcommittee of the House Committee on Government Operations.[224] Later in 1965, Technical Editor J.S. Butz gushed that the MOL "offers unparalleled technical promise and could have a greater impact on future USAF operations than any previous system with the possible exception of the ICBM."[225] By 1966, Leavitt believed that the MOL was well on track and, further, generally approved of "the evolution, still under way, from *ad hoc* and hunch to purposefulness that has marked the development of Defense -- and Air Force -- thinking on the military uses of space since the alarm-filled days that followed Sputnik nearly a decade ago."[226] This article also contained reassurances from Secretary of the Air Force Harold Brown and DDRE John Foster that the MOL program was healthy. The former had stated at the AFA Convention that "I have been assured by . . . Secretary McNamara that funding will be adjusted to what the development rate can stand. This is all you can ask of any project. I think [MOL] has a bright future."[227] The latter made the same point in January Congressional testimony: "The MOL program has not been cut back. We intend to carry out the MOL program as aggressively and efficiently as we can."[228]

By 1967, however, the AFA was beginning to sense that all was not well with the MOL program or in military space efforts more generally. Butz was now attempting to sell the MOL on the basis of its intelligence gathering capabilities. He cited President Johnson's off-the-record remarks in Tennessee about the value of spysats as evidence "that reconnaissance satellites are the most important single machines the US has ever

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[224]William Leavitt, "Getting MOL Off the Pad," AF/SD 48 (July 1965): 65-67.

[225]J.S. Butz, Jr., "MOL: The Technical Promise and Prospects, AF/SD 48 (October 1965): 42-46.

[226]William Leavitt, "Military Space: 1966 A Growing Maturity," AF/SD 49 (May 1966): 82.

[227]Ibid., 83.

[228]Ibid.

built."[229] Yet, Butz was even more sweeping -- he opined that the president "may be grossly understating the case[.]" and asserted that "there is strong reason for believing that observation from space is *the* most significant development in man's experience."[230] For Butz, the largest barrier to greater Air Force exploitation of this tremendous potential was the security surrounding intelligence gathering from space and "the policy to avoid discussion of military reconnaissance from space."[231]

Later in 1967, Butz continued with this theme by contending that "[o]veremphasizing the value of reconnaissance satellites would be difficult[.]" but that the MOL offered even more revolutionary new intelligence capabilities.[232] Here, Butz also argues that "the present financial climate" would no longer allow NASA and the Air Force to duplicate their efforts as they had in the parallel development of the Saturn I and Titan III boosters with similar capabilities and notes that a comparable situation could be developing between NASA's planned S-IV Orbital Workshop and the MOL.[233] In closing this article, Butz urges political leaders to emphasize that intelligence gathering from space -- not Project Apollo -- is the nation's top space priority:

> It is not enough to say in private that military reconnaissance is the most important product of the space age.
>
> The Air Force must not be hampered by jurisdictional disputes in upgrading the nation's space reconnaissance system to the point where it can report on an hour-to-hour basis on the situation in the air and underseas as well as on land.
>
> Somewhere along the line the number-one mission must be given the number-one priority in fact, and the first manned station must be tailored to military reconnaissance. The hundreds of millions already spent on MOL must

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[229]J.S. Butz, Jr., "Under the Spaceborne Eye: No Place to Hide," AF/SD 50 (May 1967): 93.

[230]Ibid. Emphasis in original.

[231]Ibid., 94.

[232]J.S. Butz, Jr., "Crisis in the Space Program," AF/SD 50 (October 1967): 84.

[233]Ibid., 85-86.

not be wasted.[234]

Unlike the uniformed military, Butz and the AFA were not restrained in strongly expressing their views on these important, fundamental points regarding the relative public emphasis given to the different sectors of U.S. space activity and on the utility of the MOL. The fact that only civilians were free to make such arguments publicly at this time was a direct reflection of the impact of DoD policies such as the blackout directive and undoubtedly impacted both the shape of programs like the MOL and the general development of Air Force thinking on space.

Outgoing Executive Secretary of the NASC Edward C. Welsh echoed several of these themes in an article in July 1969. Welsh emphasized that

> [t]he returns to national security from the military space program, particularly in the area of observation, have more than paid for the costs of the entire national space program to date, both military *and* civilian, several times over. And I see that profitability continuing in the future.[235]

Welsh found that "because of misunderstandings having to do with certain ill-conceived policies of overclassification, the US public does not have a sufficient understanding of the military space effort."[236] Given the nature of his former position, it is significant that he also added "there *is* [military space] knowledge that must be kept secret -- but it is a small fraction of the total so treated."[237] In conclusion, Welsh faults the decision of the previous month to cancel the MOL: "Failure to get a maximum return from this national-security system would seem to be woefully shortsighted and wasteful."[238]

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[234]Ibid., 86.

[235]Dr. Edward C. Welsh, "The US Military Space Program -- Insufficiently Understood," AF/SD 52 (July 1969): 61. Emphasis in original.

[236]Ibid., 60.

[237]Ibid. Emphasis in original. If these statements in this article are an accurate reflection of Welsh's position on the NASC concerning the need for classification of space systems this would seem to indicate that the NASC did not carry much weight in these space policy matters. Nixon abolished the NASC in 1973.

[238]Ibid., 61.

Bruised by the fight for the MOL and then caught up in the excitement of the moon landings and the atmosphere of detente, AF/SD and then AFM published precious few articles on military space issues during the 1970s. Some of these were simply "puff" pieces which merely recounted the current Air Force space inventory without any discussion of space doctrine or policies. A few articles were more substantial. In April 1972, AFM highlighted the recently released report on Soviet Space Activities written by Dr. Charles S. Sheldon, II, Chief of the Science Policy Research Division of the Library of Congress. By emphasizing the significant Soviet military space potential uncovered in this report, Senior Editor Edgar Ulsamer attempted, even in this heyday of detente, to draw a sharp distinction between the Soviet and American space programs and to illustrate the general military potential of space.[239]

Later in 1972, Ulsamer was among the first publicly to ask "How Vulnerable are USAF Military Space Systems?"[240] This article was based on an interview with Air Force Assistant Secretary for R & D Grant L. Hansen and covered a wide range of then-current and planed Air Force space systems. Hansen was not all that forthcoming concerning satellite survivability measures although he did discuss the ability of many satellites to use multiple paths to receive commands and transmit data and that the Air Force was studying how to shield satellites from EMP and laser effects.[241]

Many of Hansen's other comments are very interesting and revealing. For example, he asserted that "neither the USAF nor any other elements of DoD have a 'space program in the sense of NASA,'" because "[t]he Department of Defense and the Air Force do not view space 'as a mission, but rather as a place that offers more effective ways of accomplishing certain defense missions than do the other media of land, sea, and

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[239]Edgar Ulsamer, "The Question of Soviet Orbital Bombs," AFM 55 (April 1972): 74-75.

[240]Edgar Ulsamer, "How Vulnerable are USAF Military Space Systems?" AFM 55 (June 1972): 35-40.

[241]Ibid., 35-36.

air.'"[242] Hansen saw DDRE Foster's revision of DoD Directive 5160.32 in September 1970 as a way to encourage all the Services to "look for ways of using space systems to perform their jobs better and cheaper," and as a way to lessen the Air Force's image as the DoD's executive agency for space -- an image which might "inhibit the other Services somewhat with respect to their own space efforts".[243] In an excellent illustration of the pervasive sanctuary mindset of this period, Hansen directly contradicted the interpretation of the OST given in November 1967 by then-Secretary McNamara in response to the Soviet FOBS threat by stating that although the U.S. could build a FOBS system, it would not because "[d]evelopment of FOBS would violate the space treaty this country has signed."[244] Finally, Hansen revealed that one option being considered is "operation of the shuttle by the Air Force in the manner of a Military Airlift Command for space operations. Such an arrangement would go into effect only after the operation of the shuttle has matured to a routine status."[245] Overall, Hansen's comments clearly illustrate the impact of the sanctuary school on DoD thinking about space at this time.

Cumulatively, it is doubtful that either of these publications played a large role in the development of military space doctrine during this period. After a few fairly pointed articles early in this period, AUR easily settled into the sanctuary school and largely downplayed space issues. To its credit, later in this period AUR did at least provide a forum to individuals such as Colonel Sandborn who strongly questioned the sanctuary school of thought on space. In each case, however, AUR was, at best, keeping up with the overall trends in the evolution of military space doctrine rather than helping to lead these developments. The track record of AF/SD and AFM during this period shows even less initiative in attempting to shape developments in military space doctrine. AF/SD support for the MOL was strong and strident right up to the end of the program.

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[242]Ibid., 38. The interior quotes are from Hansen.

[243]Ibid.

[244]Ibid., 37.

[245]Ibid., 40.

Then, after the painful loss of this last hope for manned military space missions at this time, the AFA largely dropped space issues from its portfolio. Thus, AFM almost completely missed the growing discussions on satellite survivability and the debates over the merits of the sanctuary school towards the end of this period. Far from helping to lead in the development of military space doctrine at this time, the AFA barely even reported on these issues unfolding at the end of this period.[246]

Applying the Comparative Framework and Addressing the Research Questions

With the analysis of the major developments related to the evolution of U.S. military space doctrine for this period complete, this final section can now apply the comparative framework from chapter two and summarize the major findings related to the other research questions. The comparative framework is used to examine and categorize the overall doctrinal outputs of this period and to evaluate whether national security considerations or organizational behavior considerations were more important in shaping doctrinal outcomes at this time. The overall doctrinal outcomes of this period are also compared and contrasted with the predicted doctrinal outcomes from table three in chapter two. For this period, national security inputs were once again more important than organizational behavior inputs in conditioning most doctrinal outputs at this time. Unfortunately, however, some of the important doctrinal outputs of this period do not seem to be very well explained by the model. It is hoped that the process of comparing the doctrinal developments during this period with the doctrinal developments of the other periods will help to illustrate the differences and similarities in the doctrine development cycles for each period. Likewise, comparing the actual doctrinal developments of this period with the predicted doctrinal outcomes from table three may help to indicate the

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[246]In fairness, during the late 1970s AFM was strongly involved in many broader strategic debates concerning issues such as the Soviet strategic buildup, Carter's cancellation of the B-1, and SALT II ratification. For example, in August 1977 AFM reprinted the influential article by Richard Pipes entitled "Why the Soviet Union Thinks It Could Fight and Win a Nuclear War." In 1976, Pipes had led a team of outside experts (known as the B Team) which had reached very somber conclusions after it reexamined the same data available to CIA analysts concerning Soviet capabilities and intentions.

most powerful theoretical tools for examining the overall development of military space doctrine.

Applying the Comparative Framework

1) Due to the links between NTMV and the SALT I agreements, U.S. military space policy revolved around spy satellites more directly than ever during this period. Accordingly, space doctrine was defensive in nature and strongly shaped by the sanctuary and survivability schools of thought on space. Moreover, following the OST and the demise of the MOL, the military not only had few high ground or space control options left but also lacked any significant military space programs to advance these types of objectives. Other than support for the failed attempts to build more significant military space programs at the beginning of this period and the drift towards the survivability school at the end of this period, mainstream military thinking on space doctrine during this period centered as strongly on the sanctuary school as did the space thinking of civilian decision-makers. It is very instructive that civilian decision-makers rather than the military drove many of the satellite survivability measures and the revived U.S. ASAT program at the end of this period. Indeed, given that the MOL program was shaped around intelligence gathering considerations, it is difficult to think of a single major military space program of this period driven by organizational behavior inputs which supported the high ground or the space control schools of thought. Clearly, this first hypothesis strongly supports the importance of national security inputs in determining the outputs of military space doctrine related to the sanctuary school of thought.

2) The classification level for space systems during this period was a response to both national security considerations and organizational preferences. The best example of national security considerations overriding organizational preferences for classification is the MOL program. Here, the Air Force opposed the strict classification levels surrounding the MOL because its efforts to sell this system were hampered by these security considerations. Other military space programs which were not associated with intelligence gathering began a tentative, bottom-up, organizational behavior led movement away from the blackout directive during this period as force enhancement applications became more widespread and the space user community grew. However, the success of

the NRO and the intelligence community in keeping space-based intelligence gathering platforms highly classified throughout this period illustrates the power of organizational behavior inputs in achieving the opposite results. For example, the organizational preferences of the intelligence community certainly weighed in heavily to oppose declassification of space-based intelligence gathering as a way to sell arms control efforts publicly during the Johnson and Carter administrations. Of course, these security classification levels also contributed in less direct ways to the pervasive sanctuary mindset of this period where the organizational interests of the NRO and the intelligence community were best served by less attention on space despite the organizational interests of other groups in survivability and space control issues. Overall, while national security considerations often continued to be important in motivating strict classification levels for space systems, organizational preferences, especially within the intelligence community, were also very important in maintaining these classification levels throughout this period. Thus, neither national security inputs nor organizational behavior inputs seemed dominant in shaping space doctrine outputs in terms of security classification levels during this period.

3) During most of this period there was not much emphasis on military space doctrine and civilian leaders generally did not intervene strongly in the doctrine development cycle. Nonetheless, for most of this period, the emphasis on sanctuary in military space doctrine did correspond well with overall U.S. national space policy and national security strategy. The civilian leadership was clearly instrumental in structuring the framework of NTMV, arms control, and detente in which the military space doctrine cycle operated but they did not often intervene directly in the development of space doctrine. The sanctuary school of thought on space clearly matched well with the perceptions of the leadership on international relations and the efficacy of space systems other than space weapons for most of this period. Moreover, note again that the changing perceptions of military space utility on the part of involved civilian leaders as reflected in NSDM-333 and 345 as well as PD-37 was the key factor in moving the military towards greater emphasis on space system survivability and ASAT systems. This top-down intervention rather than any bottom-up organizational preference was critical

in changing the focus of military space doctrine by the end of this period. Thus, the general high level of integration between military space doctrine and both U.S. national space policy and national security strategy during this period was a reflection of a basic lack of organizational attention to military space doctrine but more importantly resulted from the national security considerations emphasized by the involved civilian space policy-makers.

4) Military space doctrine was generally stagnant during most of this period and it took national security inspired top-down intervention by involved civilian leadership to move doctrine towards more innovative approaches. Organizational preferences and bureaucratic inertia supported the continuing emphasis on the sanctuary school of thought on space despite the changes in military space technology and in international relations. The Air Force had developed remarkably little space doctrine regarding force enhancement or space control applications by the end of this period some twenty years into the space age. More innovative approaches to doctrine came only after the civilian leadership in the Ford and Carter administrations became more aware of the growing military potential of space and of the vulnerability of U.S. satellite systems. Another new approach to military space issues came when civilian officials in the Carter administration championed the innovative but unsuccessful two-track approach towards ASAT systems. Clearly, then, the limited innovations in space doctrine during this period were inspired by top-down national security considerations injected into the doctrine development cycle by involved civilian leadership and the space doctrine was generally stagnant without these inputs.

Let us now consider the relationships between the actual doctrinal outcomes of this period with the predicted doctrinal outcomes from table three in chapter two. The atmosphere of detente which animated many developments during most of this period was a clear reflection of low perceived tensions between the superpowers and table three is therefore the most appropriate theoretical tool for this period. There was a general de-emphasis on military space doctrine issues during this period and the civilian leadership did not intervene in the doctrine development cycle very often at this time. Some of the actual doctrinal outcomes for this period match closely with the doctrinal outcomes predicted by balance of power theory as listed in table three: Military space doctrine did reflect the sanctuary and then the survivability schools of thought; some space system security classification levels were set predominantly on the basis of the requirements of national security strategy; the degree of integration between space doctrine and national security strategy during this period was actually quite high rather than the low level predicted in the table; and there was generally a low degree of innovation in space doctrine outputs during this period.

Comparisons of the actual space doctrine outputs of this period with the outputs predicted by organizational theory shows a lower degree of correspondence: The space control and high ground schools were largely absent from military thinking on space during this period; space system security classification levels sometimes reflected organizational concerns to a high degree; the amount of integration between space doctrine and national security strategy for most of this period was actually quite high instead of the very low level of integration predicted by table three; and the degree of innovation in space doctrine was quite low, although perhaps not at the very low level predicted by table three.

Overall, the actual doctrinal outcomes of this period show a better match with the doctrinal outcomes predicted by balance of power theory than with the outcomes predicted by organizational theory. However, this match between the actual outcomes and the predicted outcomes from table three is considerably less accurate than the match found between the actual outcomes and the predictions of table two as discussed in the previous two chapters. In particular, the outcomes predicted by table three for both theories seem to be equally valid in the area of security classification level and neither theory accurately predicts the actual high level of doctrinal integration with national security strategy found during this period. Thus, while table three is a somewhat helpful theoretical tool in predicting the actual doctrinal outputs of this period, we must also consider why the model seems to be less useful in dealing with periods of relatively low international tensions.

Addressing the Research Questions

The final section of this chapter reviews the major findings related to the three other research questions. First, this section summarizes the major relationships between the most prominent doctrinal outcomes of this period with the doctrinally-related aspects of U.S. national space policy at this time. Next, the most important interrelationships between military space doctrine and military space organizations are reviewed. Finally, this section addresses whether the airpower development historical analogy is an appropriate tool for examining the spacepower developments during this period of the cold war.

For most of this period, U.S. military space doctrine and U.S. national space policy were in the closest alignment they enjoyed during the entire cold war era. For the bulk of this period both the military space doctrine and the national space policy focused almost exclusively on space as a sanctuary. The military was slowly moved to the sanctuary position following the OST, the cancellation of the MOL, and the SALT I agreements. Civilian decision-makers and national space policy had already reflected sanctuary school thinking but the development of the critical NTMV link during this period created even more intense support for the sanctuary school. What is most interesting in this area is that it was the civilian decision-makers rather than the military which led the movement away from the sanctuary school towards the survivability or even the space control schools. A number of factors including a lack of doctrinal attention on space, the numerous previous failed attempts to move towards more ambitious military space applications, and the organizational preferences of powerful military space bureaucracies such as the NRO combined to bind military thinking to the sanctuary school, even in the face of significant changes in international relations and space technology. Neither civilian decision-makers nor the military really directed or fully appreciated the implications of the technology-push incremental evolution of military space systems during this period; neither national space policy nor military space doctrine accounted for this evolution very well. The slow movement of the military away from the sanctuary school illustrates how difficult it is for military organizations to change rapidly or to think in innovative ways about new doctrine. Overall, the generally close alignment between military space doctrine and national space policy during this period was primarily a function of the generally stagnant state of doctrinal evolution at this time.

Space-related organizations and their preferred doctrines remained quite stable during this period. There were none of the wrenching or significant organizational changes which marked the previous period. NASA could afford largely to ignore military space doctrine during the Apollo moon race but became highly dependent upon and closely connected with military space launch requirements during the development of the STS. The designation of the STS as the national launch vehicle did not specifically suit the preferences of any space-related organization and forced NASA and the Air Force into an uneasy partnership with a vehicle which did not fully satisfy either party or any specific doctrinal position.

The NRO was probably the most powerful single space bureaucracy during this period. The secrecy surrounding this organization makes such analysis and judgements difficult but the intense focus on the sanctuary school and the critical importance of NTMV in the first superpower strategic arms control agreements at this time certainly matched well with the missions of the NRO. Undoubtedly, the best illustration of the strength of the NRO's organizational behavior driven doctrinal position at this time is the fact that it was able to prevail against top-level attempts during the Johnson and Carter administrations to open up the black world in order to sell arms control agreements more effectively to the public. The close links between the NRO and the Air Force were also important at this time, even if their effects were subtle and difficult to gauge from outside the black world. Overall, these close NRO-Air Force ties were undoubtedly influential in keeping the Air Force so firmly wedded to the sanctuary school even as civilian decision-makers and other military groups were moving towards the survivability school or beyond.

Finally, attempting to evaluate the basic organizational position of the Air Force on space doctrine is again difficult and complex. A few fairly small and relatively insignificant organizations within the Air Force, such as ADC, remained committed to the space control or even high ground schools for most of this period. The bulk of the Air Force, however, gave space issues very little attention following the demise of the MOL. Those Air Force organizations primarily involved in space such as AFSC, SAMSO, and SAFSP were committed to the sanctuary school in varying degrees. AFSC and SAMSO were both eager to expand their role in space but were not very active in investigating military space applications which did not match with the sanctuary school. Moreover, the space outlook of both of these organizations continued to be dominated by an R & D mindset which often did not serve space users very well. Additionally, SAFSP, the Air Force's component of the NRO, was in many ways the Air Force's single most important space organization and the sanctuary outlook of SAFSP continued to permeate the Air Force as a whole.

In closing, this section looks at the use and applicability of the airpower development historical analogy for the actual spacepower developments during this period. Due largely to the doctrinal fixation on the sanctuary school at this time, the airpower development historical analogy was not invoked very often or very specifically during this period. Indeed, there is little similarity between the sanctuary and NTMV focused spacepower developments of this period and the course of airpower development after the earliest days of World War I. These sanctuary and NTMV focused spacepower developments represented a new, important, and fundamentally different way to apply military-related technology which did not exist during the period of airpower development. There were virtually no calls for a significant demonstration of new methods of force application from space during this period. Likewise, at this time there was almost no movement towards developing integrated, supported, and offensively oriented spacepower doctrine similar to the AWPD-1 doctrine for airpower. Finally, there were few, if any, significant calls for the creation of an independent space force during this period. From comparing actual spacepower developments with the three critical steps in airpower development it is clear that, at least for this period, spacepower development was taking a quite different path than did airpower development.

For this longest period of the cold war, military space doctrine was not an area of major emphasis for either the military or civilian leadership. The few top-down, national security inputs to military space doctrine during this period were very important in shaping doctrinal outcomes. Organizational behavior inputs were less important but nonetheless reflected the substantial power of the various space bureaucracies which were now entrenched in the doctrine development cycle. Overall, this period contrasts sharply both with the previous periods and with the final period of the cold war The next chapter examines how the reexamination of military space doctrine begun at the end of this period continued and intensified during the early 1980s and how the high ground school of thought on space reemerged as a significant factor in shaping U.S. military space doctrine.

CHAPTER SIX: INCREASING MILITARIZATION AND POSSIBLE WEAPONIZATION

Overview

The final period in this study of the development of U.S. military space doctrine during the cold war is in many ways the most interesting and dynamic. In marked contrast with the previous period, this final period is characterized by an intense focus on military space issues and on military space doctrine. Military thinking on the proper relationships between space and national security during this period ran the gamut from the sanctuary school to the high ground school, although the space control and high ground schools received more attention from many elements within the military at this time than they had since the early 1960s. Many factors such as the creation of important new military space organizations, the military potential of the operational STS, and President Reagan's "star wars" challenge meant that in the early 1980s military space issues were again as conceptually wide open as they had been in October 1957. Moreover, during this period, the doctrinal sorting concerning the proper relationships between space and national security took place against the backdrop of the very significant military space technology expertise acquired since the beginning of the space age and the well developed space-based intelligence collection and force enhancement capabilities already in place. Thus, many of the debates over the military utility of space during this period were very complex and related to current and potential military space systems in highly technical ways. Nonetheless, the four major schools of thought on space continued to provide a complete spectrum of the major views on the utility of military space systems and, more importantly, these four basic outlooks on space continued to fundamentally shape the many complex political and technical military space issues of this period.

Given the increasing U.S.-U.S.S.R. tensions of the late 1970s and the early 1980s, the growing importance of military space systems, and the widespread perception that U.S. military space doctrine and organizations seemed unable to deal with the strategic challenges of the 1980s, military space doctrine and organizations received a good deal of attention at all levels at the beginning of this period. In April 1981, the USAF Academy sponsored a large and important Military Space Doctrine Symposium which helped to distill Air Force thinking on space at the outset of this period. April 1981 also marked the first orbital flight of the STS; the return of American manned spaceflight and the significant military potential of the STS were important factors in motivating continuing military thinking about the military potential of space. Moreover, President Reagan's overall tenor and early space policy statements represented further movements away from the sanctuary school of thought on space. The Air Force responded to these significant shifts in the perceived importance of military space missions at the beginning of this period by creating Air Force Space Command (AFSPACECOM) on 1 September 1982 as a way to consolidate, focus, and energize Air Force space efforts.

The conceptual foundations for much of U.S. thought on general strategic stability and specifically on the military utility of space were strongly jolted by President Reagan's "star wars" speech of 23 March 1983. Although space was not even mentioned in this speech, Reagan's challenge to the scientific community to investigate the possibility of technologically superseding strategic deterrence with strategic defense seemed automatically to imply that such strategic defenses would be largely space-based and this concept soon received the "star wars" moniker. From this point forward, military space issues were subsumed within the larger strategic context of the star wars controversy and further discussion of these issues was fundamentally altered. Thus, many subsequent military space developments during this period such as the creation of U.S. Space Command (USSPACECOM) on 23 September 1985, other military plans and programs of this period, spy satellite improvements, and the process of developing the MHV ASAT system were often evaluated on the basis of perceptions on their relationship with SDI and in relation to the perceived strategic utility of the SDI effort.

This period also saw the development of the first official military space doctrine statements of the cold war era. The military space doctrine contained in Air Force Manuals (AFM) 1-1 and 1-6 as well as in DoD and Air Force space policy statements is extremely important for our focus and is examined in detail below. Finally, the space thinking and doctrinal positions discussed in Air University Review and Air Force Magazine during this period are also be examined in some detail. Overall, despite all of the focus on military space issues and on military space doctrine during this period, many military space issues as well as the overall tenor of military space doctrine remained quite unclear by the end of this period as will become more apparent from the analysis below. Some of this confusion is undoubtedly a reflection of the tectonic shifts accompanying the end of the cold war but other uncertainties concerning military space issues relate directly back to the continuing divergent views on the utility of military space missions reflected in the four basic schools of thought on space.

Overview of Major Doctrinal Inputs and Considerations

The USAF Academy Military Space Doctrine Symposium provided an important conceptual starting point for doctrine development during this period. Although the direct impetus for the conference came from the top-down from Secretary Mark, the groundswell of support for this idea was reflected in the 1000 page reading book, the strength of the well-attended symposium program, and the points of consensus and recommendations generated. Many widely varied approaches to the study of doctrine development and specific recommendations for military space doctrine were broached at this symposium. Both the top-down and bottom-up approaches towards doctrine development were studied in detail. Generally, many of the presentations to the symposium emphasized the top-down approach while many of the readings analyzed the bottom-up approach and specifically focused on the role of the Air Corps Tactical School (ACTS) in developing doctrine during the interwar period as an important analogy for spacepower development. The most important outputs of this symposium helped the Air Force seriously question the adequacy of its space organizations and more carefully consider the space control and high ground schools of thought once again.

The interrelationships between NASA and the Air Force over space transportation policy and STS operations were very complex and quite strained during this period. The organizational concerns of both NASA and the Air Force predominated over most other considerations for most decisions within this area during this period. The fight over the creation of the CELV program is the best example of the strength of these organizational concerns on both sides. The NASA-DoD MOU of 25 February 1980 can also be seen as quite an organizational coup for the Air Force in terms of specifying significant control over STS operations after only low investments in STS development. Different groups within the Air Force had different outlooks on the military utility of the STS: the space cadets were excited about its potential for significant military man-in-space applications; the NRO liked its design payload capacity but chafed at its problems in meeting this specified lifting capability, its schedule delays, and its unclassified security setting; and air enthusiasts were angered with the large expenditures required for DoD STS operations infrastructure. Due to these different perspectives within the Air Force and the ability of the STS to appeal to adherents from each school of thought on military space applications, it is difficult to categorize doctrinal inputs in this area. Not surprisingly, The U.S. lacked strong military space doctrine guidance in this area. The complete reversal of earlier DoD STS policy following the *Challenger* disaster but after the investment of billions in DoD STS infrastructure is the best example of the lack of agreement on, clear guidance for, or long-term plans for DoD STS use.

The official space policy statements of the Reagan administration provide an interesting and enlightening means by which to judge the development of U.S. military space doctrine during this period. Overall, it is clear that for most military space-related areas during most of this period, the White House rather than the Pentagon produced the most ambitious goals for military space applications. Of course, this situation represents a reversal of the situation during the Eisenhower and Kennedy administrations when the military kept advancing ambitious military space plans which were shot down politically. During this period, it was the White House which generally held the high ground and space control outlooks which were not always matched with equal enthusiasm by the military. This reversal provides clear evidence of the complexity of the military space doctrine development process and illustrates that this doctrine is not simply imposed from the top-down.

The creation of AFSPACECOM on 1 September 1982 was clearly a very significant development in the structure of military space organizations during the cold war. However, the doctrinal impact of this new Air Force major command is difficult to ascertain. Doctrinal issues certainly motivated the Air Force to look seriously at creating a separate space command and, unlike almost all other major military space issues, this decision was primarily an internal Air Force affair. Pressures within the Air Force for creating a space command came from both the top-down and from the bottom-up. Additional pressures were provided by the Congressional initiatives designed to foster a separate space command due to national security considerations and from the GAO report which raised both national security considerations and organizational questions. Other than the strong space operator outlook developed by AFSPACECOM, it is sometimes difficult to detect the doctrinal preferences or advocacy of AFSPACECOM. It is certainly difficult to see where these factors might have had a large impact on a major space issue during this period. In this regard, AFSPACECOM clearly fell short of the expectations of those who supported its creation.

President Reagan's SDI was one of the most significant strategic developments during this period but it is not evident that this initiative had much specific impact on U.S. military space doctrine. It is very clear that the military had very little to do with stimulating the reawakening of the concept of strategic defense within the U.S. during the late 1970s and early 1980s. Civilians, many of whom were outside the government, did the bulk of the work in this regard. The disparate and ad hoc nature of these strategic defense advocacy groups meant that this concept was driven forward almost entirely by national security considerations rather than by organizational behavior. Due to the personal convictions of the CNO, Admiral James D. Watkins, the JCS came aboard at the eleventh hour to strongly support the investigation of strategic defenses. Of course, President Reagan's top-down initiative did significantly alter the strategic landscape for the remainder of this period but, even by the end of this period, the mainstream thinking of the Air Force and the other Services had not strongly embraced SDI. Moreover, because the military generally maintained an arms-length relationship with the autonomous SDIO there was little cross-fertilization of doctrinal ideas between these organizations and the narrow BMD focus of the SDI also may have de-emphasized the general strategic potential of the space weaponry technology under investigation.

The establishment of USSPACECOM on 23 September 1985 was a controversial development within DoD and was another very significant organizational development in the U.S. military space bureaucracy of the cold war. In a reversal of the Services' positions in the late 1950s and early 1960s, the Air Force was eventually successful in convincing the other Services of the need for a unified command for space. This unified command was the first military organization specifically charged with preparing for the space combat mission and it provided strong advocacy for military space systems during the last few years of the cold war. As such, USSPACECOM was the first major space bureaucracy whose organizational behavior preferences were directly linked to the space control and high ground schools of thought on space. While the strong advocacy of USCINCSPACE, General John L. Piotrowski, and of USSPACECOM was abundantly clear by the end of this period, it is less clear how much impact this advocacy had on military space plans, programs, and doctrine during this limited time.

Despite all of the focus on military space development at this time, very few new types of military space systems actually came on line during this period. Mainstream force enhancement capabilities such as communications, navigation, meteorology, and early warning continued to be improved during this period, mainly through bottom-up incremental technological improvements rather than as a part of some larger deductive plan. These continuing technological improvements moved even traditionally mainstream military space applications into controversial areas as the warfighting potential of these systems increased. Important new potential military space applications such as space-based lasers, radars, or infrared tracking systems were not aggressively pursued or developed during this period despite promising technological developments and successful programs or experiments in several of these areas. In large part, these types of programs languished because they were not strongly pushed from the top-down and because they lacked much bottom-up support from the military. Finally, the inability of the military to make much headway by the end of this period on new launch vehicle concepts such as the ALS or the NASP is another indication of a lack of clear and definite doctrinal guidance on launch requirements and the need for military man-in-space.

While spy satellite developments remained a critical top-down input for military space doctrine during this period, U.S. emphases towards spysat capabilities and functions changed in subtle but important ways. The Reagan administration did not initially value the arms control process as highly as had its predecessors and it did not link spysats as directly with NTMV. The Reagan administration also used spysat-derived data in novel new ways such as in the Soviet Military Power series. This weakening of the link between arms control and spysats as NTMV provided an opening for the military to attempt to build more effective programs to exploit data from these national overhead assets at the tactical level. The TENCAP program is probably the most important of these efforts but this program apparently had not yet reached anywhere near its full potential by the end of this period. The decades required to establish a program such as TENCAP and the slow progress of this program are evidence that broad spysat national security considerations apparently still outweigh the bureaucratic interests of the Services in many ways.

U.S. efforts to field an ASAT system during this period are complex and confusing but they do reveal that, in practice, neither DoD nor the Air Force strongly supported the development of the MHV system. DoD and the Air Force gave the MHV only lukewarm support despite the administration's ASAT policy in NSDD-42 and the Air Force's own space control doctrine statements in AFM 1-6. Of course, this was a complex issue; the serious Congressional restrictions imposed on the MHV between FYs 1984-1988 were by far the most important factors in causing the cancellation of the MHV. For most of its life, the Air Force's MHV ASAT system lacked effective advocacy from its eventual users -- it was not until General Piotrowski became USCINCSPACE in February 1987 that ASATs received strong and consistent support. Overall, this area illustrates the dominance of civilian defense decision-makers over the uniformed military and also that top-down policy or doctrinal guidance does not necessarily translate into bottom-up support from the Service involved.

The issuing of the first official U.S. military space doctrine statements during this period is the most important development for our focus. The first major space doctrine statement officially approved during the cold war period was AFM 1-6 released on 15 October 1982. Although it contains significant shortcomings, AFM 1-6 is a major milestone in doctrinal thinking which was responsive to both top-down and bottom-up pressures and seemed to correspond most closely with the survivability and space control schools of thought about space. Weaknesses of AFM 1-6 included its underdeveloped environmental doctrine for space, its overly constrained approach to the topic, and its general lack of clarity concerning guidance in many areas. Another very significant doctrinal milestone was reached in February 1987 when DoD issued its updated space policy inspired by national security considerations. The 1987 DoD Space Policy moved past AFM 1-6 and provided greater conceptual clarity in several ways: it divided space activities into four clear mission areas, it recognized the unique nature of the space environment instead of discussing the aerospace concept, and it took the perspective of the space user rather than the space operator. The final major space doctrine statement of this period, the Air Force Space Policy issued on 2 December 1988 built upon the DoD Space Policy of 1987 and provided clear and concise guidance for Air Force space activities. This final statement also addressed several of the weaknesses identified in AFM 1-6, seemed to flow from both top-down and bottom-up considerations, and was the strongest official Air Force embrace of the space control and high ground schools of thought during this period if not during the entire cold war era.

Analysis of Major Developments Related to U.S. Military Space Doctrine, 1979-1989

The USAF Academy Military Space Doctrine Symposium

In April 1981, the USAF Academy hosted what is probably the single most important conference devoted to military space doctrine during the cold war. This symposium was the result of a January 1980 challenge issued by then-Secretary of the Air Force Mark to the USAF Academy to apply its "spectrum of academic expertise to the study of a doctrine for the military role in space."[1] This symposium attracted a large audience of military space experts from around the Air Force, the other Services, and civilian space organizations.[2] The symposium included major addresses by General Schriever (USAF, Retired), Major General I.B. Holley (USAF Reserve, Retired), Former Secretary Mark, Lieutenant General Richard C. Henry (Commander of AFSC Space Division), and Dr. Charles W. Cook (Deputy Assistant Secretary of the Air Force for Space Plans and Policy). Moreover, because the symposium solicited, published, and widely distributed unclassified papers on military space doctrine prior to the opening of the symposium, the roundtable panel meetings at the symposium were able to deal with this topic in a more substantive manner.[3] The combination of these factors along with the timing of this event plus the cross-fertilization of ideas during the symposium itself helped to produce many of the ideas which fundamentally shaped Air Force space doctrine during the 1980s.

Three of the major addresses are reprinted in the final report. These presentations help to indicate the general tenor of the symposium and made several significant points on the state of military space doctrine at this time and on the prospects for further developments. General Schriever's Keynote address adopted a critical tone regarding the

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[1]Major Paul Viotti, ed., Military Space Doctrine -- The Great Frontier: Final Report for the United States Air Force Academy Military Space Doctrine Symposium, 1-3 April 1981, (Colorado Springs: USAF Academy, 1981), i. (Hereinafter Viotti, USAFA Symposium Final Report). Mark's challenge also resulted in the creation of an interdepartmental faculty working group on military space doctrine and an interdepartmental course on military space doctrine taught during the Spring 1981 semester.

[2]19 General Officers are found in the list of over 250 total attendees for this symposium.

[3]45 papers were selected for publication in Major Peter A. Swan, ed., The Great Frontier -- Military Space Doctrine: A Book of Readings for the United States Air Force Academy Military Space Doctrine Symposium, 1-3 April 1981, Vol. I-IV (Colorado Springs: USAF Academy, 1981). (Hereinafter Swan, USAFA Symposium Reading Book). These 1000 page reading books were distributed to Symposium attendees one month prior to the Symposium and more widely throughout the Air Force and elsewhere.

progress of military space doctrine development to date. Commenting on the earliest days of the space age, Schriever noted that the first Air Force efforts to develop military space doctrine were stymied by President Eisenhower's space priorities: "'space for peaceful purposes' was a phrase that just haunted us. It haunted us constantly."[4] Schriever next criticized the "Cambridge Mafia" brought to Washington by President Kennedy and charged that they practiced a "paralysis by analysis" management style in defense policy.[5] In summarizing the period in which he served on active duty, Schriever noted that "[t]he only area that got support was strategic intelligence[.]" and he emphasized that Air Force space programs were "stifled and inhibited by policy, not technology and know-how."[6] Moving on to his recommendations, Schriever indicated that he more firmly than ever believed that space "is the new high ground."[7] He highlighted the need for: survivable space forces, capitalizing on the U.S. technological advantage in space systems, and updated military space policy and doctrine.[8] Finally, Schriever noted that space weapons technology was continuing to evolve to the point where he could "visualize" that eventually space-based weapons could "hold land, sea, and air systems hostage."[9] Overall, this was vintage Schriever (once he was freed of the constraints of active duty) and clearly indicated his disdain for the space as sanctuary emphasis of the previous two periods.

General Holley's presentation provided a number of detailed historical analogies for doctrine development and focused on the continuous search for doctrine from the days of horse cavalry, through the earliest U.S. air doctrine, and into the current struggle to define the best ways to use military space systems. His major historical emphasis was

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[4]Viotti, USAFA Symposium Final Report, 24.

[5]Ibid., 25-26.

[6]Ibid., 26-27.

[7]Ibid., 28.

[8]Ibid., 29-30.

[9]Ibid., 34.

on "[t]he story of how a small band of zealots, true believers in strategic air-power," created the doctrine of unescorted daylight precision bombardment at the Air Corps Tactical School (ACTS) at Maxwell Field, AL, during the interwar period.[10] Because Holley's focus was on failures in military doctrine he emphasized the role of poor assumptions and skewed analyses in the debates at ACTS which downplayed the general role of fighter aircraft and the need for fighter escorts for strategic bombing missions.[11] Holley detailed a variety of technical difficulties which combined with significant doctrinal blinders to slow the development of long-range fighter escorts and noted that "[l]iterally hundreds of crewmen lost their lives because escort fighters of suitable range were not ready when needed."[12]

Unfortunately, Holley was extremely brief in his treatment of military space doctrine in this speech. He stated that it was very likely "that we shall make as many mistakes in formulating space doctrine as we did with cavalry doctrine and airpower doctrine" if we have not first "built a truly effective organization for concocting doctrine and have staffed it with the best people we can find."[13] Most importantly, he exhorted

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[10]Ibid., 47.

[11]Ibid., 47-55. The chief proponents of unescorted daylight precision strategic bombardment read as a who's-who listing of early Air Force leadership and included then-Colonel Henry H. (Hap) Arnold, then-Colonel Oscar Westover, then-Colonel Carl Spaatz, and then-Major Hoyt S. Vandenberg, Sr. One of the lone voices supporting fighter development and fighter escorts was then-Captain Claire S. Chennault.

[12]Ibid., 54. Ironically, it was Spaatz (supported by staff work from Vandenberg) who had disapproved the development of drop tanks for fighter aircraft in 1941. In 1943-44, Spaatz learned through bloody experience as the Head of 8th Air Force in Europe of the need for this range extender for fighters.

[13]Ibid., 55. Holley helped to define what he meant by the "best people" for developing doctrine as follows: "We need officers who will go out of their way to seek and to welcome evidence which seems to confuse or contradict the received wisdom or their own most cherished beliefs. In short, we need officers who understand that the brash and barely respectful subordinate who is forever making waves by challenging the prevailing posture just may prove to be the most valuable man in the organization -- that is, if he is listened to, and providing his imagination and creativity can be disciplined by the mandate that he present his views dispassionately and objectively." Ibid., 56.

his audience not to "delay our effort to *conceptualize* the eventual combatant role of spacecraft even if current treaty obligations defer the actual development of hardware."[14]

By contrast, General Henry's presentation focused on current space issues almost exclusively. He acknowledged the difficulties caused by having an R & D organization such as AFSC Space Division in charge of space operations but defended this practice by noting the continuing need to rely heavily on contractor engineering talent for both space launch and on orbit support.[15] Henry asserted that "space systems are becoming -- if not already -- the fourth element in our strategic arsenal, joining the ICBM, the penetrating bomber and the submarine in providing the country's front line deterrent to war or geographical encroachment."[16] Henry also identified "three central doctrinal issues" related to maintaining assured access to data streams from space for force enhancement: space system survivability, hardware for connectivity with major military systems, and the direct command and control links between headquarters and unit level forces possible through space-based communications relays.[17] Significantly, Henry focused on space-based force enhancement capabilities almost exclusively rather than even discussing space control or high ground potentials. In closing, Henry asserted that first the Air Force needed to sequentially, carefully, and completely develop an "orbital strategy" designed "for depth and survivability".[18] Henry indicated that developing an orbital strategy would help to assure force enhancement data flows from space; generate requirements for launches, launch vehicles, and spacecraft; and help to define production strategies and provide for stable acquisition cycles.[19] In short, Henry concluded that "[a]s a by-product

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[14]Ibid. Emphasis in original.

[15]Ibid., 65.

[16]Ibid., 67.

[17]Ibid., 67-68.

[18]Ibid., 69.

[19]Ibid.

such a strategy would probably reflect a doctrine."[20]

The four volume reading book produced for this symposium contains many important papers on military space doctrine. A wide variety of issues related to military space doctrine ranging from theoretical insights on doctrine development to space personnel and organizational considerations as well as numerous doctrinal recommendations are covered in these 1000 pages.[21] Several papers addressed the need to create mechanisms to better develop and maintain the space expertise required by the Air Force. Some of the most detailed recommendations in this area came from Lieutenant Colonel Robert B. Giffen in a paper which outlined a system for centrally managing space personnel in a manner similar to the existing system for managing rated officers. Giffen indicates that such a system would help to provide for more clear career progression routes for those Air Force officers in space career fields and allow the Air Force to "grow" its future space generals from within these space career fields.[22] Giffen and the others who address this problem in the reading book clearly recognize the links between personnel, organizations, and doctrine and are attempting to describe structures which would help to produce stronger space doctrine from the bottom-up.

By contrast, many papers in the reading book approached the problem of space doctrine from the top-down. Air Force Deputy Assistant Secretary Cook's paper provided some of the most detailed analysis and recommendations on how to restructure Air Force space organizations using this strategy. Cook first provided a review of the

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[20]Ibid. For more on Henry's "orbital strategy" and his emphasis on the need for on orbit spare satellites see, Bruce A. Smith, "USAF Officer Cites Need to Plan Orbital Strategy," Aviation Week & Space Technology, 22 June 1981, 104-5.

[21]Interesting insights into the theory of doctrine development are provided by Major Todd I. Stewart, Lieutenant Colonel Richard V. Badalamente, and Colonel Charles R. Margenthaler in "Understanding the Nature of Doctrine: An Essential First Step," in Swan, USAFA Symposium Reading Book, Vol. I, 43-74.

[22]Lieutenant Colonel Robert B. Giffen, "Spacepower: Space Systems Distribution and Training Management," in Swan, USAFA Symposium Reading Book, Vol. II, 332-45. Giffen is currently Permanent Professor and Head of the Department of Astronautics at the USAF Academy.

major recent Air Force space organization-related initiatives. The initiatives he mentioned included the ongoing work in drafting AFM 1-6 "Military Space Doctrine," the February 1979 Space Mission Organization Planning Study (SMOPS), Summer 1980 reports related to space organizations from both the Defense Science Board (DSB) and the Air Force Scientific Advisory Board (SAB), the October 1979 creation of SPADOC, and the creation in September 1980 of a new Deputy Commander for Space Operations (DCSO) at Space Division.[23] The bulk of Cook's paper identifies and discusses a list of seventeen Air Force space organizational and management shortfalls.[24] Cook next looks at potential methods for dealing with these problems organizationally including continuing with the status quo; designating SAC, AFSC or ADC as the Air Force space manager; and the creation of a new space command. Based on his analysis of these options, Cook finds that the most effective approach would be to "assign operations of all strategic defensive space assets to ADCOM, strategic offensive space assets to SAC, and place all other space operations, as well as resource management of all space activities, in a separate command."[25] In closing, Cook makes three other recommendations: revising DoD Directive 5160.32 to designate the Air Force as the DoD

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[23]Dr. Charles W. Cook, "Organization for the Space Force of the Future," in Swan, USAFA Symposium Reading Book, Vol. II, 467-99. Cook noted that one of the conclusions of the SAB "Summer Study of Space" was that current "*AF organization for operational exploitation of space is inadequate*." Emphasis in original. The four major recommendations of the SMOPS included: 1) "The Air Force should be the DOD executive agent for space." 2) "The Air Force should seek operational control of the Shuttle for all national security missions." 3) "The Air Force should acquire operational military capabilities in space." And 4) "The Air Force should make organizational adjustments to assume the operational posture needed to achieve these objectives." Ibid., 473-76.

[24]Ibid., 476-92. Cook's five organizational shortfalls were: assignment of responsibilities, planning, operational control, advocacy, and developer-operator relationships. His twelve management shortfalls included: operations doctrine, space weapons, space system survivability, spacecraft positioning, multimission payloads, career management, spacecraft maintenance, electromagnetic capability, COMSAT architecture, spacecraft leasing policy, space liability, and space debris.

[25]Ibid., 496.

executive agent for space, completing AFM 1-6, and undertaking a follow-on SMOPS.[26] Cook's paper provides an important window through which to view the changes in the space thinking of the top civilian leadership at the Pentagon and illustrates how far this thinking had evolved away from the sanctuary school.

A final major theme of the papers in the reading book for this symposium dealt with historical analogies between the current state of space doctrine development and previous military doctrine development efforts. Not surprisingly, the doctrine development efforts of the ACTS received the greatest attention in this area. Several of the papers examined the organizational attributes of the ACTS which enabled this group of officers to create the unescorted daylight precision strategic bombardment doctrine and many of the papers called for the Air Force to establish an organization similar to the ACTS and to charge this new organization with the responsibility to create space doctrine.[27] These recommendations based on the airpower development historical analogy were also motivated by the desire to build stronger space doctrine from the bottom-up and at least implicitly contrasted the "success" of the ACTS in creating doctrine for a new combat medium with the perceived failure of the Air Force in creating a similar new doctrine for the new medium of space.

The majority of the deliberations at the symposium took place at three roundtables. Each roundtable panel was headed by a general officer. The topics for the three roundtables were divided as follows: 1) U.S. space operations doctrine, 2) U.S. space organization doctrine, and 3) USSR/International space operations and organization doctrine. Roundtable one reached consensus on a number of major findings including: the basic link between national security requirements and space missions, recognition of

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[26]Ibid., 497-99.

[27]See, for example, Major Charles D. Friedenstein, "A Concept: The USAF Space Operations School," in Swan, USAFA Symposium Reading Book, Vol. II, 544-53; Major Robert L. Swedenberg, "In Search of an Environment for the Growth of Space Doctrine," in Swan, Vol. III, 582-613; and Second Lieutenant Michael A. Syiek, "The Air Force and the Space Force: The Role of the Air Corps Tactical School in the Development of Air Power," in Swan, Vol. II, 554-81.

force enhancement as the current primary space mission with the expectation that space control and force application missions were likely to develop, the need for survivability and assured support to users, a lack of understanding about space and about doctrine in general, the need for expanded military man-in-space missions, and the need for a deductive approach towards future space developments rather than following the inductive, incremental path of military space developments to date.[28]

Roundtable two reached consensus on the following items: the development of airpower doctrine was traumatic, the current major legal and policy frameworks for space are adequate, the Air Force should be designated as the DoD space executive (but not exclusive) agent, strong advocacy is crucial to space development, school(s) of thought as crucibles of doctrine are needed, and in the long term a dedicated military space organization is inevitable.[29] Finally, roundtable three found that Soviet space activities are dominated by the military, are designed to enhance Soviet national power, and are likely to expand in the future. Accordingly, the U.S. military should attempt to: recognize the importance of economic and political factors, understand Soviet doctrine, accurately measure Soviet capabilities, integrate information from disparate U.S. military communities in military planning, and advise the U.S. civilian leadership on national policy and in international negotiations.[30] The overall tenor of the items of consensus and the recommendations from the symposium reflected considerable optimism and enthusiasm towards the increasing military potential of space and the growing role of the Air Force in that process.

Attempting to gauge the impact of a single conference on subsequent policy is a risky proposition. Nonetheless, the Military Space Doctrine Symposium does seem to have been a landmark event in shaping general Air Force and military attitudes towards military space doctrine issues in the early 1980s. Several commentators have mentioned

[28]Viotti, USAFA Symposium Final Report, 13-14.

[29]Ibid., 17.

[30]Ibid., 18-20.

the importance of this symposium and its impact.[31] Clearly, the timing of this symposium was right -- the various recommendations from the papers in the reading book as well as from the deliberations at the symposium itself found a receptive audience in the larger Air Force and national space policy-making communities during the early 1980s. Various recommendations from this symposium certainly supported the Air Force's establishment of a new Major Command, AFSPACECOM, less than a year and one-half from the end of this symposium. Perhaps most importantly, the ideas generated at this symposium helped to encourage the Air Force and the other Services once again to think seriously about space control and high ground military space applications as they considered military space doctrine for the 1980s.

The Military, Space Transportation Policy, and STS Operations

This period witnessed both the long awaited arrival of STS operations and the wrenching reordering of U.S. space transportation policy following the *Challenger* disaster. DoD interactions with the STS program continued to be a very important factor

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[31]In Congressional testimony in May 1982 Representative Ken Kramer, (R.-CO) praised the Academy Doctrine Symposium and particularly emphasized the "series of papers" generated for the symposium -- noting that their "collective influence could be historic, insofar as they demonstrate the conceptual innovation and intellectual vigor of the Air Force's 'space community'". See, U.S. Congress, House, Committee on Armed Services, Investigations Subcommittee, Hearing before the Investigations Subcommittee on H.R. 5130: Aerospace Force Act, 97th Cong., 2nd sess., 19 May 1982, 27. (Hereinafter HASC, Aerospace Force Act). See also, Thomas Karas, The New High Ground: Systems and Weapons of Space Age War (New York: Simon & Schuster, 1983), 9-13. (In this section Karas also strongly emphasizes the profound impact of DeWitt S. Copp, A Few Great Captains: The Men and Events That Shaped the Development of U.S. Air Power (Garden City, NJ: Doubleday & Company, 1980) on the doctrinal thinking of what he terms the Air Force "spacemen" of the early 1980s); Michael A.G. Michaud, Reaching for the High Frontier: The American Pro-Space Movement, 1972-84 (New York: Praeger, 1986), 217; and Robert Frank Futrell, Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1961-1984, Vol. II (Maxwell AFB, AL: Air University Press, December 1989), 691-93. Moreover, the major items of consensus from the roundtables and several papers in the reading book from this symposium were clearly very influential in the development of Lupton's typology of four schools of thought on space, see Lieutenant Colonel David E. Lupton, USAF, (Ret.) On Space Warfare: A Space Power Doctrine, (Maxwell AFB, AL: Air University Press, June 1988), especially chapter three.

in shaping this program while the DoD's stance on the STS provides important insights into the military's space priorities and actual level of commitment to various space programs. Despite the great military potential of the STS and the considerable support for the STS within elements of the Air Force and elsewhere in DoD, several significant points of friction remained between the Air Force, DoD, and NASA concerning STS operations and plans. Even prior to the *Challenger* disaster the NRO had managed to gain formal approval to build a backup launcher, the Complementary ELV (CELV), for its most important payloads. Following the *Challenger* disaster, U.S. national space transportation policies were completely reordered under the Space Launch Recovery Plan and the Air Force planned to move almost all DoD payloads onto ELVs. Thus, the story of the DoD's interaction with the STS during the 1980s illustrates the reversal of several major space transportation policies, the abandonment of the original STS program goals, and the demise of yet another potential vehicle for significant military man-in-space missions.

As described in chapter five above, the DoD had been instrumental in saving the STS from cancellation at the outset of the Carter administration. DoD was also a key player in defending the STS in the late Carter administration when the program again faced significant political opposition due to successive schedule slips and funding shortfalls requiring supplemental appropriations.[32] DoD support for the STS was critical in maintaining political support for the STS within the administration and culminated in a 14 November 1979 White House meeting between the president and all of the top players on this issue where Carter firmly committed his administration to fully funding and rapidly completing the STS.[33] DoD support for the national security mission of the STS was also a key factor in pushing the supplemental appropriations through Congress

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[32]In 1979, NASA required supplemental appropriations totaling over $1 billion (1972 dollars) to keep the STS program on track, see Hans Mark, The Space Station: A Personal Journey (Durham: Duke University Press, 1987), 93.

[33]Mark, Space Station, 101-3; and Joseph J. Trento, Prescription for Disaster (New York: Crown Publishers, 1987), 169.

following hearings in March 1980.[34]

DoD exacted a price from NASA for its indispensable support: on 25 February 1980, NASA and DoD signed an extensive MOU "on Management and Operation" of the STS which was quite favorable to DoD.[35] Specifically, the MOU indicated that "DOD will have priority in mission preparation and operations consistent with established national space policy."[36] Further, the MOU established two categories of DoD STS missions: 1) national security missions conducted by NASA, and 2) "Designated National Security Missions" controlled by the Air Force.[37] Overall, this MOU went a long way

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[34]Representative Edward Boland (D.-MA) was instrumental in gaining approval for these supplemental appropriations as Chairman of the NASA appropriations subcommittee. His support for the STS stemmed from his position as Chairman of the House Intelligence Committee where he learned about the STS-spy satellite link in detail. See Mark, Space Station, 105; and Trento, Prescription for Disaster, 156-57.

[35]"NASA/DOD Memorandum of Understanding on Management and Operation of the Space Transportation System," 25 February 1980; microfiche document 00561 in U.S. Military Uses of Space, 1945-1991: Index and Guide (Washington: The National Security Archive and Alexandria, VA: Chadwyck-Healey, Inc., 1991). This MOU replaced the 14 January 1977 NASA-DoD MOU on the STS and provided the basis for several NASA-DoD sub-agreements.

[36]Ibid., 3. The "established national space policy" referenced is presumably PD-37. This DoD mission priority on the STS is often referred to as the right of DoD to "bump" other payloads from the STS manifest in favor of top-priority national security payloads. Other significant provisions of this MOU indicated that: The Air Force was DoD's "sole point of contact with the NASA for all commitments affecting the STS and its use in matters regarding national security space operations and in international defense activities covered by Government to Government agreements;" the Air Force would "[d]evelop, acquire, and operate a dedicated Shuttle mission planning, operations, and control facility for national security missions;" and "[a]n STS mission assignment schedule and plan" would be developed to facilitate the "expendable booster transition and phaseout plans" of NASA and the Air Force.

[37]Ibid., 3-4, 6-9. Specifically, for category one DoD STS flights, NASA would exercise flight control from JSC but "NASA will be responsive to DOD Mission Directors" who retain "overall responsibility for achieving mission objectives." For these missions, Air Force personnel "will be integrated into NASA line functions for training" in order to "allow the USAF to develop the capability to plan, control, and operate national security missions." For category two DoD STS flights an Air Force Flight

towards giving the Air Force the type of operational control over an manned space vehicle it had sought since the late 1950s -- an arrangement which was quite remarkable considering that the Air Force had not paid for the development of the STS.

The initial spaceflight of the STS took place on 12 April 1981 when *Columbia* was launched from KSC. This marked a bittersweet milestone because it was the world's first reusable spacecraft and signified the return of manned American spaceflight but the STS was also two years behind schedule and cost $2 billion more to develop than originally projected. Moreover, it rapidly became apparent that due to very intensive and difficult refurbishing requirements following each flight, the STS could not come close to meeting its planned flight schedule.[38] However, the military potential of the STS was also apparent from the outset. The second STS mission in November 1981 conducted radar imaging experiments from orbit which pinpointed an ancient city buried beneath the sands of the Sahara and thereby demonstrated the significant military potential of this type of spaceborne sensor.[39] The first classified military payload was carried into orbit aboard *Columbia* during the STS-4 mission in June-July 1982 which also marked the end of the

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Director "will be responsible for overall mission accomplishment and operational control, including flight vehicle and crew safety, through the Air Force chain of command." Although not specified in this MOU, the implication is that category two DoD STS missions would be controlled from the SOPC at CSOC.

[38]NASA's STS mission models adopted in the early 1980s were far more realistic than the 60 flights per year originally projected for the shuttle in the early 1970 but they still called for 24 flights per year from the complete four Orbiter STS fleet. In practice, Orbiter turnaround time was approximately 60 days rather than the seven days originally projected and the turnaround operation required 6000 people or nearly four times the expected number. There were only 24 total flights in the nearly five years of STS operations prior to the *Challenger* disaster. See E.C. "Pete" Aldridge, Jr., "Assured Access: 'The Bureaucratic Space War,'" Dr. Robert H. Goddard Historical Essay, n.d., 5. Offprint provided to author by the Office of the Secretary of the Air Force.

[39]Trento, Prescription for Disaster, 200-1; and Jeffrey T. Richelson, America's Secret Eyes in Space: the U.S. Keyhole Spy Satellite Program (New York: Harper & Row, 1990), 219. These first radar imaging experiments were conducted with Shuttle Imaging Radar (SIR)-A. SIR-B experiments were conducted with updated hardware on mission 41-G in October 1984. According to Richelson, the SIR-A radar could apparently image objects 16 feet beneath dry sand.

STS flight STS testing phase.[40]

Meanwhile, elements within the Reagan administration and Congress were carefully monitoring early STS developments. On 13 November 1981, President Reagan signed National Security Decision Directive (NSDD)-8 which reaffirmed the space transportation policies of the Ford and Carter administrations by stating that "the STS will be the primary space launch system for both United States military and civil government missions. The transition should occur as soon as practical."[41] According to Mark, NSDD-8 also indicated "that the president had a strong personal interest in the space shuttle program."[42] Reagan's first comprehensive space policy, NSDD-42, was publicly announced by the president himself at a 4 July 1982 ceremony at Edwards AFB marking the beginning of the operational phase of STS operations with *Columbia* in the background. In terms of space transportation policy, NSDD-42: reaffirmed that the STS was the nation's primary launch system, declared that the U.S. "is fully committed to maintaining world leadership in space transportation", stated that the "first priority of the STS program is to make the system fully operational and cost-effective in providing routine access to space[.]" and indicated that U.S. "government spacecraft should be designed to take advantage of the unique capabilities of the STS."[43] Additionally, this directive indicated that "[f]or the near-term" the STS would be managed under the terms of the NASA/DoD MOUs but as "STS operations mature, options will be considered for

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[40]Melvyn Smith, Space Shuttle (Newbury Park, CA: Haynes Publications, 1989), Appendix VII; "Chronology" in Military Uses of Space, 52.

[41]NSDD-8, "Space Transportation System," 13 November 1981; cited in "Chronology" in Military Uses of Space, 51.

[42]Mark, Space Station, 131.

[43]National Security Decision Directive Number 42, "National Space Policy," 4 July 1982, 2-3, NSC box, National Archives, Washington. Two complete pages and approximately five additional paragraphs are deleted from the sanitized version of this directive. The White House also issued a five page Fact Sheet "National Space Policy," on 4 July 1982, reprinted in National Aeronautics and Space Administration, Aeronautics and Space Report of the President, 1982 Activities (Washington: GPO, 1983), 98-100. (Hereinafter President's Space Report, year of report).

possible transition to a different institutional structure."[44] Finally, NSDD-42 made a concession to the NRO: "Unique national security considerations may dictate developing special-purpose launch capabilities."[45]

Early STS operations presented a variety of challenges and opportunities for the Air Force. Different elements within the Air Force had particular space priorities and viewpoints on the potential of the STS. The space cadets former Secretary Mark had re-energized within the Air Force were eager fully to explore the military potential of the STS, especially for military man-in-space missions.[46] The NRO was not very happy with being directed to abandon ELVs for the STS but was in the process of redesigning and reconfiguring its future payloads to take full advantage of the STS's substantial payload capabilities.[47] Other groups within the Air Force were far less excited with

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[44]NSDD-42, "National Space Policy," 4.

[45]Ibid.

[46]Military uses of the STS are not often or fully discussed in open sources. In answering Congressional questions in March 1983, DoD drew a distinction between "payload delivery" and "full exploitation" of the STS, defining the latter as follows: "In the longer term, when the capabilities of the Shuttle will be routinely available, the DoD envisions use of the enhanced capabilities unique to the Shuttle, such as on-orbit assembly of large structures; checking out payloads prior to deployment; repairing and servicing of satellites on-orbit; retrieving spacecraft for repairs and refurbishment; and performing man in the loop experiments." See U.S. Congress, House, Committee on Appropriations, Subcommittee on the Department of Defense, Department of Defense Appropriations for 1984: Hearings before Subcommittee on Department of Defense, Part 8, 98 Cong., 1st sess., 1983, 508. (Hereinafter House, Defense Appropriations, 84). See also, Edward H. Kolcum, "Defense Moving to Exploit Space Shuttle," Aviation Week & Space Technology, 10 May 1982, 40-42. Kolcum notes that the DoD's space test program (STP) experiments (e.g. Teal Ruby) would henceforth use the STS rather than ELVs.

[47]One of the most sensitive points for NASA regarding STS performance is that it has never met its original 65,000 pound payload specification as set in conjunction with the Air Force in the early 1970s. The NASA STS performance data in the President's Space Report for 1981-87 indicated that the STS was able to boost approximately 65,000 pounds "in full performance configuration." However, the figure in the President's Space Report for 1988 (after resumption of STS operations) indicated a significant drop in STS full performance configuration capabilities to approximately 54,895 pounds. Moreover,

space or the STS and opposed the substantial Air Force expenditures required to prepare for DoD STS operations. Major Air Force programs designed to support DoD STS operations included the ill-stared Inertial Upper Stage (IUS) program, modifications of SLC-6 at VAFB for STS launch, construction of the Shuttle Operations and Planning Complex (SOPC) at the Consolidated Space Operations Center (CSOC), and modifications to the Kennedy (KSC), Johnson (JSC), and Goddard Space Flight Centers for "controlled mode" DoD STS operations.[48]

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during Congressional testimony in 1981, Air Force Assistant Secretary (and presumably NRO director) Robert J. Hermann indicated that "[c]urrent projections of Shuttle performance show it to be about 8000 lbs lower than the original commitment. DOD missions can profitably use the full capability of the original performance commitment." Quoted from U.S. Congress, Senate, Committee on Commerce, Science, and Transportation, Subcommittee on Science, Technology, and Space, NASA Authorization for Fiscal Year 1982: Hearing before the Subcommittee on Science, Technology, and Space, Part 2, 97th Cong., 1st sess., 1981, 349. (Hereinafter Senate, NASA Authorization, FY 82). In 1982, Aldridge, Hermann's successor as NRO director, indicated that the first VAFB shuttle launch scheduled for October 1985 "will require full specification Shuttle performance -- as called out in our Performance Reference Mission 4 requirements. Specifically, the Shuttle must be capable of delivering 32,000 pounds to a 98 degree inclined, 150 nautical mile circular orbit and, then, recover another satellite weighing 25,000 pounds and return it to Vandenberg. The Shuttle with its current performance estimate cannot achieve this long standing defense requirement." Quoted from prepared statement of Under Secretary Aldridge in U.S. Congress, Senate, Committee on Commerce, Science, and Transportation, Subcommittee on Science, Technology, and Space, NASA Authorization for Fiscal Year 1983: Hearing before the Subcommittee on Science, Technology, and Space, 97th Cong., 2nd sess., 1982, 166. Later, Aldridge simply indicated that the "final Shuttle capabilities were nearly 20% short" of NASA's originally promised "65,000 pounds of payload to low earth orbit from Kennedy Space Center and 32,000 pounds to a polar orbit from Vandenberg AFB, California." See Aldridge, "Assured Access," 3.

[48]See Senate, NASA Authorization, FY 82, 340-41, 346-50, 444, 484. At this time (April 1981) the first STS launch from VAFB was scheduled for August 1984. Assistant Secretary Hermann indicated that the term controlled mode "signifies that we are protecting the classified information used in the planning and execution of a DOD mission by controlling access to it. The modifications include construction changes to the buildings to isolate certain areas, the procurement of additional equipment, and the shielding of certain equipment to preclude electronic eavesdropping." He also stated that "[a]ll defense payloads will have completed their transition to use of the Space Shuttle

Despite these widespread efforts and considerable expenditures, the Air Force's and DoD's basic positions on how the STS fit into long-range military space plans or doctrine remained far from clear, at least in the available unclassified material. Undoubtedly, the basic Air Force overall organizational ambivalence towards space missions was a factor in structuring the long-term Air Force relationship with the STS, especially in light of all the rejected military man-in-space programs the Air Force had previously proposed.

In the early 1980s, former astronaut, space enthusiast, and Space Subcommittee Chairman Senator Harrison Schmitt (R.-NM) was among those most clearly upset with the apparent lack of Air Force long-range planning for STS use. During exchanges with Air Force and DoD witnesses at Congressional hearings in 1981 Schmitt charged that "historic inertia" as well as "the lack of an organizational focus that has [space] as a primary mission[.]" had made the Air Force "relatively slow to grasp the opportunities that the Space Shuttle provides, not only as a launch vehicle, but as a test and operational vehicle in space".[49] Moreover, Schmitt opined that "within a few years, you all are going to come back in and say 'We need a dedicated shuttle fleet.' And it's painted blue that we could use for our purposes."[50] Further, he warned that unless the Air Force pursued space missions more aggressively that "I can almost predict that there is going

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as the primary launch vehicle by 1987." The SOPC was to "provide the management and control needed for our national security space operations in the post-1985 timeframe." Additionally, the SOPC would provide a backup to the single STS control node at JSC and would "provide a maximum opportunity to fully exploit the Shuttle unique capabilities, in particular the presence of military man in space." At these same hearings, Dr. James P. Wade, Acting UDRE, estimated that all of the DoD STS related activities would cost approximately $3 billion through FY 1986. In March 1983, DoD provided figures indicating that "DOD's portion ($15.2 billion) of the total STS cost ($51.1 billion) is 30 percent [these figures are projected through FY 88]." See House, Defense Appropriations, 84, 513. On the Air Force's STS related expenditures and infrastructure see also, William P. Schlitz, "USAF's Investment in the National Space Transportation System," Air Force Magazine 65 (November 1982): 106-12.

[49]Senate, NASA Authorization, FY 82, 458-59.

[50]Ibid., 447.

to be another Department of Something in the Department of Defense. And the Air Force will be flying airplanes, and not Shuttles."[51]

More widespread Congressional concern in 1982 focused on Air Force-NASA relations in regard to the question of whether the U.S. should procure a fifth STS Orbiter Vehicle before the Rockwell Orbiter production lines shut down. Many believed that it would be wise to procure a fifth Orbiter as a backup and to provide greater STS capability.[52] The Air Force was very interested in producing another of the lighter weight and more capable Orbiters but was unwilling to use DoD funds to procure this fifth orbiter.[53] Meanwhile, NASA was less supportive of the need for a fifth orbiter, largely because Administrator James M. Beggs and Deputy Administrator Mark had privately agreed that NASA should push a permanently manned space station as the nation's new major civil space goal and were therefore unwilling to take on other major new projects at this time.[54] By the end of 1982, despite considerable Congressional support for a fifth orbiter, the NASA compromise solution of keeping the Rockwell lines par[illegible] produ[illegible] won out and the decision to build a fifth Orbiter was

[51]Ibid., 460.

[52]Those favoring a decision to build another orbiter at this time also used economic arguments about the economic impact of keeping the Rockwell production lines open and the lower costs of building a fifth Orbiter in sequence. In Prescription for Disaster, Trento speculates that a decision to build the fifth Orbiter at this time (with the lines open) would have cost approximately $1.2 billion instead of the $2.1 billion which the fifth Orbiter (*Endeavor*) actually cost, see page 205.

[53]See, for example, the testimony of Major General James A. Abrahamson (NASA Associate Administrator for Manned Spaceflight) and Air Force Under Secretary Aldridge in U.S. Congress, House, Committee on Science and Technology, Subcommittee on Space Science and Applications, The Need For a Fifth Space Shuttle Orbiter: Hearing before the Subcommittee on Space Science and Applications, 97th Cong., 2nd sess., 15 June 1982. (Hereinafter House, Need for Fifth Orbiter).

[54]Mark, Space Station, 121-22; Trento, Prescription for Disaster, 180-81. Following a long NASA sales campaign within the administration, President Reagan announced in his 1984 State of the Union Address the national goal of building a permanently manned space station (*Freedom*) within ten years.

deferred.[55] This decision was formalized by NSDD-80 issued on 3 February 1983.[56]

During 1983 and 1984 NRO Director Aldridge waged a mostly secret and very difficult but eventually successful campaign against NASA to obtain approval to develop a new ELV capable of launching the spy satellites designed to fit into the STS.[57] Building upon the opening in NSDD-42 to consider building "special-purpose launch capabilities" for "[u]nique national security considerations," on 23 December 1983 Aldridge issued a memorandum, "Assured Access to Space" to AFSC and Space Division.[58] This memorandum directed these organizations to plan for the procurement of a complementary ELV (CELV) capable of boosting a payload the size of the STS cargo bay and weighing 10,000 pounds into GSO.[59] According to Aldridge, NASA

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[55]Trento, Prescription for Disaster, 205. On Congressional support for a fifth Orbiter see, for example, the position of many Representatives in House, Need for Fifth Orbiter; and the formal recommendation for a fifth Orbiter in U.S. Congress, House, Committee on Science and Technology, Subcommittee on Space Science and Applications, The Need for an Increased Space Shuttle Orbiter Fleet, 97th Cong., 2nd sess., 1982, Committee Print Serial HH.

[56]William P. Clark, NSDD 80, "Shuttle Orbiter Production Capability," 3 February 1983, NSC box, National Archives, Washington. Specifically, this one page directive indicated that a warm production line would "be achieved through the production of structural and component spares necessary to insure that the Nation can operate the four Orbiter fleet in a robust manner."

[57]The intense Air Force-NASA struggles of this period (a "bureaucratic space war") are the primary focus of Aldridge, "Assured Access," 3-15. Naturally, this piece covers the positions of Aldridge and the Air Force far more sympathetically than the positions of Beggs or NASA but it is by far the most detailed description of developments surrounding the CELV decision uncovered during research for this study.

[58]"Chronology" in Military Uses of Space, 55. The primary rationale behind developing such a capability was to avoid dependence on a single system for space launch. Additionally, the final Air Force ELV buys were being completed at this time and the production lines were in danger of being shut down unless new orders were found.

[59]Ibid. Secretary Caspar Weinberger outlined a new DoD space launch strategy relying on a mixed-fleet of ELVs and the STS in a letter to the president on 7 February 1984, see Aldridge, "Assured Access," 6.

Administrator Beggs "was furious" with these developments and saw them as "only a ploy of the Air Force to abandon the Shuttle."[60] However, in August 1984, Aldridge's position was formally supported by the NSC in NSDD-144 which approved Air Force development of the CELV.[61] Nonetheless, Beggs and NASA continued to oppose the CELV option and enlisted considerable Congressional support in opposition to the CELV.[62]

Aldridge notes that the NSC staff hosted "the *critical* meeting" on the CELV issue

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[60]Aldridge, "Assured Access," 6.

[61]"Chronology" in Military Uses of Space, 56. Presumably, NSDD-144 was the subject of the White House Fact Sheet, "National Space Strategy," issued on 15 August 1984 and reprinted in President's Space Report, 1984, 137-39. According to this fact sheet, the directive specified two requirements for "assured launch capability": "the need for a launch system complementary to the STS to hedge against unforseen technical and operational problems, and the need for a launch system suited for operations and crisis situations." However, there is some confusion about at least the number of this classified directive in open sources. Scott Pace in "US Space Transportation Policy: History and Issues for a New Administration," Space Policy 4 (November 1988): 307, 309, indicates that NSDD-144 "National Security Launch Strategy," was not issued by the EOP until 28 February 1985. Aldridge does not discuss this directive in "Assured Access." NSDD-144 was not available in the NSC box at the National Archives.

[62]According to Aldridge, NASA had several concerns with and employed several tactics against the CELV. NASA felt that if DOD moved away from the STS, the costs per launch would increase and NASA would need to charge its commercial customers more for each launch but that this would drive more commercial customers towards the Ariane. In an 18 May 1984 letter from Administrator Beggs to Secretary Weinberger, NASA indicated that an STS backup was not necessary but if DoD was determined to build a new launch vehicle that it should be derived from STS components. Next, NASA supporters in Congress specified that a competition be run between NASA designs and industry designs for a system to meet Air Force requirements. Aldridge claims that NASA put subtle pressure on its suppliers not to compete against its Standardized Launch Vehicle (SLV-X) in this competition by indicating that their behavior would have consequences for future NASA purchases. A modified Titan III called a Titan 34D7 was the winner in the industrial competition conducted by the Air Force while the NASA entry was judged by the Air Force Space Division to be uncontrollable during the boost phase of flight. Finally, NASA recommended that several major and lengthy studies be undertaken on the CELV issue as a delaying tactic as the ELV production lines were beginning to shut down. "Assured Access," 7-13.

on 14 February 1985.[63] At this meeting Aldridge and Beggs finally reached agreement. This agreement was reflected in NSDD-164 issued on 25 February 1985.[64] Specifically, NSDD-164 authorized the Air Force to buy ten CELVs and to launch approximately two CELVs per year in the period 1988-92.[65] Thus, Aldridge won his victory in the bureaucratic space war less than one year prior to the complete reordering of U.S. space transportation policy caused by the *Challenger* disaster.

In hindsight, given the *Challenger* disaster and its large impact, it is remarkable that there was such sustained opposition to acquiring a backup capability for the STS. Moreover, while access to space is a prerequisite for any space activity, it is unfortunate that Aldridge and the top levels of Air Force space leadership as well as much of NASA's leadership were largely consumed with this issue during the mid-1980s rather than focusing on broader, more important, or more future oriented space policy issues. Finally, it is also interesting to note that many groups were dissatisfied with STS performance capabilities and especially the mounting STS payload backlog of the mid-1980s but that only the NRO had the clout to develop a new ELV and move its most important payloads off the STS.[66]

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[63]Ibid., 13. Emphasis in original.

[64]NSDD 164, "National Security Launch Strategy," 25 February 1985, NSC box, National Archives, Washington. This unclassified directive was publicly released on 14 November 1985.

[65]Ibid., 1. NSDD-164 also: indicated that a "competitive decision" on a specific CELV would be made by 1 March 1985, directed that "DoD will rely on the STS as its primary launch vehicle and will commit to at least one-third of the STS flights available during the next ten years[.]", directed NASA and DoD to "jointly develop a pricing policy for DoD flights that provides a positive incentive for flying on the Shuttle[.]" and authorized a joint NASA-DoD effort to produce a national security study directive (NSSD) on the development of "a second-generation space transportation system".

[66]Some of the strongest opposition to STS "forced busing in space" came from within NASA's own space science community. NASA had directed that all its payloads would be launched exclusively by the STS but by the mid-1980s, the STS backlog and problems with the STS upper stages were causing multi-year delays and significant design changes for key space science projects such as the Galileo Jupiter probe and the Hubble Space

The *Challenger* disaster completely reordered U.S. space transportation policy and effectively deferred any Air Force plans to use the STS as a vehicle to build a significant manned military presence in space. During 1986 and 1987 NASA, DoD, and the newly formed Office of Commercial Space Transportation (OCST) within the Department of Transportation worked together to produce a new U.S. Space Launch Strategy and the Space Launch Recovery Plan. NSDD-254, "United States Space Launch Strategy," was completed on 27 December 1986.[67] This directive specified that the U.S. would henceforth rely upon a "balanced mix of launchers" consisting of the STS and ELVs defined "to best support the mission needs of the national security, civil government and commercial sectors of U.S. space activities."[68] Further, "[s]elected critical payloads will be designed for dual-compatibility, i.e., capable of being launched by either the STS or the ELVs."[69] In order to accomplish these objectives, the directive indicated that DoD "will procure additional ELVs to maintain a balanced launch capability and to provide access to space."[70]

Telescope. See, for example, Bruce Murray, "'Born Anew' Versus 'Born Again'," in "Policy Focus: National Security and the U.S. Space Program After the Challenger Tragedy," International Security 11 (Spring 1987): 178-82. Even more significantly, because the STS was not providing low-cost launch rates (even at its generous pre-*Challenger* disaster subsidized rates) or reliable service and launch schedules, commercial customers were "voting with their feet" and moving in increasing numbers onto the more commercially viable Ariane ELV.

[67]National Security Decision Directive 254, "United States Space Launch Strategy," 27 December 1986, NSC box, National Archives, Washington. Approximately three sentences of this two page directive are deleted in the sanitized version. A Fact Sheet on this directive was released by the White House on 16 January 1987. NSDD-254 superseded NSDD-164.

[68]Ibid., 1.

[69]Ibid.

[70]Ibid. Additionally, NSDD-254 specified that NASA would no longer provide commercial or foreign launch services on the STS "unless those spacecraft have unique, specific reasons to be launched aboard the Shuttle." The directive also set a 1995 "commercial contract mandatory termination date." This policy meant that of the 44

The Space Launch Recovery Plan dealt with the means to implement this new launch strategy in greater detail. The plan focused on the revitalization of the nation's ELV production base and attempted to use government ELV purchases as a means to stimulate the development of a more robust commercial ELV industry. The plan also provided $2.1 billion to NASA for the production of a fifth Orbiter, *Endeavor*, to be ready for flight by 1992. Most importantly for our focus, under this plan the Air Force completely reoriented its future space support infrastructure and plans. The Air Force launched a $12 billion program to initiate or expand four ELV programs.[71] These Air Force ELV programs include: expansion of the original 10 booster CELV program to 41 Titan IVs, two medium launch vehicle programs consisting of 20 Delta 2 and 11 Atlas-Centaur 2 ELVs, and refurbishing 14 decommissioned Titan II ICBMs for space launch.[72] Additionally, the Air Force took drastic steps to reconfigure the infrastructure it had developed to operate DoD STS missions including: placing the unused SLC-6 at VAFB into "minimum facility caretaker" status in July 1986, eliminating the 32 member strong Manned Spaceflight Engineer (MSE) program within AFSC Space Division, disbanding the Manned Spaceflight Control Squadron at the JSC as of 30 June 1989, and ending development of the SOPC at CSOC in February 1987.[73] Further, as a result of

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commercial and foreign launch commitments NASA had in January 1986, only 20 of these payloads now qualified for STS launch. See President's Space Report, 1986, 33.

[71]Pace, "US Space Transportation Policy," 310.

[72]Ibid.; William J. Broad, "Military Launches First New Rocket for Orbital Loads," New York Times, 6 September 1988, p. 1; and Joint Statement of Air Force Secretary Aldridge and Chief of Staff General Larry D. Welch in U.S. Congress, Senate, Committee on Appropriations, Subcommittee on Department of Defense, Department of Defense Appropriations for Fiscal Year 1988: Hearings before the Subcommittee on Department of Defense, Part 3, 100th Cong., 1st sess., 1988, 301-3.

[73]William J. Broad, "Pentagon Leaving Shuttle Program," New York Times, 7 August 1989, p. A13. Broad estimated the costs for these programs to be "at least $5 billion", the lions share of which was the $3.3 billion SLC-6 at VAFB. The SOPC building at CSOC was converted into the National Test Bed for the SDI program. As Broad relates, military space critics such as John E. Pike of the Federation of American Scientists charged that the Air Force went overboard in developing new ELVs and

this plan, the DoD scheduled only seven dedicated STS launches for the period 1991-95 and thereafter planned to rely almost exclusively on ELVs.[74]

The relationships between the Air Force, DoD, and NASA over STS operations were clearly marked by great difficulties during the 1980s. The development of military space launch policy during this period provides one of the most powerful instances of organizational behavior inputs shaping U.S. space policy and significantly impacting military space doctrine. Despite building a large and expensive infrastructure for launching and controlling DoD STS missions, the Air Force never fully exercised this capability prior to the *Challenger* disaster and following the disaster the Air Force was instrumental in leading the DoD's rush off the STS in favor of ELVs. The bitter fight with NASA over the CELV and the general desire to fully control its launch vehicles were important factors in motivating this Air Force space launch policy reversal; however, the speed and complete nature of the virtual abandonment of the STS and the significant infrastructure designed to support DoD STS missions is remarkable and not well explained in open sources. The lack of clear and powerful military space doctrine undoubtedly contributed to these false starts, reversals, and lack of clear direction for the DoD STS mission. Cumulatively, this episode seems to be an excellent illustration of the general Air Force ambivalence over the military potential of space and military man-in-space as well as evidence of its lack of clear doctrinal guidance on these issues.

Reagan Space Policy and the Military

The Reagan administration devoted a great deal of attention to space issues and generated more official space policy statements than any other administration during the cold war. Many of these space policy statements have already been introduced in the STS section above, others are discussed in greater detail in the SDI and ASAT sections below. Reagan's space policy statements covered a wide range of topics but generally emphasized military space potential and space commercialization efforts to a greater

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abandoning the STS.

[74]Pace, "US Space Transportation Policy," 310. The first Titan IV launch took place on 14 June 1989 from Cape Canaveral, see "Chronology" in Military Uses of Space, 61.

degree than previous administration's space policies. Overall, Reagan's space policy statements represent another instance where the civilian leadership rather than the military was leading the push for a greater investigation of the military potential of space.

Space was not a major emphasis of the Reagan administration during the transition period or its first months in office. By the Summer of 1981, however, the administration was ready to begin carefully examining major space issues. A series of NSC meetings between 10 June and 3 August chaired by National Security Advisor Richard V. Allen provided the first evidence of the administration's strong support for the STS and also for developing the SLC-6 STS launch site at VAFB.[75] In August, the president directed that the NSC initiate a comprehensive review of space policy.[76] This review was conducted by an interagency group headed by Dr. Victor H. Reis, Assistant Director of OSTP.[77] In the meantime, Allen revamped the NSC staff structure and eliminated the PRC (Space) which had been an important top-level space policy decision-making body in the Carter administration. The first fruits of these efforts was the formal reaffirmation of the STS as the nation's primary launch system found in NSDD-8 on 13 November 1981.

The final product of the Reis interagency group space policy review was the Reagan administration's first major space policy statement contained in NSDD-42 and publicly announced on 4 July 1982. As space policy positions within the administration grew more divergent in late 1981 and early 1982, the Reis interagency group was transformed into the Senior Interagency Group or SIG (Space) and was chaired by

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[75]Mark, Space Station, 129-31. At the 7 July meeting, the IOC of SLC-6 was slipped from October 1984 to October 1985.

[76]White House Fact Sheet, "United States Space Policy," 4 July 1982, reprinted in President's Space Report, 1982, 98-100.

[77]Ibid., 100. According to the fact sheet, the Reis group "addressed the following fundamental issues: (1) launch vehicle needs; (2) adequacy of existing space policy to ensure continued satisfaction of United States civil and national security program needs; (3) Shuttle organizational responsibilities and capabilities; and (4) potential legislation for space policy."

Science Advisor George A. Keyworth II.[78] During the first half of 1982, SIG (Space) was often the scene of intense debates over the proper focus of future U.S. space efforts. Generally, Keyworth, DoD, and CIA remained unconvinced of the utility of the large-scale, permanently manned space station which Beggs and Mark were pushing as NASA's next major goal. Keyworth and his supporters felt that NASA should first concentrate on getting the STS to live up to its many promises before diverting its attention to the next space spectacular. Thus, according to Mark, NASA lost out in the debates which culminated in NSDD-42 in two important ways: first, NASA was unable at this time to gain an administration commitment to a space station as the nation's next major space goal; and second, the language of the directive also opened the door through which the NRO would eventually push spy satellites off the STS and onto the CELV as described in the section above.[79]

Many of the most important portions of NSDD-42 were discussed above in relation to the STS but several other sections are also important for our current focus. Despite the fact that NSDD-42 formally superseded PDs 37, 42, and 54, the language of Reagan's first comprehensive space policy generally echoed many of the provisions in Carter's statements while other elements in this directive reflected the earliest principles of U.S. space policy as established under Eisenhower. For example, NSDD-42 continued the U.S. emphasis on the "use of outer space by all nations for peaceful purposes and for the benefit of all mankind[.]", rejected "any limitations on the fundamental right to acquire data from space[.]", and reemphasized the U.S. positions that space systems are considered national property and that "purposeful interference" with space systems "shall

[78]SIG (Space) with the National Security Advisor as the chairman was formally established by NSDD-42. As described in the space doctrine statements section below, DoD also conducted a major space policy review between August 1981 and August 1982.

[79]Mark, Space Station, 147-52, covers this period in detail and reveals that Mark had even drafted a speech for the president to deliver at Edwards AFB on 4 July 1982 which would have committed the administration to a space station as its next major space goal. Reagan actually delivered a completely different address and did not even mention a space station at this forum.

be viewed as an infringement upon sovereign rights."[80] One significant change in emphasis between the Carter and Reagan administrations concerns the perceived utility of space-related arms control efforts as reflected in the following section of the directive:

> The United States will continue to study space arms control options. The United States will consider verifiable and equitable arms control measures that would ban or otherwise limit testing and deployment of specific weapons systems should those measures be compatible with United States national security. The United States will oppose arms control concepts or legal regimes that seek general prohibitions on the military or intelligence use of space.[81]

Unfortunately, the most relevant sections of NSDD-42 for this study remain completely classified. The fact sheet issued on this space policy does discuss these areas in limited detail. According to the fact sheet, the U.S. national security space program would be guided by the following four policies: an emphasis on the survivability and endurance of all space system elements and "an aggressive, long-term program" to "provide more assured survivability"; the development of an operational ASAT system capable of deterring threats to U.S. space systems and denying enemy space-based force enhancement capabilities; a program to "develop and maintain an integrated attack warning, notification, verification, and contingency reaction capability" to detect and react to threats to U.S. space forces; and maintenance of appropriate security classifications for space systems in accordance with Executive orders and applicable directives.[82] Thus, in this unclassified version of the first Reagan administration space policy, the civilian space leadership apparently remained considerably ahead of the military in conceptualizing more significant military space missions and requirements.

NSDD-42 served as the basic, overall space policy guidance for the bulk of the

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[80]NSDD-42, "National Space Policy," 2.

[81]Ibid., 3. This section is the most specific policy guidance concerning space-related arms control remaining in the sanitized version of this directive available at the National Archives. Stares makes a great deal of what he perceives as Reagan administration backsliding on space-related arms control efforts, see The Militarization of Space: U.S. Policy, 1945-1984 (Ithaca, Cornell University Press, 1985), 217-19.

[82]Reprinted in President's Space Report, 1982, 99.

Reagan administration's two terms in office. Of course, this is not to suggest that nothing changed in U.S. national space policy between 1982 and 1989. Clearly, by emphasizing the possible military utility of space for strategic defense, the SDI fundamentally impacted space policy by changing many perceptions about space amongst the public and officials alike. The development and impact of SDI is discussed in a separate section below. Moreover, as discussed in the previous section, the administration issued a number of directives which dealt with space transportation policy issues such as the CELV and the recovery from the *Challenger* disaster. Due to the impact of all of these developments, the Reagan administration issued a revised comprehensive directive on overall U.S. national space policy on 5 January 1988.[83]

According to the fact sheet on this directive, most of the basic "Goals and Principles" of U.S. space policy in the new directive did not change even in wording from the basic "Principles" outlined in NSDD-42. However, there are several significant changes in the new basic goals: maintenance of U.S. space leadership is no longer listed as a basic goal, more emphasis is placed on expanding commercial space activities, and expanding "human presence and activity beyond Earth orbit" is added as a basic goal.[84] The new directive also reflects the four space sector typology developed during the 1980s and thus provides more emphasis on commercial space activities and on government policies to promote commercial space activity.[85]

The basic functions of U.S. military space forces required by national security

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[83]This directive was not available in the NSC box at the National Archives and is not identified by number in the open sources with which I am familiar. Two detailed White House Fact Sheets, "Presidential Directive on National Space Policy," and "The President's Space Policy and Commercial Space Initiative To Begin the Next Century," were released on 11 February 1988. These fact sheets are reprinted in President's Space Report, 1988, 188-96.

[84]Ibid., 188.

[85]The three openly discussed sectors are civil, national security, and commercial Space-based intelligence collection is not mentioned as a basic goal in these public releases but remains of critical importance and surely must constitute a fourth basic sector of space activity in classified space policy statements.

space policy had evolved significantly by the time of this 1988 directive and were specified as follows:

> 1) deterring, or if necessary, defending against enemy attack; 2) assuring that forces of hostile nations cannot prevent our own use of space; 3) negating, if necessary, hostile space systems; and 4) enhancing operations of United States and Allied forces.[86]

This directive also reflects the four part military space activity typology expressed in DoD space policy statements earlier in the 1980s which includes: space support, force enhancement, space control, and force application. Under space support, DoD is directed to maintain launch capability on both coasts and to "continue to enhance the robustness of its satellite control capability".[87] For force enhancement, DoD is to develop space systems and plans to support operational forces at all levels of conflict.[88] In the space control area, DoD is directed to develop "an integrated combination of antisatellite, survivability, and surveillance capabilities."[89] Accordingly, "DOD will develop and deploy a robust and comprehensive ASAT capability with programs as required and with initial operational capability at the earliest possible date."[90] Finally, under force application, "DOD will, consistent with treaty obligations, conduct research, development, and planning to be prepared to acquire and deploy space weapons systems for strategic defense should national security conditions dictate."[91]

During the last year of the cold war, the newly created National Space Council

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[86]President's Space Report, 1988, 189.

[87]Ibid., 191.

[88]Ibid., 192.

[89]Ibid.

[90]Ibid.

[91]Ibid.

worked to establish the first national space policy of the Bush administration.[92] President Bush signed his first space policy directive on 2 November 1989 and a White House Fact Sheet was distributed on 16 November.[93] The unclassified "National Space Policy" dated 2 November 1989 is virtually identical to the 11 February 1988 fact sheet on the last Reagan space policy and is not discussed further.

Cumulatively, the Reagan's space policy directives examined above clearly called for the DoD to develop the most capable, robust, and comprehensive space forces of the cold war period. What is less clear is what impact this top-level guidance from the executive branch had on Congress or how it translated into Air Force and DoD military space doctrine. Funding restrictions and specific Congressional prohibitions on the development of individual systems (such as the MHV ASAT) certainly precluded realization of all of the Reagan administration's military space policy goals by the end of this period; however, at times both the Air Force and DoD did not aggressively pursue important elements within the administration's military space policy such as ASAT and SDI. This lack of enthusiasm on the part of the Air Force and DoD was less important than the Congressional restrictions and cutbacks but was still a significant factor in the development of the policy-capability gap apparent by the end of this period. To be sure, elements within the Air Force such as Space Division and AFSPACECOM as well as other DoD elements such as USSPACECOM were highly supportive of the Reagan military space policy goals; apparently, however, these elements lacked sufficient bureaucratic clout within their larger organizational structures to ensure a closer match between space policy and capabilities in the face of a shrinking DoD resource base. Most

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[92]Executive Order 12675 established the National Space Council on 20 April 1989. The Council is chaired by the Vice President and includes the Secretaries of State, Treasury, Defense, Commerce, and Transportation as well as the OMB Director, the National Security Advisor, the Science Advisor, the DCI, and the NASA Administrator. The National Space Council is the heir of the NASC which was established by the National Aeronautics and Space Act of 1958 but disbanded by President Nixon in 1973. The National Space Council was disbanded early in the Clinton administration.

[93]The White House, Office of the Press Secretary, "Fact Sheet: U.S. National Space Policy," 16 November 1989.

tellingly, despite the incentives provided by these top-level space policies, for most of this period the Air Force and DoD still lacked or did not fully support the type of military space doctrine which might have helped to close this policy-capability gap.

The Creation and Impact of AFSPACECOM

The most important space-related Air Force organizational development of the cold war era was the creation of AFSPACECOM on 1 September 1982. AFSPACECOM was the first completely new major command formed by the Air Force in 32 years. The new command was designed to consolidate, centralize, and focus many of the Air Force's space efforts. AFSPACECOM was also the product of many factors and was the result of significant internal bureaucratic struggles within the Air Force. Pressures to create a separate space command within the Air Force came both from the top-down and from the bottom-up. However, unlike almost all other military space-related issues, the decision to create a separate major command for space was mostly an internal Air Force bureaucratic matter. While the creation of AFSPACECOM was an important development in the evolution of military space organizations, it can hardly be considered the last word in such bureaucratic developments. AFSPACECOM continued to evolve towards a more operational focus during the remainder of this period and a unified command structure over AFSPACECOM was established on 23 September 1985. Most importantly, however, by the end of this period it was apparent that AFSPACECOM had clearly fallen short of the high expectations its supporters had held for the ability of a new space command to focus and energize Air Force space plans and doctrine.

From the earliest days of the space age, certain individuals had called for the establishment of a separate space force or at least for a major military command to centralize space activities. Of course, these earliest calls for a dedicated space organization were not successful in producing a centralized military space bureaucracy. Rather, we witnessed the alphabet soup hodgepodge of disparate organizations with responsibility for various segments of the military space mission such as: AFBMD, ABMA, NASA, NRO, AFSC, SAC, NORAD, AFSCF, SAMSO, SAMTEC, and Space Division. Given the de-emphasis of military space issues during the "Sanctuary Supreme" period, this fragmented bureaucratic structure for space was not perceived to be a problem. However, with the military space awakening of the late 1970s, there were numerous renewed calls for at least a separate major military space command if not for a future space force.

Several individuals and groups provided important support for the idea of creating a separate space command within the Air Force during the late 1970s and early 1980s. One of the earliest and strongest public expositions on the need for a separate space command was the 1977 Air University Review article by Colonel Sandborn discussed in the previous chapter. At the AFA Convention in October 1978 General James E. Hill, Commander of NORAD and ADC, asserted that the U.S. had reached the point "where we must develop the doctrine and we must foster the visions which will give us security in the unbounded reaches of space."[94] Then, shortly before his retirement in 1979, Hill stated in a letter to the Air Force Chief of Staff that "unless we make an explicit organizational decision which assigns to a single organization the Air Force responsibilities in space operations once and for all, we will be faced with serious, negative, long-term impacts on resource management and planning."[95] Many other factors during this time also highlighted the growing importance of military space missions and pointed towards the possible need for a separate space command. Some of these factors included: the initial drafting of AFM 1-6 on military space doctrine begun in 1977; the SMOPS completed in February 1979; the establishment of the Manned Space Flight Support Group at JSC in June 1979; the creation of SPADOC in October 1979; studies on military space issues completed by the DSB and the Air Force SAB in the Summer of 1980; the plans to build the CSOC, the creation of the DCSO at Space Division in September 1980; the initiation of STS spaceflights and the plans for the Air Force to control DoD dedicated STS missions; and the opening of the Directorate for

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[94]Futrell, Doctrine, Vol. II, 689.

[95]Ibid.

Space Operations (XOS) on the Air Staff in September 1981.[96] Cumulatively, these factors and others as well as the general support for a separate space command evident at the classified Air University Airpower Symposium on the Role of the Air Force in Space in February 1981 and at the USAF Academy Military Space Doctrine Symposium discussed above were very important in moving the Air Force to consider very carefully the need for a separate space command.

Thus, by 1981-82 a host of individuals and factors were pushing the Air Force towards the creation of a separate space command. Of course, in discussions of reorganizations of this type, those advocating a changed bureaucratic structure must overcome bureaucratic inertia and are generally much more vocal than those individuals favoring the status quo. Thus, while there are virtually no major public statements from within the Air Force opposing the creation of a new major command for space, these sentiments were certainly expressed privately by much of the traditional, airpower oriented Air Force. Others within the Air Force such as AFSC Commander, General Robert T. Marsh, argued for a slow, evolutionary approach towards the creation of a new command.[97] Moreover, the strength of these sentiments either opposing or slowing the drive towards a separate space command is evident when considering the number of years required to move AFSPACECOM to actual fruition.

During the 1981-82 timeframe there were also two inputs from outside of the Air Force which were important in motivating the final drive towards a separate space command. The first was a series of Congressional hearings, resolutions, and bills designed to consolidate and energize military space efforts under a separate space

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[96]Cook, "Organization for the Space Force of the Future," in Swan, USAFA Symposium Reading Book, Vol. II, 467-99; Futrell, Doctrine, Vol. II, 689-98; and Stares, Militarization of Space, 219-20. On the creation of the 30-man XOS directorate under Brigadier General John H. Storrie, see "New USAF Organization to Intensify Space Focus," Aviation Week & Space Technology, 26 October 1981, 25.

[97]Department of the Air Force, AFSPACECOM, "History of SPACECOM, 1 January-31 December 1982," 1983, 6-7; microfiche document 00309 in Military Uses of Space. (Hereinafter "AFSPACECOM History, 82"). General Marsh's proposal came at a meeting of senior Air Force leaders in February 1982.

command.[98] The second was a report released on 29 January 1982 from the General Accounting Office (GAO) which charged that the DoD lacked an adequate long-range plan for military space, needed a single DoD manager for space, and specifically recommended that funding for the CSOC be withheld until these and other military space problems were addressed.[99] These Congressional pressures and the findings of the GAO report clearly indicated that the DoD's and Air Force's organizational structures and plans for space were deemed to be inadequate by many and were the object of considerable concern outside of the military.

During the Spring of 1982, a working group of officers from ADC, AFSC, Space Division, and SAFSP was established "to consider a number of space organizational alternitives."[100] This working group determined that the potential benefits of a separate

[98]Many of these Congressional efforts to energize and consolidate military space activities were spearheaded by Senator Schmitt and especially by Representative Kramer. In 1981-82, Kramer generated several hearings, resolutions, and a bill on military space issues. See, HASC, Aerospace Force Act. Specifically, H.R. 5130, introduced on 8 December 1981, would have changed the name of the Air Force to the Aerospace Force and directed the Secretary of the Aerospace Force to report "to Congress on the desirability of establishing a Space Command within the Aerospace Force." Kramer found that as of 5 November 1981, there were 13 separate Air Force and 26 total DoD and national level organizations with some type of responsibilities over military space missions. Under Secretary Aldridge stated at these hearings that "[w]e oppose this legislation as unnecessary." See pages 1-6, 14-18, 37. On Air Force opposition to Kramer's initiative see also, Edgar Ulsamer, "In Focus: The 'Aerospace Force' Controversy," Air Force Magazine 65 (August 1982): 12.

[99]General Accounting Office, Consolidated Space Operations Center Lacks Adequate DOD Planning MASAD-82-14, (Washington, GPO, 29 January 1982). GAO personnel and Air Force representatives discussed this report in detail in U.S. Congress, Senate, Subcommittee of the Committee on Appropriations, Air Force National Programs: Special Hearing before a Subcommittee of the Committee on Appropriations, 97th Cong., 2nd sess., 1982. (Hereinafter Senate, AF National Programs). As a result of this GAO Report, the FY 1983 funding for CSOC was frozen between January and September 1982, pending Congressional investigation of the issues raised in the report, see "AFSPACECOM History, 82," 70-72; microfiche document 00309 in Military Uses of Space; and "Organizations Glossary," in ibid., 187-88.

[100]"AFSPACECOM History, 82," 7; microfiche document 00309 in Military Uses of Space.

space command outweighed the possible drawbacks. On 17 April, these findings were briefed to Air Force Chief of Staff, General Lew Allen, Jr., by NORAD and ADC Commander, General James V. Hartinger.[101] General Allen concurred with these recommendations and, on 21 June 1982, a few days before his retirement, he announced that AFSPACECOM would be activated at Peterson AFB, CO on 1 September.

Futrell provides the best brief synopsis of the responsibilities and organizational structure of this new major command:

> [AFSPACECOM was given] the mission of managing and operating assigned space assets, centralizing planning, consolidating requirements, providing operational advocacy, and ensuring a close interface between research and development activities and operational users of Air Force space programs. The commander of Space Command was also to serve as CINCNORAD and CINCADC. The commander of the Air Force Systems Command's Space Division was assigned the added duty SPACECMD's deputy commander. In a related reorganization, the Air Force established the Air Force Space Technology Center at Kirtland AFB, New Mexico, subordinate to the AFSC Space Division. Within this framework it was conceived that the Air Force Space Technology Center would work on basic technology; Space Division would be responsible for research, development, launch, and checkout; and the operational space commands then would assume in-orbit control, management, and protection responsibilities. SPACECMD immediately took over the space defense operations center already operating in the Cheyenne Mountain Complex; ground breaking occurred in May 1983 for the consolidated space operations center, which was to have the missions of controlling operational spacecraft and managing DOD space shuttle flights.[102]

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[101]Ibid.

[102]Futrell, Doctrine, Vol. II, 697. General James V. Hartinger, first Commander of AFSPACECOM, listed the following tasks for AFSPACECOM at the command activation ceremony: "1. Push for understanding and awareness of the Soviet space threat. 2. Develop space defense doctrine and strategy. 3. Strengthen the softest link in the space systems development cycle -- the statement of operational needs. 4. Promote and oversee space education, training and career development. 5. Realistically address space activities in Air Force and joint exercises. 6. Give a clearer aim to the Air Force space medicine program. 7. Advocate a sound survivability program for operational space users." These tasks are reprinted in Colin S. Gray, American Military Space Policy: Information Systems, Weapon Systems and Arms Control (Cambridge, MA: Abt Books, 1982), 119. On the creation and functions of AFSPACECOM see also Edgar Ulsamer, "Spacecom: Setting the Course for the Future," Air Force Magazine 65 (August 1982):

Thus, at its inception AFSPACECOM was made a major space player within the Air Force but was by no means designed to be the Service's sole space organization or a replacement for many of the existing space organizations such as AFSC's Space Division. This failure to further consolidate space activities was considered a potential problem with this approach from the outset by some military space enthusiasts such as Senator Schmitt. In Congressional hearings in June 1982 immediately after the announcement to create AFSPACECOM, Schmitt argued that "the major [space] components are not consolidated under the Space Command[.]" and that "[t]he only problem may be that they didn't consolidate enough."[103] While AFSPACECOM would gain operational control over more space systems and space activities generally would become more operationally oriented during the remainder of this period, the basic and somewhat limited scope of AFSPACECOM's turf as specified at its creation would not change appreciably.

AFSPACECOM's structure and operational control over space systems continued to grow and evolve throughout the remainder of this period. When formed, AFSPACECOM was the smallest Air Force major command; it consisted of only three bases and four stations, some 6000 Air Force civilian and military personnel, and about 2000 contractors worldwide.[104] As outlined above, some of the most important systems and missions of the new space command came from the Aerospace Defense Center and included the early warning radar nets provided by the BMEWS and PAVE PAWS radar systems.[105] The first two military satellite systems AFSPACECOM took responsibility

48-55; and "Space Command: A Major Command," Air Force Magazine 66 (May 1983): 96-97.

[103]Senate, AF National Programs, 18.

[104]"Space Command," Air Force Magazine 67 (May 1984): 112.

[105]The ballistic missile early warning system (BMEWS) consists of three radar sites at Clear AFS, AK; Thule Air Base, Greenland; and Fylingdales, UK. The BMEWS sites at Thule and Fylingdales have recently been upgraded with modern phased array radars. The PAVE PAWS phased array radar system consists of four sites located at Cape Cod AFS, MA; Beale AFB, CA; Robbins AFB, GA; and Eldorado AFS, TX. Construction on the Robbins and Eldorado sites began in 1984; the former was completed in 1986 and

for were the DMSP and the DSP systems.[106] By 1986, AFSPACECOM had organized itself into a wing and squadron administrative structure similar to a traditional Air Force major command and in October 1987 the CSOC completed the process of taking primary responsibility for operational control of the Air Force Satellite Control Network away from the AFSCF.[107] By 1989, the final year of this period, AFSPACECOM had grown to include some 8400 Air Force military and civilian members, 5400 contractor personnel, and operational responsibility for 35 installations worldwide.[108] At this time, AFSPACECOM exercised operational control over the DSP, GPS, and DMSP satellite systems from the CSOC and plans were well underway to transfer control of the DSCS and FLTSATCOM systems as well.

Despite this growth in AFSPACECOM's personnel, facilities, and operational control over space systems, it is difficult to discern exactly what type of impact this new command had on the development of military space plans and doctrine during this period. In short, it is difficult to find an instance where the organizational advocacy of AFSPACECOM made the difference in the development of a major military space plan or doctrine. Moreover, there is little evidence that AFSPACECOM had any real bureaucratic clout either within or outside the Air Force during this period. The

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the latter in 1987. Space Command also operates the perimeter acquisition radar attack characterization system (PARCS) originally designed for the deactivated Safeguard ABM system located at Cavalier AFS, ND. See Blair, Strategic Command and Control, 222-26; and John C. Toomay, "Warning and Assessment Sensors," in Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, eds., Managing Nuclear Operations (Washington: Brookings Institution, 1987), 282-321.

[106]"Space Command: A Major Command," Air Force Magazine 66 (May 1983): 97.

[107]"Air Force Space Command," Air Force Magazine 70 (May 1987): 99-101. During this time, the installation on which the CSOC is located was designated as Falcon AFS and Sunnyvale AFS was renamed Onizuka AFS in honor of Air Force Mission Specialist Ellison S. Onizuka who was killed in the *Challenger* disaster. AFSPACECOM also started a dedicated training course for its new space systems operators known as Undergraduate Space Training (UST).

[108]"Air Force Space Command," Air Force Magazine 72 (May 1989): 67-68.

complete demise of the DoD STS mission -- a mission which was originally envisioned as a fundamental rationale behind and responsibility for the CSOC and AFSPACECOM was surely a major bureaucratic defeat for this new organization and clearly would seem to indicate a lack of influence by AFSPACECOM even in protecting one of its core missions. Thus, by the end of this period, neither the scope of AFSPACECOM's operational responsibilities nor its impact on military space plans and doctrine measured up to the optimistic goals the supporters of a separate space command had held just a few years prior.

The SDI and Military Space Plans and Doctrine

Conceptually, President Reagan's 23 March 1983 "star wars" speech was clearly one of the most important strategic events of the 1980s. By initiating a policy-push, top-priority, long-term research program to investigate the feasibility of strategic defenses, Reagan fundamentally altered the strategic landscape worldwide and just may have given "the United States a second wind in the critical home stretch of the Cold War."[109] In terms of our focus, the links between SDI and U.S. military space doctrine are less clear. While the military potential of space-based kinetic energy weapons (KEW) and especially directed energy weapons (DEW) is enormous and could completely revolutionize military concepts and doctrine, the overall impact of SDI on U.S. military thinking about space by the end of the cold war actually seemed to be quite limited. This limited impact of SDI on military space doctrine may seem counterintuitive but is the product of many factors including: a significant amount of military bias against strategic defenses and the limited role of the military in initiating and sustaining the SDI, the research rather than operational focus of the program, the extremely controversial nature of the program and the possible political costs of support, the bureaucratic structure and treatment of SDIO,

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[109]Donald R. Baucom, The Origins of SDI: 1944-1983 (Lawrence, KS: University Press of Kansas, 1992), 198. Baucom was formerly the SDIO Historian. His short Epilogue (the source of the quote in the text) and its supporting notes provide an excellent review of several major discussions on the critical issue of the relationships between SDI and the end of the cold war. Moreover, his exhaustively researched text provides a richly detailed account of the background for Reagan's 23 March 1983 speech which will undoubtedly serve as the definitive study for many years.

and the lessening of tensions accompanying the end of the cold war. These factors and others are examined below in an attempt to trace some of the most important links between SDI and military space doctrine.

In many ways, the mission of strategic defense has generally been treated as a orphan by the U.S. military. The organizations within the Army and the Air Force responsible for strategic defense have usually lacked the bureaucratic clout and resources needed to prevail in debates over priorities with the more offensive oriented elements within their respective Services.[110] Moreover, even a very strong organizational advocate for these systems would have faced a difficult political challenge in moving ABM systems towards deployment given their controversial nature. Of course, the early 1980s was not the first time the U.S. had struggled with the issues surrounding strategic defenses; the Air Force and especially the Army had been bloodied in these earlier fights, a situation which undoubtedly contributed to their lack of enthusiasm the second time around.

The roots of U.S. BMD efforts go back to before the opening of the space age. On 16 January 1958, Secretary McElroy had assigned the Army primary responsibility for developing an ABM system over Air Force objections but the Army's primary program in this area, known as Nike-X, made only halting progress in the early 1960s.[111] The growing opposition of Secretary McNamara to large-scale ABM

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[110]On the politics and bureaucratic factors behind developments in U.S. strategic defense efforts prior to SDI, see B. Bruce-Briggs, The Shield of Faith: Strategic Defense from Zeppelins to Star Wars (New York: Touchstone Books, Simon & Schuster, 1988). Note also that the orphan status for the strategic defense mission within the U.S. military contrasted sharply with the priority and organizational structure accorded this mission within the Soviet military. The Soviets took the strategic defense mission very seriously; they assigned this mission to a completely separate service (APVO) which was generally considered to be the third most powerful branch within the five major branches of the Soviet military.

[111]Baucom, Origins of SDI, 11-24. Nike-X consisted of a large phased array guidance system together with two nuclear armed missiles, a modified Zeus renamed Spartan and a high-acceleration, short-range missile known as Sprint. The Spartan was designed to intercept incoming RVs at an altitude of 70 to 100 miles and the Sprint would

deployments became more clear as he refined the concepts behind MAD; McNamara's opposition was a key factor in slowing movement towards ABM deployments.

During the 1967-1969 period, the Army and the Johnson and Nixon administrations grappled with great controversy as they moved to deploy America's first ABM system. The Army's Nike-X system, now renamed Sentinel, was first approved as a "thin" defense of cities -- primarily against the emerging threat of PRC missile deployments. The incoming Nixon administration reoriented the Sentinel system towards defending ICBMs and renamed the program Safeguard. The Safeguard system survived a series of very close votes in Congress and was fundamentally shaped by the ongoing SALT I negotiations; it emerged as a one site system designed to defend the Minuteman ICBM fields at Grand Forks AFB in North Dakota. The Safeguard system became operational on 1 October 1975. However, by 18 November, both the House and the Senate had voted to scrap this system and deactivation began in February 1976.[112] The torturous path towards Safeguard deployment and its rapid demise as well as its primary mission of defending Air Force ICBMs clearly soured the Army on the whole concept of strategic defense. Likewise, the Air Force had very little incentive at this time to follow the Army down this rocky road and, moreover, retained the strong institutional bias towards offensive forces which had justified its development as a separate Service.

While the U.S. military had almost no interest in exploring new BMD systems following the demise of the Safeguard system, several new potential BMD technologies, such as space-based laser systems, began to excite renewed interest in BMD within

provide a second layer of defense at 20 to 30 miles altitude after atmospheric sorting of decoys from warheads. Under ARPA's Project Defender, fairly small scale conceptual studies of space-based BMD systems were undertaken during the late 1950s and early 1960s. One type of BMD system under study within Project Defender was the ballistic missile boost intercept (BAMBI) project. One BAMBI concept called for high-speed ground based interceptor missiles with nuclear warheads; another, known as space patrol active defense, called for space-based KEW housed in "garage" satellites.

[112]Safeguard was widely seen as ineffective against a large scale attack. DoD had independently initiated plans to deactivate the system by 1 July 1976. See Baucom, Origins of SDI, 96-97.

groups outside the military by the late 1970s. The four key figures in helping to generate increased U.S. interest in exploring the potential of space-based laser BMD systems in the late 1970s included: Lockheed aerospace engineer Maxwell W. Hunter II, Senator Malcolm Wallop (R.-WY), Dr. Angelo M. Codevilla of Wallop's staff, and Aviation Week & Space Technology Senior Editor Clarence J. Robinson, Jr.[113] On 31 October 1977, Hunter completed an important study for Lockheed entitled "Strategic Dynamics and Space-Laser Weaponry."[114] Hunter's study was anonymously given wide circulation as a part of an influential series of articles by Robinson on emerging BMD technologies. This initial circle was completed after Hunter met Codevilla at a symposium organized by the Institute for Foreign Policy Analysis in Washington and Codevilla later introduced Hunter to his boss.[115] At Wallop's urging, Hunter put together a team of leading experts on the technologies involved in a space-based laser system and this team presented a series of briefings during the Fall of 1979 to Senators, staffers, and DARPA officials.[116] While these briefings were generally well received by those in attendance, other DoD and Air Force officials were "so rankled" that they pressured "those

[113]Baucom, Origins of SDI, 108-27; Michaud, Reaching for the High Frontier, 222-25; and Angelo Codevilla, While Others Build: The Commonsense Approach to the Strategic Defense Initiative (New York: Free Press, 1988), 59-92.

[114]Baucom, Origins of SDI, 119. This study analyzed the costs and operational parameters of space-based laser systems with varying numbers of laser battle stations and different capabilities. Hunter's study was the anonymous source behind Robinson's 16 October 1978 Aviation Week & Space Technology article, "Army Pushes New Weapons Effort."

[115]Baucom, Origins of SDI, 124.

[116]Ibid., 126-27; and Codevilla, While Others Build, 68-73. Hunter's briefing team was known as the gang of four and included laser expert Dr. Joseph Miller of TRW, optical expert Dr. Norbert Schnog from Perkin-Elmer, and Dr. Gerald Ouellette an expert in pointing and tracking technologies from the Draper Laboratory. Codevilla reports that 15 Senators attended the informal briefing on 12 December 1979. This group included: Howell Heflin (D.-AL), Ernest Hollings (D.-SC), John Tower (R.-TX), Henry Jackson (D.-WA), Daniel Moynihan (D.-NY), Harrison Schmitt (R.-MN), and Jake Garn (R.-UT).

companies funded under laser contracts to keep members of the briefing team out of Washington."[117]

One of the most specific achievements resulting from the strong advocacy of these individuals and Hunter's briefings was the addition of $30 million to the FY 1982 Air Force budget for the development of space-based lasers. Wallop also recognized and attempted to deal with the conceptual opposition and bureaucratic inertia of the Services on this issue. Specifically, his bill

> required the air force to establish a program office for airborne and spaceborne lasers and work towards an early demonstration of high-energy lasers in earth orbit. If the air force did not vigorously pursue this laser research, Wallop threatened to have the program shifted to army control. There was also some support for establishing a new military service to take responsibility for space operations, since none of the established services was showing adequate interest. One reason no service wished to become the patron of space weaponry was the fear that these expensive systems would consume resources that could be used for purposes the services considered more important.[118]

Overall, this first group was quite successful in bringing the substantial BMD potential of space-based lasers to the attention of many key defense decision-makers in Washington and in re-energizing the concept of strategic defense more generally. Thanks to the efforts of this group, many at least began to consider the revolutionary potential of space-based weaponry such as high-energy lasers.[119] What is most remarkable about

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[117]"Defense Dept. Experts Confirm Efficacy of Space-Based Lasers," Aviation Week & Space Technology, 28 July 1980. Cited in Baucom, Origins of SDI, 127.

[118]Baucom, Origins of SDI, 137. As suggested by his title, Codevilla is very critical of the Pentagon's slow response to the military potential of space-based lasers. He particularly emphasizes Air Force opposition to Wallop's initiatives by noting its foot-dragging in establishing the laser program office and bureaucratic maneuvering such as staffing this office with underachievers. See While Others Build, 77-9[illegible] Other important outputs of this group included Robinson's continuing series of article[illegible] strategic defense technologies and Wallop's influential article, "Opportunities and In[illegible]ives of Ballistic Missile Defense," Strategic Review 7 (Fall 1979): 13-21.

[119]On the military potential of space-based lasers see, for example, Chapter three, "Space Warfare," in Gray, American Military Space Policy, 45-74; one of the best brief treatments of the basic strategic implications of space and the general military potential of space-based weaponry is Simon P. Worden and Bruce P. Jackson, "Space, Power, and

these events, however, is that civilians were entirely responsible for driving them forward and that they were strongly opposed by the U.S. military. This strong DoD and Air Force opposition to these efforts illustrates not only general bureaucratic inertia and the "not invented here" syndrome but also the specific continuing influence of the sanctuary school and a general lack of doctrinal thought on weapons in space. The Air Force and DoD did not have many focused and coherent plans for more benign military space applications at this time, let alone for the development of space weaponry. Indeed, one anonymous Pentagon official emphasized this lack of basic military space doctrine as the greatest conceptual impediment to progress on space-based BMD in the early 1980s: "The overriding issue is not technology progress but U.S. space warfare doctrine. We are not at the point where Billy Mitchell was in 1921, but we can't go any faster without political and financial support."[120]

With the advent of the Reagan administration, a new group of civilians became most directly responsible for strongly advocating the continuing exploration of America's strategic defense options. Spearheading these efforts was the High Frontier Organization headed by Lieutenant General Daniel Graham, U.S. Army (Retired), and the High Frontier Panel chaired by Karl Bendetsen, a former Under Secretary of the Army.[121] During the late 1970s and the early 1980s, Graham became increasingly concerned with what he perceived to be very dangerous strategic trends for the U.S. Early in Reagan's tenure, he began to push his ideas about strategic defenses by using the connections with

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Strategy," The National Interest, Fall 1988, 43-52. A major conclusion of this piece is that "[n]*on-nuclear weapons based in space are potentially more effective militarily than nuclear weapons*." Page 45; emphasis in original.

[120]"Laser Weaponry Technology Advances," Aviation Week & Space Technology, 25 May 1981, 65. Cited in Baucom, Origins of SDI, 134. Baucom describes the early 1980s as "a policy void."

[121]For a review of the factors which motivated Reagan's 23 March 1983 SDI speech which emphasizes the role of Dr. Edward Teller, see Philip M. Boffey, William J. Broad, Leslie H. Gelb, Charles Mohr, and Holcomb B. Noble, Claiming the Heavens: The New York Times Complete Guide to the Star Wars Debate (New York: Times Books, 1988), 3-25.

some of Reagan's closest advisors he had developed while working on Reagan's campaign staffs beginning in 1976.[122] Graham's thinking on America's strategic position centered on the unlikelihood that the U.S. could successfully compete with the Soviets in a buildup of strategic offensive forces, focused on the military and commercial potential of space, and emphasized near-term KEW using off-the-shelf technology rather than developing DEW for future BMD applications.[123]

Bendetsen met Graham at a national security forum sponsored by the National Strategy Information Center in Washington and the two rapidly formed an alliance to raise funds for and to create an executive board for Graham's ongoing BMD study efforts now known as the High Frontier project.[124] By August 1981, Bendetsen selected a group of top Republican supporters to serve on the High Frontier Panel.[125] The High

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[122]During 1981, Graham met with White House counsel Edwin Meese, Secretary of Defense Caspar Weinberger and President Reagan. Graham's views had been shaped by his service on the CIA's 1976 B Team strategic reevaluation exercise chaired by Richard Pipes. Further evolution of Graham's thinking on the U.S. strategic situation and the role of strategic defenses can be traced by reviewing his major publications during this timeframe: Shall America Be Defended? SALT II and Beyond (New Rochelle, NY: Arlington House, 1979); "Toward a New Strategy: Bold Strokes Rather Than Increments," Strategic Review 9 (Spring 1981): 9-16; and High Frontier: A New National Strategy (Washington: High Frontier, 1982).

[123]Michaud's Reaching for the High Frontier, 226-45, points out how Graham's strong advocacy of general space commercialization initiatives and support for using huge satellites to collect solar power for microwave relay and terrestrial use meshed well with some of the ideas previously supported by grassroots space advocacy groups such as Gerard O'Neill's L-5 Society. However, Graham's emphasis on space-based BMD was very difficult to swallow for many within these pro space groups and, overall, the High Frontier movement caused large and unusual divisions within these groups. Note also that Graham, apparently unknowingly, appropriated his group's title from the title of O'Neill's The High Frontier: Human Colonies in Space (New York: William Morrow, 1977).

[124]Information in this paragraph is drawn primarily from Baucom, Origins of SDI, 146-70.

[125]High Frontier Panel members included: Joseph Coors, president of Coors Brewing; Jaquelin Hume, chairman of Ampco Foods; William Wilson, U.S. Ambassador to the Vatican; Dr. Edward Teller, father of the H-Bomb and former Director of the Lawrence

Frontier Panel enjoyed close links with members of the White House staff including Edwin Meese; in coordination with Meese, the Panel agreed to avoid publicity while completing a comprehensive strategy for developing a strategic defense program. The Panel continued to meet and coordinate with members of the White House staff and, by the end of November, had completed a briefing for the president based on the study directed by Graham. On 8 January 1982, Bendetsen presented the Panel's briefing to the president and several close advisors during an Oval Office meeting. Although Bendetsen and other attendees felt that President Reagan and his staff were supportive of the concepts they had briefed, no public White House initiatives on this issue were forthcoming throughout the remainder of 1982. Moreover, soon after this meeting, Graham parted company with the Panel and published High Frontier: A New National Strategy in March 1982.[126] Thus, by the end of 1982, it was unclear whether the High Frontier Panel or the High Frontier project had exerted much influence on the administration or whether the president would support a major initiative to investigate strategic defenses.[127]

Livermore National Laboratory; and Science Advisor George Keyworth. Coors, Hume, and Wilson were long-time close friends of Reagan.

[126]Several factors prompted the split between Graham and the High Frontier Panel: Graham's emphasis on short-term KEW versus Teller's emphasis on DEW such as the X-Ray laser, Graham's desire to publicize their efforts in the hopes that public pressure would be brought to bear on the administration versus the Panel's desire to remain out of the limelight and allow the president to initiate any strategic defense effort, and Graham's perception that he had been slighted when he was not invited to the 8 January Oval Office meeting.

[127]A good deal of wind was taken out of the High Frontier's sails when Dr. Robert S. Cooper, Director of the Defense Advanced Research Projects Agency (DARPA), testified before the Senate Armed Services Committee in March 1982 that DoD's understanding of the space-based KEW Global Ballistic Missile Defense (GBMD) system proposed by High Frontier "would lead us to project expenditures on the order of $200 to $300 billion in acquisition costs alone for the proposed system." Cooper's testimony on this issue along with Graham's response is in U.S. Congress, Senate, Committee on Foreign Relations, Controlling Space Weapons: Hearings before the Committee on Foreign Relations, 98th Cong., 1st sess., 1983, 49-50. (Hereinafter SFRC, Controlling Space Weapons). The name of ARPA was changed to DARPA in 1972. Several other

Beginning in late 1982, two other key actors came to strongly support a strategic defense initiative and these individuals, along with the president, shaped the developments which culminated in Reagan's 23 March 1983 speech.[128] The key actors at this time were National Security Advisor Robert "Bud" McFarlane and Chief of Naval Operations (CNO) Admiral James Watkins. By the end of 1982, the administration's plans to deploy the MX "Peacekeeper" ICBM were in disarray due to public and Congressional opposition to various basing modes. Moreover, McFarlane was convinced that the nuclear freeze movement was gaining momentum and might block all other U.S. strategic modernization efforts as well. Against this backdrop, McFarlane was strongly drawn towards strategic defenses as "a way to outflank the freeze movement[.]", exploit U.S. technological prowess, and expand U.S. strategic options.[129]

The story behind Watkins's conversion to strong support for strategic defenses within the JCS is unconventional and is also illustrative of the limited military support for strategic defenses at the beginning of 1983. Watkins is a devout Catholic and was eventually drawn towards the concept of strategic defenses on a personal level due to his feelings toward the anti-nuclear positions of the U.S. Catholic Church in the early 1980s. This anti-nuclear stance was evident in the positions taken at National Conference of Catholic Bishops meetings and culminated in the 1983 pastoral letter, "The Challenge of

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studies on BMD technologies undertaken during this time reached conflicting conclusions. In 1981, the Defense Science Board recommended against accelerating space-based laser programs due to problems with laser development and optics. A classified GAO report issued in February 1982 recommended that the DARPA Triad program (The Alpha Laser, the LODE optics experiment, and the Talon Gold pointing and tracking experiment) be accelerated. Meanwhile, DARPA Director Cooper generally took an orderly versus a crash approach towards developing these systems. See Codevilla, While Others Build, 70-103; and Stares, Militarization of Space, 224.

[128]The material in the following paragraphs is drawn primarily from Baucom, Origins of SDI, 171-96.

[129]Quoted from McFarlane interview, ibid., 182.

Peace: God's Promise and Our Response."[130] On a professional level, Watkins believed that the December 1982 JCS split vote 3-2 against MX deployment pending resolution of the basing mode was symptomatic of America's strategic quandary. Thus, beginning at the very end of 1982, he was both personally and professionally drawn towards strategic defenses as the best way out of America's worsening strategic situation, a quagmire he described in biblical terms as "a strategic valley of death."[131] From an organizational focus, it is most interesting that virtually the only major early conceptual support for SDI from the military was developed by the Navy, the Service with the least experience in and the least vested interest in deployments of BMD systems.

Thus, in early 1983 everything finally came together to produce a policy decision in favor of investigating strategic defenses. During January 1983, Watkins and his staff worked hard to convince the other Chiefs of the importance of moving out of their strategic valley of death by investigating the potential of new technologies for strategic defense. At a 5 February executive session of the JCS, Watkins was able to get JCS concurrence on this recommendation for the president and was undoubtedly aided by McFarlane's admonition that if the Chiefs were "all over the lot on this issue, there's not a chance in the world he [Reagan] would support a missile defense program."[132] A critical meeting took place at the White House on 11 February involving the JCS, Secretary Weinberger, National Security Advisor McFarlane, and the president. At this

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[130]Ibid., 185-87. Watkins strongly believed that nuclear deterrence was moral and compatible with Catholicism. He was very upset to learn "from the navy's chief of chaplains that news of the bishops' work was causing sailors and officers to leave because they believed that service in the navy was no longer compatible with a moral life." In 1982-83, he undertook a series of presentations to counter the bishops' positions. The depth of Watkins's feelings on this issue was evident to Baucom during their interview because Watkins retained an extensive grasp of the details concerning various draft versions of the pastoral letter more than five years after the event, see note 56 on page 242.

[131]Ibid., 184. Between the summer of 1982 and February 1983, the JCS met over forty times in executive session to discuss the issues raised by the growing vulnerability of U.S. ICBM forces.

[132]Quote from McFarlane interview, ibid., 191.

meeting, the president responded favorably to the unanimous support of the JCS for investigating new strategic defense possibilities. Immediately after the formal meeting, McFarlane requested that each of the Chiefs submit a thorough report on this issue to him and charged his staff with the same responsibility. Reagan's personal interest in this issue was evident when he pushed McFarlane to produce a public announcement of this policy before the completion of these reports and when he participated extensively in the drafting of the 23 March speech.

This synopsis of the origins of President Reagan's SDI clearly indicates that the military was only marginally involved throughout most of this process. Admiral Watkins did play a critical role in moving the JCS towards support for this initiative and JCS support was essential for Reagan to proceed with this course. However, by the time the JCS came aboard, the yeoman's work on the strategic defense issue had already been accomplished and they were critical only to the endgame. Moreover, the fact that it was largely the personal views of the CNO which initiated this support for SDI rather than any organized and developed Army or especially Air Force doctrine is clearly indicative of a lack of favorable long-range thinking about strategic defense or space-based weaponry on the part of the other Services.

Reagan's SDI speech did change the terms of the strategic debate within the U.S. and worldwide by reintroducing a fundamental strategic concept while simultaneously outflanking the nuclear freeze movement. Moreover, because Reagan's initiative shocked those who believed that MAD should continue to form the basis for stable deterrence, the administration had a short reprieve of several months before widespread and committed opposition to the SDI became organized and publicized. During this time, the administration completed three critical studies on the SDI and set the bureaucratic structure for the SDIO into motion. On 25 March 1983, Reagan signed NSDD-85, "Eliminating the Treat from Ballistic Missiles," which formally directed the start of the initiative he had publicly announced two days earlier. Soon thereafter, National Security Study Directive (NSSD) 6-8[illegible] ordered that two major studies on the SDI concept be completed within the administration by October. The largest of these studies examined in detail the current and likely technologies available for BMD. Formally titled the

"Defensive Technologies Study," this effort is better known as the Fletcher study after its chairman, former (and future) NASA Administrator James C. Fletcher. The other major study was titled the "Future Security Strategy Study" and focused on the political and strategic implications of the SDI. This study was undertaken by two groups, an interagency team led by Franklin Miller and a team of outside experts chaired by Dr. Fred Hoffman. Generally speaking, all of these reports strongly supported starting the type of long-term R & D program on strategic defenses called for by the president.[133]

On 6 January 1984, NSDD-119, "Strategic Defense Initiative," officially accepted the recommendations of these studies and formally started the SDI. Accordingly, in January a new office, SDIO, was established within DoD. The Fletcher study "was used as a general guide for initiating the program."[134] SDIO was made directly responsible to the Secretary of Defense and placed outside of the normal Service and other bureaucratic structures of DoD. On 15 April, Lieutenant General James A. Abrahamson moved from his position as Associate Administrator for Manned Spaceflight at NASA to become the first director of SDIO. The SDIO first demonstrated the potential of new BMD technologies on 10 June when a KEW known as the Homing Overlay Experiment (HOE) launched from Meck Island in the Pacific Test Range successfully intercepted a

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[133]All of these studies remain classified. In October 1983, an unclassified summary of the Hoffman study was released. This summary: stressed previous and ongoing U.S.S.R. strategic defense efforts and the U.S. strategic need for BMD, emphasized that any BMD systems must be designed to be highly survivable, and recommended that the U.S. embark on a building-block approach towards BMD by noting that even "intermediate" BMD systems could significantly enhance deterrence. In April 1984, an unclassified summary of the eight volume Fletcher study was made public. The conclusions of the Fletcher study included that "powerful new technologies are becoming available that justify a major technology development effort"; "the most effective systems have multiple layers, or tiers"; and "significant demonstrations of developing technologies for critical ballistic missile defense functions can be performed over the next ten years". These unclassified summaries are reprinted in Steven E. Miller and Stephen Van Evera, eds., The Star Wars Controversy (Princeton: Princeton University Press, 1986), 273-327.

[134]U.S. Department of Defense, Strategic Defense Initiative Organization, Report to the Congress on the Strategic Defense Initiative, (Washington: GPO, 1985), 3.

test RV launched atop a Minuteman ICBM from VAFB.[135]

Military involvement in the SDI program and the doctrinal impact of this initiative was quite limited during this period as well. Secretary Weinberger was in charge of all the SDI study efforts but the bulk of the work for these studies was done either by civilian DoD officials or by outside consultants. Moreover, the R & D focus and detached bureaucratic structure created for SDIO was somewhat reminiscent of ARPA's position in the earliest days of the space age.[136] In both cases, these organizations clearly limited the interactions between the Services and cutting-edge military space developments and thereby inhibited possible doctrinal developments in these important areas. The joint (or "purple suit") composition of the SDIO staff as well as its unclear bureaucratic standing and long-term prospects also served to discourage extensive cross-fertilization between the Services and SDIO.

Beginning in 1985 and continuing throughout the remainder of this period, SDI faced well-organized and increasing political opposition in Congress and elsewhere. This increasing political opposition deflected SDIO's attentions away from b[illegible]g term strategic planning and onto narrow shor -term budgetary and political issues. The protracted debate over SDI's place in the broad versus narrow ABMT interpretation dispute discussed in chapter five above is an example of one major factor which drained

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[135]The HOE program was begun under Army auspices in 1980. This was the fourth and final test in this series and the only successful intercept. The results from this test were widely touted at the time as being equivalent to "hitting a bullet with a bullet." On 18 August 1993, The New York Times charged that this test was rigged as a part of a larger U.S. deception campaign designed to deceive the Soviets about the efficacy of U.S. BMD efforts. See Tim Weiner, "Lies and Rigged 'Star Wars' Test Fooled the Kremlin, and Congress," New York Times, 18 August 1993, p. A1. An investigation by DoD and GAO investigators confirmed that there had been a deception campaign underway at this time but that this effort was halted prior to the 10 June HOE test. See "Washington Outlook: Deception Confirmed, Test Exonerated," Aviation Week & Space Technology, 13 September 1993.

[136]Of course, the greatest difference between ARPA and SDIO is that the former was created largely to mitigate against the interservice rivalry caused when all of the services were attracted to space missions whereas the latter was designed to protect a mission in which none of the services had a great interest.

SDIO's attention away from strategic defense developments per se. Thus, there was little focus at SDIO on developing long-range doctrine for space weaponry. Moreover, SDIO's research only focus and BMD charter also generally tended to serve as an intellectual blinder to thinking about the other very significant military applications of space weaponry. Additionally, there is little open evidence that the Air Force or DoD picked up this slack and carefully considered the military potential of the technologies being explored under the SDI for applications other than BMD. Given all of these difficulties, it is not surprising that even the Commander-in-Chief's strong support for SDI was not powerful enough to overturn the deeply ingrained psychological and doctrinal preferences for massive retaliation or MAD within much of the U.S. military hierarchy.[137] Indeed, former SDIO Director, Ambassador Henry F. Cooper indicated to the author in an interview that, in general, "the Services have never been that supportive of SDI."[138]

Reevaluations of the political role of strategic defense, the sustained political opposition to SDI, and the changing political environment on the way to the end of the cold war combined to result in significant refocusing of the program away from the very robust "astrodome" type population defense of Reagan's original vision. In an address on 20 February 1985, Ambassador Paul Nitze officially codified two criteria by which SDI developments would be judged: first, that any defense systems be highly survivable,

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[137]Service, and especially Air Force, opposition to space-based lasers and other possible components of strategic defense systems is a major theme in Codevilla, While Others Build, especially 218-22; see also Bill Rusher, "Why brass fights SDI," Colorado Springs Gazette Telegraph, 13 August 1989, p. 11. Rusher is the former publisher of National Review. A primary fear of the Services regarding SDI was that the funding for a large-scale BMD deployment would come out of their budgets and strip funds from their preferred, core missions.

[138]Ambassador Henry F. Cooper, interview by author, National Institute for Public Policy, Fairfax, VA, 26 October 1993. Cooper was the first civilian Director of SDIO and served in that post from mid-1990 until early 1993. He also indicated that President Bush's 29 January 1991 State of the Union Address which refocused the SDI program onto the more limited global protection against limited strikes (G-PALS) goal received more support from the Services.

and second, that defense systems "be cost effective at the margin -- that is, they must be cheap enough to add additional defensive capability so that the other side has no incentive to add additional offensive capability to overcome the defense."[139] A series of SDIO experiments conducted on 5 September 1986 known as the Delta 180 test confirmed the ability of space-based infrared sensors and KEW to perform simulated boost-phase intercepts.[140] During 1987, the JCS "formally provided operational requirements for a Phase I Strategic Defense System" by establishing a classified "minimum performance level which must be achieved" in a Phase I strategic defense deployment.[141] This was followed by Secretary Weinberger's announcement on 18 September that the Defense Acquisition Board had approved the entry of six elements of the Phase I SDI program into the demonstration and validation phase of the defense acquisition process.[142] Lieutenant General Abrahamson resigned his post at the end of January 1989 without making full general.[143] In a final major development at the end of this period, Dr.

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[139]Ambassador Paul H. Nitze, "On the Road to a More Stable Peace," Bureau of Public Affairs, Department of State, Current Policy No. 657, 20 February 1985, 2.

[140]"Chronology" in Military Uses of Space, 59. The Delta 181 test took place on 8 February 1988 and tested more advanced sensing and tracking technologies.

partment of Defense, Strategic Defense Initiative Organization, Report to the on the Strategic Defense Initiative, (Washington: GPO, April 1988), 1-9.

[142]U.S. Department of Defense, Office of Assistant Secretary of (Public Affairs), "News Release: SDI Gains Milestone I Approval," 18 Septe 87. The six elements selected for the Milestone I dem/val review were th und-based surveillance and tracking system (GSTS); the boost surveillance and tracking system (BSTS); the space-based surveillance and tracking system (SSTS); battle management/command, control, and communications (BM/C^3); the space-based interceptor (SBI); and the exoatmospheric reentry vehicle interceptor subsystem (ERIS).

[143]Michael R. Gordon, "General Quitting as Project Chief for Missile Shield," New York Times, 28 September 1988, p. A1. Abrahamson was an energetic, positive, and sales-oriented advocate for Reagan's original comprehensive vision of SDI in his appearances before Congress and the public. Despite a long string of successful assignments and being perceived as a rising star within the Air Force prior to becoming director of SDIO, Abrahamson's nomination by President Reagan for full general was blocked by forces within DoD and the Senate "in part because of concern that a

Lowell Wood of the Lawrence Livermore National Laboratory, proposed an enhanced and proliferated space-based interceptor system known as brilliant pebbles.[144]

Given that the military played a minimal role in the origins of the SDI program and continued to have an arms-length relationship with the SDIO throughout the remainder of this period, it is little wonder that the doctrinal impact of the SDI on general military space doctrine is limited and unclear. Moreover, the division of responsibilities caused by the creation of SDIO and the general overriding focus on R & D for the BMD mission during this time may have obfuscated other significant military missions possible through space-based weaponry and other technologies under investigation by SDIO. In retrospect, it is clear that the SDI was not helpful in terms of stimulating or consolidating military doctrine for space weaponry based on new technologies.

The Creation and Impact of USSPACECOM

When the Air Force activated AFSPACECOM on 1 September 1982, it did so with the expectation that this new major command would be a part of an evolving bureaucratic structure for military space organizations and that a unified space command would also soon be established. However, the process of establishing USSPACECOM involved considerably more controversy than did the creation of AFSPACECOM. In 1983 and 1984 the other Services, and the Navy in particular, needed to be convinced of the need for a unified space command. Interestingly, the individual positions of the Services on the creation of a unified space command in the 1980s was almost the exact

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promotion of that sort would increase the influence of the Strategic Defense Initiative office in Pentagon decision-making." Abrahamson's replacement, Air Force Lieutenant General George L. Monahan, Jr., entered office only one year prior to reaching his mandatory retirement after 35 years of service -- another example which seemed to indicate the military's true feelings towards SDI. Andrew Rosenthal, "Pentagon: The New 'Star Wars' Chief Brings a Soft-Sell Approach to his Mission." New York Times, 18 May 1989, p. A15.

[144]U.S. Department of Defense, Strategic Defense Initiative Organization, 1989 Report to the Congress on the Strategic Defense Initiative, (Washington: GPO, 13 March 1989), 5.3-1 through 5.3-3. Wood is a protegee of Teller who was heavily involved in the X-Ray laser program prior to developing the brilliant pebbles concept.

opposite of the Services' positions on this issue in the late 1950s and early 1960s. The arguments of the Air Force and elements within DoD were eventually successful and USSPACECOM was activated on 23 September 1985. Not surprisingly, since its inception, USSPACECOM has proven to be a powerful military organization for advocating military space forces and missions to support the space control and high ground schools. The doctrinal impact of USSPACECOM was also significant by the end of this period, although less pronounced than its general advocacy role might suggest.

The Army, the Navy, and DoD generally had little impact on and were little concerned with the creation of AFSPACECOM. In Congressional testimony in June 1982 immediately after the announcement that the Air Force would create a separate major command for space, Under Secretary Aldridge indicated that this Air Force action had the "blessings" of DoD and the JCS but emphasized the internal nature of this decision:

> This is an internal Air Force decision to reorganize, to consolidate, the space activities. I did brief Secretary Weinberger and [Deputy] Secretary [Frank C.] Carlucci and the Secretary of the Navy. I have talked informally to the Secretary of the Army about it, and the CNO and, of course, General Allen, who is a member of the Joint Chiefs, who made the announcement. I find no one who objects.[145]

During his testimony, Aldridge immediately contrasted this internal Air Force action with what he saw as the next logical step for military space organizations by indicating that

> we have deliberately started an evolutionary process.
>
> The next step has to be beyond the Air Force; it has to go to the Department of Defense. If we are to create someday in the future a unified command, it will take approval of the Secretary of Defense, the President, and the Congress.[146]

In 1983 and 1984, the Air Force continued to push for the creation of a unified space command but the Navy was not at all convinced of the need for such a command. The Air Force Posture Statement for FY 1985 formally recommended that a unified space

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[145]Senate, AF National Programs, 18.

[146]Ibid.

command "be formed soon."[147] In making this recommendation, the Air Force Posture Statement emphasized that no single military organization currently exercised operational control over military space systems during peace or war and asserted that a unified command would provide a more clear chain of command for these forces.[148] This statement also indicated that a unified command was needed because "[i]n the future, space-based systems may become available which will add a truly new dimension to conducting warfare."[149]

By contrast, the Navy generally saw no operational need for a unified space command at this time. In Congressional testimony in 1983, Secretary of the Navy John F. Lehman "flatly disagreed with the need for a unified space command."[150] In March 1984, CNO Watkins testified that he was not opposed to creating a unified space command with a warfighting mission:

> I think that a unified command should be a command that has the potential to fight a war and if it is going to be a command established during a massive R & D program [SDI], then I don't really understand it. So I think there is confusion about the need for a unified command at this particular time.[151]

Meanwhile, the Navy and Army were also reorganizing their own space organizational structures at this time. On 15 June 1983, Secretary Lehman announced that the Navy would form its own Naval Space Command to consolidate its space activities; this command is headquartered at Dahlgren, VA, and was activated on 1 October 1983. Stares asserts that the Naval Space Command "was also clearly designed to resist the Air Force's attempts to control all DoD space assets under a Unified Command."[152] In May 1984, the Army took an intermediate step by creating the Army Space Office. Overall,

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[147]Futrell, Doctrine, Vol. II, 699.

[148]Ibid., 698-99.

[149]Ibid., 699.

[150]Ibid.

[151]Ibid.

[152]Stares, Militarization of Space, 220.

as indicated by these divergent opinions and conflicting bureaucratic moves, there was some legitimate confusion regarding the need for and the types of missions a unified command would undertake at this time and this issue directly related to unresolved basic issues related to military space doctrine.

Despite these unresolved conceptual issues, the Air Force and elements within DoD were successful in selling a unified space command to the JCS in late 1983. "On 8 November 1983, the JCS approved, in concept, the creation of a unified space command."[153] Some additional efforts were made by the Navy to slow or block the creation of a unified command following this decision but this was a losing cause. Peterson AFB in Colorado Springs, the location of AFSPACECOM headquarters, was also chosen as the site for the unified command headquarters. USSPACECOM was activated on 23 September 1985, becoming the smallest of a group of only nine other unified or specified commands which control all combat forces within the U.S. military. USSPACECOM was placed above AFSPACECOM and contained the Naval Space Command and the Army Space Office as well. The responsibilities for USSPACECOM were the same as those given to AFSPACECOM with the additional responsibility of setting requirements for and planning the operational BMD system which might result from the SDI program. Moreover, as a unified command over all the Services, USSPACECOM also took responsibility over the space systems controlled by the Navy such as the White Cloud and FLTSATCOM satellites.[154] As a unified command with

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[153]Arthur J. Downey, The Emerging Role of the US Army in Space (Washington: National Defense University Press, 1985), 51.

[154]The operational responsibilities for USCINCSPACE were more specifically spelled out in a series of three memoranda from the JCS during 1985. The operational forces assigned to the command of USCINCSPACE included: SPADOC; the MHV ASAT system; the Missile Warning and Space Surveillance Centers; SLBM, BMEWS, SPACETRACK, and Navy Space Surveillance system sensors; the DSP, GPS, and DMSP satellite programs; the Satellite Control Network (excluding Satellite Test Center facilities that support national programs); and the Navy Astronautics Group. See U.S. Department of Defense, Joint Chiefs of Staff, "USCINCSPACE Mission Responsibilities," 12 February 1985; "USCINCSPACE Mission and Responsibilities," 4 April 1985; and "USCINCSPACE Space Forces," 15 October 1985; microfiche documents 00440, 00442,

broad responsibilities and representing all Services, USSPACECOM has slightly more of a space user outlook rather than the space operator outlook predominant in AFSPACECOM.

The position of Commander-in-Chief (CINC) of USSPACECOM was created as a four star billet and originally given triple-hatted responsibilities as CINCNORAD, USCINCSPACE, and CINCAFSPACECOM.[155] To date, the USCINCSPACE has always been from the Air Force while the Deputy Commander has been drawn from the Navy. AFSPACECOM has remained by far the largest and most important element of the unified command. Critics have charged that the disproportionate size and power of AFSPACECOM have made it the tail that wags the dog within this command structure; indeed, this was one of the bureaucratic problems which the Navy had hoped to avoid in opposing a unified command.[156] The source of this disproportionate size and power is clear: the Air Force space budget of $11 billion for FY 1986 represented 79% of total DoD spending on space.[157] General Robert T. Herres was the first USCINCSPACE; when he left on 6 February 1987 to become the first Vice Chairman of the JCS, General John L. Piotrowski became USCINCSPACE for the remainder of the cold war era.[158]

While General Herres is generally given high marks in inaugurating USSPACECOM, General Piotrowski used his position as USCINCSPACE to provide

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and 00443 in Military Uses of Space.

[155]The creation of USSPACECOM ended the past arrangement where the Commander of the AFSC Space Division would serve as the Vice Commander of AFSPACECOM. In 1987, USCINCSPACE reverted to a dual-hat position when Major General Maurice C. Padden became CINCAFSPACECOM. See "Air Force Space Command," Air Force Magazine 70 (May 1987): 99-101.

[156]In 1985, the staff officers for USSPACECOM were 50% Air Force, 30% Navy and Marine Corps, and 20% Army. See Edgar Ulsamer, "What's Up in Space," Air Force Magazine 69 (February 1986): 48.

[157]James W. Canan, "High Space Heats Up," Air Force Magazine 68 (July 1985): 61.

[158]Vice Chairman of the JCS was a position created by the Goldwater-Nichols Defense Reorganization Act of 1986.

what is probably the strongest military space advocacy from any single military member during the cold war. The combination of his NORAD and USSPACECOM roles made General Herres keenly aware of both the deficiencies in the U.S. early warning network as well as the potential of space-based radars (SBR) to solve these problems. The advocacy for the development of SBR has been a key emphasis item of USSPACECOM since its inception. General Piotrowski also supported the development of SBR but he saved his greatest enthusiasm for high ground concepts such as SDI and for programs to support the space control school including the MHV ASAT system, improved space surveillance capabilities, and measures to enhance U.S. satellite survivability.

During his tenure as USCINCSPACE, General Piotrowski used every available forum to emphasize and reemphasize the need for SDI and the importance of building the type of space infrastructure needed to support space control operations. Overall, General Piotrowski was convinced that "space is the ultimate high ground," and argued that "we need to be able to operate there with the same robustness that we operate on land, at sea, and in the atmosphere."[159] Other than SDIO Director Abrahamson, Piotrowski was undoubtedly the most vocal supporter of SDI within the military. The rationale behind his strong support for SDI was well defined in the October 1987 "Air Force Policy Letter for Commanders."[160] General Piotrowski was even more forceful and persistent in describing the comprehensive nature of the Soviet space threat and in arguing the need for a robust U.S. space control infrastructure. During Congressional testimony in 1987, Piotrowski highlighted the significant Soviet advantages in almost all categories of military space activities and referred to an operational ASAT capability as "a cornerstone

[159]General John L. Piotrowski, "Military Space Imperatives," Address at Air Force Association Space Symposium, Colorado Springs, CO, 21 May 1987.

[160]Department of the Air Force, Office of the Secretary of the Air Force, "Air Force Policy Letter for Commanders: SDI, The Cornerstone of Peacekeeping," 1 October 1987. Piotrowski listed five chief reasons why strategic defenses are so important including: their ability to deny logical war aims, the possibility that they could stimulate deep arms control reductions by greatly limiting the value of ballistic missiles, their non-offensive nature, their ability to place responsibility for U.S. security back in the hands of the U.S., and their affordable costs.

of my Space Control mission capability."[161] His arguments on these and other space control issues also received widespread circulation through numerous journal articles and published speeches.[162]

Cumulatively, Piotrowski's persistent efforts made the strength of USSPACECOM's support for SDI, ASAT, and general space control efforts abundantly clear. It is far less clear, however, how much impact these efforts on behalf of USSPACECOM had on the development of general U.S. military space doctrine or space policy at this time. Indeed, the general flow of Piotrowski's recommendations versus the actual trends in U.S. military space developments during the final years of the cold war were moving in almost completely opposite directions. Clearly, during this final period of the cold war, the development and support for more ambitious military space goals within USSPACECOM was out of phase with the periods of strongest Congressional support for these type of goals: The military had few comprehensive military space plans to develop space control or high ground capabilities in the early 1980s when there were many calls from Congress to develop such capabilities; but by the time comprehensive military space plans and programs were ready to come on line in the mid-1980s, the support within Congress for developing these types of capabilities had dissipated. Moreover, because most of USSPACECOM's efforts during the final years of the cold

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[161]Quoted from Piotrowski's prepared statement in U.S. Congress, Senate, Subcommittee of the Committee on Appropriations, Defense Appropriations for Fiscal Year 1988: Hearings before A Subcommittee of the Committee on Appropriations, 100th Cong., 1st sess., 1987, 461. According to Piotrowski, the Soviets were ahead of the U.S. in launch pads (2:1), in launch rate (5:1), in on orbit spacecraft (3:1), in manned space days (3:1), and in average annual weight launched (10:1). Of course, the Soviets also had the only operational dedicated ASAT system. See also Piotrowski's testimony on the mission of Soviet RORSAT and EORSAT spacecraft in targeting U.S. carrier battle groups in U.S. Congress, Senate, Committee on Armed Services, Defense Authorization for Fiscal Years 1988 and 1989: Hearings before the Committee on Armed Services, 100th Cong., 1st sess., 1987, 2247-8.

[162]Some of Piotrowski's major journal articles during this time include: "C^3I for Space Control," Signal 41 (June 1987): 23-33; "U.S. Antisatellite Requirements: Myths and Facts," Armed Forces Journal International 125 (September 1987): 64-68; and "A Soviet Space Strategy," Strategic Review 15 (Fall 1987): 55-62.

war were generally focused on near-term attempts to push or save specific ongoing programs such as SDI or the MHV ASAT, there was less effort in developing the type of long-range military space requirements and doctrine which might help to support future military space systems.

Military Space Plans and Systems

Several of the most important military space plans and systems are discussed in separate sections within this chapter. This section focuses on those other plans, systems, and improvements which have a bearing on the development of military space doctrine during this last period of the cold war. Most of the major space plans and systems of this period which are not covered in separate sections were long-term or ongoing programs begun in the previous period. Despite all of the discussion of military space issues at this time, few new types of systems actually came on line during this period and, as with the previous periods, most of the more ambitious military space plans did not result in operational systems.

By this period, most of the major ongoing military space programs designed primarily for force enhancement had become fairly routinized. Examples of these type of systems would include communications systems such as the FLTSATCOM, AFSATCOM, and DSCS systems discussed in the previous chapter. Each of these systems was more fully developed during this period. Newer model FLTSATCOM satellites launched in December 1986 and September 1989 were designed to test the EHF communications bands which are used on Milstar satellites.[163] The AFSATCOM system became fully operational on 1 July 1984.[164] The next model of DSCS satellites (DSCS III) featuring both communications links for transmitting EAM to strategic forces and tactical links for theater forces and diplomatic traffic was first launched on 20 October

[163]"Space Systems Glossary" in Military Uses of Space, 160.

[164]Ibid., 153.

1982.[165]

Planning and development of the next generation military communications satellite, the military strategic-tactical and relay system or Milstar, was initiated in April 1981. As a critical element of the Reagan administration's strategic modernization program, the Milstar system was apparently given the highest national priority for development.[166] But soon this program ran into great controversy and difficulty due to the tremendous cost of these satellites (approximately $1 billion each) along with growing Congressional questioning of the need for a system primarily designed to provide enduring strategic connectivity in light of the fading of the cold war. The first satellite in this system was not launched until 7 February 1994.[167] The Milstar system is designed to be highly survivable, even after a nuclear conflict and has been designed with a great deal of on-board computing and switching capability to allow connectivity of forces at all levels using small, difficult to jam receivers. Moreover, as discussed in the spysat section below, the Milstar system is also designed to provide crucial links between spy satellites and their ground stations and to provide intelligence data from at least "KH-12" photoreconnaissance satellites directly to tactical users under the TENCAP program.[168]

Cumulatively, these different types of robust communications links established during this period went a long way towards providing assured mission capability for all types of military communications. Once again, communications generally continued to

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[165]Ibid., 157. The capability of the DSCS to transmit EAM is its secondary function and is a backup for the strategic communications links of the SDS, AFSATCOM, and FLTSATCOM systems.

[166]James W. Canan, "High Space Heats Up," Air Force Magazine 68 (July 1985): 67.

[167]"Milstar Launched," Aviation Week & Space Technology, 14 February 1994, 28. The Milstar system has been extensively cut back (from approximately ten to six satellites) and reconfigured to emphasize tactical level applications versus strategic communications and nuclear hardening.

[168]One mission of the Milstar system is apparently to replace the SDS for transmitting KH-11 and probably "KH-12" data to their ground stations.

be one of the least controversial and least doctrinally challenging military applications of space. However, the increasing difficulties facing the Milstar program also illustrate how the continuously evolving technologies for space systems were improving the capabilities and warfighting potential of these systems and thereby making these systems more controversial as well.

Other force enhancement satellite systems underwent similar upgrades during this period. An upgraded type of DMSP satellite known as Block 5D-2 was first launched in 1982. The Block 5D-2 satellites feature improved meteorological data collection sensors and a better ability to transmit data directly to field terminals.[169] The GPS system continued in development and limited deployments during this period. Beginning with the eighth test GPS satellite launched on 14 July 1983, all of these satellites have incorporated the nuclear detection system (NDS) capable of accurately locating nuclear explosions worldwide.[170] Despite originally being scheduled for a mid-1980s IOC, the first operational GPS satellites were not launched until 1989 due to difficulties with the system and with launch vehicles in the wake of *Challenger*.[171] This significant delay in establishing GPS capabilities is indicative of the types of launch problems caused by the *Challenger* disaster and also illustrates that the Air Force is less enthusiastic about funding and developing space systems designed to serve more users outside the Air Force than within the Air Force.

With the renewed interest in strategic defense during this period, the DSP system was seen as incapable of dealing with the launch detection and booster tracking needs of a BMD system. The Phase One SDI architecture called for replacing the DSP system

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[169]"Space Systems Glossary" in Military Uses of Space., 155-57.

[170]Ibid., 160.

[171]The fully operational constellation of 21 satellites plus three spares was not established until 1993.

with the twelve satellite boost surveillance and tracking system (BSTS) by the mid-1990s.[172] Despite continuous improvements, the DSP system does not approach the type of comprehensive and highly accurate boost-phase coverage which the BSTS was designed to provide.[173] The differences in capabilities between the DSP and proposed BSTS systems provides an excellent example of the impact of doctrinally derived mission requirements on space hardware. The DSP system was originally designed during the heyday of detente and MAD; despite being upgraded, it still performs best as a strategic "bellringer" system rather than in tactical applications such as closely determining launch sites or tracking boosters.[174]

The Air Force and DARPA started work on several interesting military space

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[172]For information on the BSTS see, for example, U.S. Department of Defense, Strategic Defense Initiative Organization, 1990 Report to the Congress on the Strategic Defense Initiative, (Washington: GPO, May 1990), 5-5 through 5-7. The BSTS system was canceled in 1991 and current efforts to upgrade or replace the DSP system are in disarray.

[173]"Space System Glossary" in Military Uses of Space, 157-58. The first of a significantly upgraded block of DSP satellites (known as sensor evolutionary development satellites) was launched on 14 June 1989. The most significant new features reportedly include better nuclear hardening, improved sensors better able to deal with laser illumination, data storage and rebroadcast capability, and laser communications crosslinks with other satellites.

[174]Despite the very significant contributions of the DSP system during the Gulf War overall, tactical level weaknesses with the DSP were evident during the campaigns against Scud missile launchers. During the Fall of 1990, the U.S. moved the two newest and most capable DSP satellites into GSO overhead the Gulf region to provide stereo imaging of missile launches from this area. This stereo imaging was critical in predicting impact points and providing at least 90 seconds of warning prior to Scud impact. This data also provided crucial cueing data to support Patriot interception attempts. The DSP system was less helpful in providing data to precisely locate the Scud launch sites for bombing by coalition forces. Reportedly, the DSP satellites could only localize Scud launch sites within approximately 2.2 nautical miles which, apparently, was not accurate enough to allow many of these mobile launchers to be taken out during the course of the war. See Craig Covault, "Astronauts to Launch Warning Satellite, Assess Manned Reconnaissance From Space," Aviation Week & Space Technology, 18 November 1991, 65-69; and Covault, "USAF Missile Warning Satellites Providing 90-sec. Scud Attack Alert," Aviation Week & Space Technology, 21 January 1991, 60-61.

systems or experiments during this period but, apparently, none of these efforts resulted in operationally oriented developments. The stillborn efforts to produce a military space-based radar program fall into this category. As early as 29 August 1980, Air Force Headquarters had directed AFSC "Space Division to begin development of a near-term space-based radar."[175] Clearly, these earliest SBR proposals did not lead to any major deployed military SBR systems throughout the remainder of this period but since the technology for such systems is available it is less clear why such systems have been canceled or deferred. Publicly, the cost of a SBR system was generally cited as the primary reason why these types of systems were not developed but many bureaucratic factors were at work as well. According to Secretary Aldridge in October 1987, the Air Force had made the judgement that "the country cannot afford a space-based radar now."[176] It is also difficult from open sources to gauge the overlap in capabilities and military potential between proposed Air Force SBR systems and the Lacrosse radar imaging satellites first deployed in December 1988. From an organizational perspective, the Air Force is probably less enthusiastic about SBR than about many other potential military space applications because one primary purpose of such a system would be to provide long-range radar coverage for carrier battle groups but direct Air Force applications are less apparent.[177]

Several other major space technology development programs under DARPA have

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[175]"Chronology" in Military Uses of Space, 49.

[176]James W. Canan, "Our Blind Spots in Space," Air Force Magazine 71 (February 1988): 47.

[177]At the 1-2 November 1984 Air Force Association's "Military Imperatives in Space" Symposium, AFSC Commander General Lawrence A. Skantze "cautioned against impetuous pursuit of space-based radar. Not only might the cost of putting three or four of these systems into space reach $15 billion, but, because they will by necessity be very large, the enemy will be able to find and presumably destroy them easily." Also at this forum, the Commander of the Naval Space Command (and future NASA Administrator), Commodore Richard L. Truly, indicated that the Navy had been attempting to build such systems for twenty years but that "interservice fights, disagreements over technical direction, and cost" had derailed these efforts. Quotes from Edgar Ulsamer, "Military Imperatives in Space," Air Force Magazine 68 (January 1985): 94.

also apparently failed to produce significant fruit as of yet. The Teal Ruby experiment was designed to use infrared sensors to track aircraft and cruise missiles from space in all weather conditions. A space-based, wide-area, long-range target acquisition and tracking system would seem to have enormous potential, especially when coupled with long-range precision-guided munitions and the GPS. Despite this very significant military potential, the Services have apparently been very wary of the costs of developing such revolutionary technologies and DARPA was left to pick up the entire tab on the Teal Ruby experiment.[178] Prior to the *Challenger* disaster, the Teal Ruby experiment was to be the primary payload on the first STS launch from VAFB, scheduled for 20 March 1986.[179] According to Military Uses of Space, this experiment was originally scheduled for launch in 1981 but the system was placed in storage in 1989 without any plans for a future launch.[180] Given all of the other apparently successful space-borne infrared sensors of this period including DSP and "KH-12" satellites as well as the tracking systems on the HOE and MHV ASAT systems, the failure of the Services to support carefully investigating space-based infrared sensors for tracking and targeting military heat sources is difficult to explain from open sources.

Another major DARPA space experiment originally scheduled for this period was known as the DARPA Triad and consisted of the Alpha Laser, the LODE optics experiment, and the Talon Gold pointing and tracking experiment. Stimulated by the space-based laser advocacy of Senator Wallop and others in the late 1970s, funding for

[178]See the comments of DARPA Director Cooper at the Air Force Association's 1984 Space Symposium. Reported in Ulsamer, "Military Imperatives in Space," 92-95. Cooper charged that the services' "technological conservatism" which "is most pronounced" with regard to space systems had made it necessary for DARPA to pay the entire $450 million-plus for the Teal Ruby experiment "without any service money."

[179]Edgar Ulsamer, "Slick 6," Air Force Magazine 68 (November 1985): 47.

[180]"Space Systems Glossary" in ibid., 172. On the Teal Ruby experiment see also William E. Burrows, Deep Black: Space Espionage and National Security (New York: Berkley Books, 1986), 301-2.

the DARPA Triad began in FY 1980.[181] The objectives of the Triad were as follows: the Alpha program was to

> develop a hydrogen fluoride laser with a wavelength of 2.7 microns and a power output of 5 megawatts. The second element was the large optics demonstration experiment (LODE), which involved the "fabrication" of a large mirror 4 meters in diameter. The third component was TALON GOLD, an undertaking to develop precise pointing capabilities. A TALON GOLD experiment was to be conducted in mid-1985 on a space shuttle flight to demonstrate a pointing accuracy of "at least 0.2 microradians." Boeing was responsible for combining these three elements for a system demonstration.[182]

In May 1984, DARPA Director Cooper testified that he had added funding to these programs in FYs 1982-84 to keep the programs on schedule and that "we expect that each of those programs will converge to the final testing in the 1987 and 1988 time period."[183] At these same hearings, SDIO Director Abrahamson indicated that with the creation of SDI "the DARPA TRIAD programs have been absorbed and will actually be enhanced as a part of the Space-Based-Laser [SBL] portion of the SDI Directed Energy Weapons [DEW] program element."[184] Despite this "enhancement," none of these programs had actually been tested in space by the end of this period.[185] Thus, more

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[181]Stares, Militarization of Space, 215. On the DARPA Triad see also Baucom, Origins of SDI, 110-13; and Gray, American Military Space Policy, 61-63.

[182]Baucom, Origins of SDI, 110. Baucom's data and quotes are drawn from the following articles in the 28 July 1980 edition of Aviation Week & Space Technology: "Technology Eyed to Defend ICBMs, Spacecraft," 40-41; "Pentagon Studying Laser Battle Stations in Space," 57-58, 61; and "Laser Applications in Space Emphasized," 62.

[183]U.S. Congress, Senate, Committee on Appropriations, Subcommittee on Defense Appropriations, Defense Appropriations for Fiscal Year 1985: Hearing before the Subcommittee on Defense Appropriations, Part 3, 98th Cong., 2nd sess., 324.

[184]Ibid., 325.

[185]Portions of the original DARPA Triad are incorporated in the Zenith Star project, a space-based test of the Alpha laser originally scheduled for the mid-1990s. See U.S. Department of Defense, Strategic Defense Initiative Organization, 1990 Report to the Congress on the Strategic Defense Initiative, (Washington: GPO, May 1990), 6-6 through 6-7, 7-15.

than ten years after the prospects of space-based lasers for BMD had excited many and had helped to reinvigorate U.S. thinking on strategic defenses, the U.S. was still years away from testing a space-based laser. Most importantly, the continuing lack of enthusiasm on the part of the Air Force or the other Services for space-based laser weapons is evident from their satisfaction with the pace of these efforts and the lack of any other major military space-based laser demonstration projects.

The final type of programs briefly examined in this section are the military's efforts to develop new space launch vehicles starting near the end of this period. In the wake of the *Challenger* disaster and the growing realization that many elements of a space-based BMD might require a heavy lift capability, in May 1987, DoD initiated a joint program with NASA to develop a new ELV program known as the Advanced Launch System (ALS). The goals of the ALS program included the development of a flexible and reliable family of modular launch vehicles which could easily be configured for specific needs. The ALS was to use improved technology to lower the cost per pound to LEO initially to $1500 and then to $300 by the late 1990s.[186] Despite the apparent need for new booster technology and the possible need for heavy lift capability for SDI components and assembly of space station *Freedom*, the ALS program floundered along and was no more than a study effort by the end of this period.[187]

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[186]Pace, "US Space Transportation Policy," 312. Pace estimates the costs per pound to LEO for the STS and Titan IV at approximately $3000. As of the mid-1980s, virtually all U.S. booster technology was derived from the ICBMs developed in the late 1950s and early 1960s -- the ALS was designed to significantly modernize these technologies with modern materials, controls, and production methods.

[187]In Congressional testimony in April 1987, Secretary Aldridge indicated that a presidential decision to begin deployment of a large SDI system in the 1993-95 timeframe "would be the first firm requirement for a vehicle that is larger in payload capacity than we currently have through the Shuttle or through the Titan IV." Quote from U.S. Congress, Senate, Committee on Appropriations, Subcommittee on Defense Appropriations, Defense Appropriations for Fiscal Year 1988: Hearings before Subcommittee on Defense Appropriations, Part 3, 100th Cong., 1st sess., 1987, 425. The ALS was redesignated as the National Launch System (NLS) following the Augustine Report of December 1990 but then essentially was terminated by Congress in FY 1993. The Aldridge Report of November 1993 recommended the development a new core ELV

A second major joint DoD-NASA space launch technology development effort was emphasized by President Reagan in his 1986 State of The Union Address and is known as the X-30 or the National Aerospace Plane (NASP). The goal of the NASP program was to build an experimental manned single-stage-to-orbit vehicle which would take off like an airplane, fly into space, and then return to land like an airplane. The NASP program was extremely challenging technologically and had not made significant headway by the end of this period.[188]

Both of these efforts to develop next-generation unmanned and manned launch vehicles suffered from Air Force-NASA bickering over funding levels and designs, Congressional funding cutbacks, and the perception that they were not required given the downsizing of SDI and space station *Freedom*. Moreover, the lack of clear and coherent military space doctrine specifying the need for such launch capabilities or outlining the role for military man-in-space was undoubtedly a significant factor in contributing to the disarray of these programs at the end of this period.[189]

Spy Satellite Developments and the Military

Spy satellite developments continued to be a very important input in shaping national space policy and military space doctrine during this period. However, at this

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capability known as the Spacelifter concept. See David J. Lynch, "Toward a New Launcher Lineup," Air Force Magazine 76 (January 1993): 48-51.

[188]The NASP program grew out of earlier Air Force Transatmospheric Vehicle (TAV) studies and DARPA's Copper Canyon project. The goal of building and testing a full-size, manned X-30 vehicle was abandoned in late 1992, primarily due to the mounting budget requirements (estimated at approximately $2 billion per year) which would have been needed to push the vehicle to the testing phase between 1995 and 2000. A December 1992 GAO report estimated the total costs for a complete X-30 program would have been $17 billion versus the $3.1 billion original estimate in the late 1980s. See, for example, Ben Iannotta, "NASP Officials Flesh Out Lower-Cost Hyflite Option," Space News, 14-20 June 1993, 24.

[189]Pace clearly addresses this issue in "US Space Transportation Policy," 315: "The DoD and the Air Force in particular, is the most complex player in space transportation policy. This stems from the many different organizations affected by the ALS, and their differing views on it. These views in turn depend on what each organizations sees as the future of military space operations."

time there was also a slight reduction in the importance of the NTMV mission of spy satellites due to both the lesser initial emphasis of the Reagan administration on arms control and the first establishment of an OSI regime in the INF Treaty of December 1987. Moreover, because of the general discussion of significant military space applications during this period and especially the SDI, military space applications at least as important as NTMV and general space-based intelligence collection missions were given widespread consideration during this period. Nonetheless, spy satellite developments generally remained of critical importance and continued to override almost all other space policy considerations in most instances. Towards the end of this period, the U.S. deployed the first elements of several new spysat systems. Finally, during this period the first systematic approach to better using spy satellite data in tactical military situations was established under the Tactical Exploitation of National Space Capabilities (TENCAP) program.

With the launch of the first GSO SIGINT satellites during the last period and the establishment of the realtime photointelligence capabilities of the KH-11 system during the late 1970s, the basic hardware for the U.S. space-based intelligence collection program was set prior to the beginning of this last period of the cold war. These established systems allowed the U.S. to enjoy capable and seemingly quite robust spysat coverage up until the string of launch failures surrounding the *Challenger* disaster.[190] These successive launch failures demonstrated that this whole space-based collection effort was actually quite fragile even thirty years into the space age. Moreover, the basic uses for and perceptions towards U.S. spysats was evolving due to several factors such as the increased U.S.-U.S.S.R. tensions of this period, the continuing Soviet military buildup, and the Reagan administration's lesser initial emphasis on arms control.

The Reagan administration was the first systematically to use the products from

[190]Two major spysat launch failures surrounded the *Challenger* disaster: on 28 August 1985 a Titan 34D which apparently had a KH-11 aboard was destroyed following an engine failure about four minutes into its flight from VAFB; on 18 April 1986, the last KH-9 launch attempt ended in a spectacular failure when the Titan 34D booster blew up just above the launch pad at VAFB.

spysats (and other sources) publicly to emphasize the extent of the continuing Soviet military expansion as a part of its broader domestic and international efforts to sell the U.S. defense buildup. Beginning in September 1981 and continuing throughout the remainder of this period, DoD began publishing and widely distributing an annual glossy report entitled Soviet Military Power.[191] Remarkably detailed illustrations of almost all of the principal Soviet military systems were a major feature of these reports. As Richelson and others have pointed out, U.S. photointelligence satellites were undoubtedly the primary source for creating most of these illustrations.[192] Presenting this spysat derived data in a military threat and planning context and in a public report marked an important break with previous practice on spysat data.

U.S. perceptions towards the NTMV role of spysats also underwent subtle but significant transformations at this time. Rather than attempting to sell space-based NTMV as the ultimate method for enabling arms control and insuring Soviet compliance with SALT II as had the Carter administration, the Reagan administration changed the emphasis more towards ensuring compliance with and looking for Soviet violations of SALT II and other arms control agreements. Moreover, due to further analysis of the Soviet approach towards arms control and the verification difficulties discussed during the SALT II ratification debates, many groups now believed that Soviet concealment and deception techniques clearly called into question the spirit of these agreements and raised serious concerns about the U.S. ability to verify compliance adequately with the letter of

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[191] U.S. Department of Defense, Soviet Military Power (Washington: GPO, September 1981). Subsequent editions of this report during this period were printed in March 1983, April 1984, April 1985, March 1986, March 1987, April 1988, and September 1989. Much of the information contained in these reports was previously classified; the release of this data signified the judgement that public knowledge of these developments was deemed to be more important than protecting U.S. intelligence sources and methods from the Soviets.

[192] Richelson, Secret Eyes, 185-87. In a carefully worded statement, these reports indicated that the illustrations they contained "are derived from various US sources; while not precise in every detail, they are as authentic as possible." Beginning in 1987, the reports also contained satellite photos of Soviet installations obtained commercially from the SPOT Image Corporation and EOSAT Inc.

these agreements.[193]

One of the best examples of the changed emphases on spysats and NTMV during this period was the U.S. discovery of and reaction to the Soviets' construction of a large phased array radar (LPAR) near Krasnoyarsk. Due to its siting and orientation, this LPAR was a clear violation of the ABMT, a fact which was formally recognized by then-Foreign Minister Eduard Shevardnadze in a speech to the Supreme Soviet in October 1989.[194] What is most relevant from the Krasnoyarsk saga for our focus is the fact that despite being tipped off to the construction of this LPAR by a Soviet defector, it apparently took one year for U.S. NTM to discover the this object "equal in size to the

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[193]As evidence that the Soviets valued strategic deception very highly consider that then-General Nikolai V. Ogarkov, the Soviet General Staff representative to the SALT I negotiations, was head of the Chief Directorate for Strategic Deception (GUSM) within the Soviet General Staff. Marshall Ogarkov later became Chief of the General Staff. His successor as head of GUSM, Marshall Sergey F. Akhromeyev, also became Chief of the General Staff. Richelson, Secret Eyes, 192. For information on Soviet denial and deception efforts against U.S. NTM see Richelson, 190-98; and William R. Harris, "Counterintelligence Jurisdiction and the Double-Cross System by National Technical Means," in Roy Godson, ed., Intelligence Requirements for the 1980s: Counterintelligence (Washington: National Strategy Information Center, 1980), 53-82. See also William R. Harris, "Soviet Maskirovka and Arms Control Verification," and Angelo M. Codevilla, "Space, Intelligence and Deception," in Brian D. Dailey and Patrick J. Parker, ed., Soviet Strategic Deception (Lexington, MA: Lexington Books, 1987), 185-224, 467-86.

[194]Excerpts of Shevardnadze's speech are reprinted in "The Kremlin Apology: Excepts From Speech," New York Times, 25 October 1989, p. A18. See also Sven F. Kraemer, "The Krasnoyarsk Saga," Strategic Review 18 (Winter 1990): 25-38. The LPAR at Krasnoyarsk is very similar to the other eight "Pechora class" ABM LPARs which are legal under the ABMT because they are located on the Soviet periphery facing outward. The struggles within the U.S. government, first in determining that this LPAR was in fact a violation and then in attempting to craft a policy in response to this violation of the ABMT, very clearly illustrate how difficult it is for a pluralist democracy to deal with violations of arms control agreements -- especially when the evidence of violation is based upon NTMV. Despite the fact that the Krasnoyarsk radar represents one of the most clear violations of a treaty that the U.S. could ever expect, many "expert" groups such as the Arms Control Association, the Federation of American Scientists, and Congressional delegations were issuing judgements as late as 1987 that the radar did not violate the ABMT.

Egyptian pyramids."[195] The failure of sophisticated U.S. NTM to spot an object so large for so long highlights the sheer size of the Soviet Union, underscores problems with cloud cover over much of their territory, and hammers home the truism that "we have never found anything which has been successfully hidden" to an alarming degree since something as large as the Krasnoyarsk LPAR could not even be hidden.

Cumulatively, the publication of Soviet Military Power, the Krasnoyarsk saga, and other factors clearly and publicly illustrated that the U.S. emphases on spysats were changing during this period and that the U.S. was now beginning to see and value spysats for several applications beyond just their role in enabling and verifying arms control. This was a subtle but important distinction concerning the rationale behind and value of NTM. These subtle distinctions were important to the military because they had long sought to use the data from U.S. NTM in more militarily useful ways, especially at the tactical level. Thus, as the links between NTM and arms control were weakened in these small ways, the door was slightly opened to the military for the possibility of using these national assets in more militarily useful ways.

Three major types of new spysat systems were first fielded towards the end of this period. The first of these was the next generation GSO SIGINT satellite codenamed Magnum. According to Ball, the Magnum satellite has an antenna span of 100 meters or ten times that of the Rhyolite and was the largest object ever placed in GSO.[196] This increased size and hence sensitivity was required to continue monitoring critical Soviet transmissions (especially telemetry from test ICBM and SLBM launches) following Soviet countermeasures designed to reduce our take beginning in the late 1970s.[197] This

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[195]Kraemer, "Krasnoyarsk Saga," 25; and Richelson, Secret Eyes, 189-90.

[196]Desmond Ball, Pine Gap: Australia and the US geostationary signals intelligence satellite program (Sidney: Allen and Unwin, 1988), 25-27; and "Space Systems Glossary" in Military Uses of Space, 163-64, 167-68. According to the glossary, the first launch of the Magnum system was delayed over two years due to problems with the IUS system needed to carry the satellite from the STS LEO to GSO.

[197]Ball, Pine Gap, 34-44. These Soviet countermeasures have been linked to the compromise of the Rhyolite system by Boyce and Lee in 1975. Ball indicates that the

TELINT from space became especially critical to the U.S. ability to verify Soviet compliance with the unratified SALT II Treaty following the loss of the ground based TELINT stations in Iran in 1979.[198] The first Magnum satellite was launched aboard *Discovery* from the KSC on 25 January 1985.[199] There are apparently no open discussions of the interfaces between the military and this next generation GSO SIGINT satellite system.

The next of these new spysat systems known as Indigo or Lacrosse was apparently first launched aboard *Atlantis* on 2 December 1988.[200] The Lacrosse system represents another revolutionary technological development in U.S. spysat evolution because its primary means of reconnaissance is via radar imaging generated from its

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signal received at GSO would be only .001 per cent the strength of the signal received at the Trackman 2 SIGINT station in Iran located only about 1000 km from the Soviet space launch complex at Tyuratam (Baikonur Cosmodrome). This extremely weak signal necessitated the huge antenna on the Magnum system.

[198]Loss of the Tracksman TELINT stations in northern Iran caused the U.S. to reconfigure subsequent Chalet satellites for the TELINT mission. Apparently, the U.S. faced a quite severe lack of TELINT capability between the Iranian Revolution and the first launch of the Magnum system. These deficiencies contributed directly to the debates over whether the SS-25 constituted a prohibited second new type of ICBM under SALT II. See Ball, Pine Gap, 25-29; and "Space Systems Glossary" in Military Uses of Space, 163-64, 173-74.

[199]"Launch Listing" in Military Uses of Space, 118-19. The large amount of media attention on this dedicated national security STS mission was exactly the type of security problem which the NRO had hoped to avoid when using the STS. Subsequent Magnum satellites were apparently launched in November 1989 and November 1990 by *Discovery* and *Atlantis*, respectively.

[200]Ibid., 122-23. This first Lacrosse satellites was launched from KSC and placed into a 400 mile circular orbit with a 57 degree inclination. A second Lacrosse satellite was launched into a 65 degree inclination orbit from VAFB atop a Titan IV on 8 March 1991. These less than polar inclinations may reflect the fact that, apparently, neither the STS or the Titan IV has the boosting power required to place this heavy satellite into polar orbit. The Lacrosse system apparently uses NASA's Tracking and Data Relay Satellite System (TDRSS) to transmit data to its ground station at White Sands, NM. Richelson, Secret Eyes, 221-27.

powerful synthetic aperture radar (SAR).[201] The origins of this system apparently date back to 1976 when then-DCI George Bush approved the development of a radar imaging spysat under the codename Indigo.[202] The primary rationale behind the development of this new type of imaging satellite was the general problem of cloud cover obscuring the skies over the Soviet Union and Eastern Europe during much of the year.[203] As with many of the earlier spysat systems, Lacrosse ran into funding difficulties during its development; in 1983, Senator Barry Goldwater (R.-AZ) supposedly saved the $200 million allocated for the Lacrosse system from the budget knife of Representative Edward Boland (D.-MA).[204] The apparent success of the Lacrosse SAR imaging system has undoubtedly bolstered the arguments of elements within the Air Force and DoD on the feasibility and utility of other space-based radar projects.

The final major new spysat hardware system which made its debut at the end of this period is often referred to as the "KH-12." This new system was apparently first launched aboard *Columbia* on 8 August 1989.[205] Richelson asserts that the NRO, tired of all the press leaks and speculation, had actually instituted a completely random

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[201]Richelson, Secret Eyes, 219-20; "Space Systems Glossary" in Military Uses of Space, 162-63.

[202]Ibid. The Indigo test vehicle was launched on 21 January 1982 by a Titan III-B from VAFB, "Launch Listing" in Military Uses of Space, 112-13.

[203]Richelson, Secret Eyes, 217-19. Richelson notes that the mean monthly cloud cover over the Krasnoyarsk LPAR "never falls below 49 percent and rises to 76 percent in December." Even the most sophisticated optical or infrared imaging systems are adversely affected by thick cloud cover.

[204]Richelson, Secret Eyes, 220-21; and Bob Woodward, Veil: The Secret Wars of the CIA, 1981-1987 (New York: Pocket Books, 1987), 244-46. At the time, Goldwater and Boland were the Chairmen of the Senate and House Select Committees on Intelligence.

[205]"Launch Listing" in Military Uses of Space, 124-25. This first "KH-12" was launched from KSC into a 57 degree circular orbit 185 miles high. Two of these systems were launched in 1990, one from KSC aboard *Atlantis* on 28 February, and the second atop a Titan IV from KSC on 7 June. None of these satellites was placed in an inclination higher than 65 degrees which again probably indicates that these satellites are too heavy to reach a full polar orbit.

numbering system for its assets by this time.[206] Richelson refers to this system as the Advanced KENNAN/Improved CRYSTAL, but whatever it is called it does appear to represent a generational improvement over the KH-11. The main technological advance for reconnaissance on this system is reportedly an advanced infrared imaging system capable of taking "pictures" in both the near infrared and thermal infrared spectrums.[207] Other major improvements in this satellite are apparently designed to enhance its survivability in a nuclear environment or against ASAT weapons.[208] Undoubtedly, the military should also be interested in potential military applications of infrared imaging from space for purposes other than just the ballistic missile launch detection provided by DSP satellites.[209]

Cumulatively, the deployment of these new generation spysats at the end of this period represents the continuing advances in space hardware as well as a blurring and overlap between sensor technologies in multi-spectral imaging. There is clearly tremendous military potential in realtime, all-weather MSI. A worldwide system which could reliably pinpoint major enemy force concentrations, even if well concealed, for

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[206]Richelson, Secret Eyes, 231.

[207]Ibid.; "Space Systems Glossary" in Military Uses of Space, 161. This infrared imaging system is a supplement to the CCD visible light camera system also carried by these satellites. Additionally, this satellite system allows its imagery to be used directly for terrain mapping purposes.

[208]According to Richelson in Secret Eyes, this new system may weigh up to 40,000 pounds and its hydrazine fuel supply has been increased from 6500 to 15,000 pounds. This increased fuel supply would allow the satellite to maneuver more frequently to arrive overhead targets unexpectedly or to maneuver away from the Soviet co-orbital ASAT system. Additionally, these new satellites may also carry the Satellite On-Board Attack Warning System (SOARS) being developed by TRW to provide realtime warning of the detection of many types of ASAT weapons.

[209]Current DSP satellites can reportedly already detect aircraft operating on afterburners. As described above, the DARPA program known as Teal Ruby was designed to use infrared sensors to track aircraft and cruise missiles but, apparently, was placed into storage in 1989 without ever being tested in space. Burrows, Deep Black, 301-3; and "Space Systems Glossary" in Military Uses of Space, 172.

realtime targeting purposes would represent a major breakthrough in military capability and strategy. With the advent of these newest spysats, the technology for this type of system now seems to be at hand but major political, organizational, and doctrinal issues regarding the development of such a system for tactical military use remain unresolved.

A final development related to spysats during this period was the slow but continuing movement towards developing programs to exploit these national spysat capabilities more effectively for military applications at the tactical level. Clearly, the planning and training for certain high-priority tactical military operations such as the 1970 raid on the Son Tay POW camp in North Vietnam and the 1980 Iranian hostage rescue attempt which ended in the debacle at Desert One had relied heavily upon intelligence data collected from space-based assets.[210] During this period, the first sustained efforts were made to move beyond the ad hoc intelligence dissemination procedures established in the examples above and create a permanent system which would more easily and directly disseminate critical tactical information from spysats directly to terminals available to tactical level commanders. Unfortunately, as with almost everything else about spysats, these programs designed to disseminate classified data from spysats more directly and easily were themselves classified and there are few details about them in open sources.

The most prominent of the programs designed for this purpose is known as the

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[210]The planning for the raid on the Son Tay POW camp made use of KH-9 photos and undoubtedly also SIGINT satellites because the operation "had been given number-one priority of all electronic intelligence work worldwide." Benjamin F. Schemmer, The Raid (New York: Harper and Row, 1976), 61, 151. Schemmer (pages 91-92) also reveals that the Son Tay camp mock up built for training at Eglin AFB was designed to be completely dismantled and was always taken down prior to Soviet reconnaissance satellite overflights. Providing prior warning of such overflights is the purpose of the U.S. Satellite Reconnaissance Advance Notice (SATRAN) warning system now run by USSPACECOM. On the extensive use of KH-11 photos in planning the Iranian hostage rescue attempt see Richelson, Secret Eyes, 179-83.

Tactical Exploitation of National Capabilities or TENCAP program.[211] Congress directed the Services to create TENCAP offices in 1977 but it is unclear that any significant headway was made on this issue for several years.[212] Representative Kramer made a limited reference to this classified program in a statement inserted into Congressional testimony for 19 May 1982. This statement indicated that as of November 1981 the TENCAP program was "a tri-service planning effort" and that the program "is designed to extract useful tactical information from the surveillance satellites and other 'sensors' that we already operate in space."[213] Apparently, the TENCAP plan calls for using links between the new "KH-12" spysat system and the Milstar military communications satellite system to allow spysat data to be sent directly to field terminals via the Milstar system.[214] Given that the first "KH-12" spysats came on line at the very end of this period and that Milstar deployments were still several years away, it is doubtful that the TENCAP program or any other program designed for this purpose achieved very significant capabilities at the tactical level by the end of this period.[215]

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[211]In Secret Eyes, Richelson also lists several other programs for this purpose such as: the National Intelligence Systems to Support Tactical Requirements, the Defense Reconnaissance Support Program, the Joint Tactical Fusion Program, and Fleet Imagery Support Terminals. See page 255.

[212]Eddie Mitchell, Apogee, Perigee, and Recovery: Chronology of Army Exploitation of Space, RAND Note N-3103-A (Santa Monica, CA: RAND Corporation, 1991), 72.

[213]HASC, Aerospace Force Act, 15.

[214]Burrows, Deep Black, 313-14; and "Space Systems Glossary" in Military Uses of Space, 164-65. The Milstar is also apparently designed to replace the SDS constellation which currently provides the data stream downlinks for KH-11 and possibly "KH-12" satellites.

[215]The judgement that these program probably had not produced much fruit at the tactical level by the end of this period is supported by the fact that problems with disseminating intelligence data to field commanders was among the major critiques leveled by coalition Commander General Norman Schwartzkopf at the end of the Gulf War in 1991. See, for example, David A. Fulghum, "Key Military Officials Criticize Intelligence Handling in Gulf War," Aviation Week & Space Technology, 24 June 1991, 83.

Overall, it is clear that spysats remained an important top-down, national security determinant of national space policy during this period. However, the traditional strength of this input in enabling arms control and as NTMV was weakened somewhat at this time and new emphases on the different capabilities of spysats were also evident during this period. This slight weakening of the top-down, national security links with spysats provided a small opening for the development of programs such as TENCAP which were driven by different national security considerations and the organizational behavior inputs of the military. Nonetheless, the continuing strength of the national security considerations related to spysats is well illustrated by the fact that it took some twenty years to establish programs such as TENCAP and that these programs apparently remain quite limited and constrained.

ASAT Developments and Military Space Doctrine

The course of U.S. ASAT developments during this period presents an image of severe conflict over U.S. military space objectives and unclear military space doctrine. The Air Force's MHV ASAT program had been initiated in September 1977 and was first flight tested in January 1984. On 13 September 1985, the MHV successfully performed its first and only test intercept against a satellite in space. Earlier, in 1983, however, Congress had adopted the Tsongas and McHugh amendments which significantly limited the ability of the Air Force to test this ASAT system. The next several years were marked by rancorous and continuing high-level political debates over the general U.S. strategic need for an ASAT system and the broad prospects for ASAT arms control as well as on specific testing restrictions for the MHV ASAT. In December 1987, following two years of funding cutbacks and a testing prohibition which prevented the Air Force from testing the MHV unless the Soviets first performed a dedicated test of their co-orbital system, the Air Force proposed the cancellation of its MHV ASAT system. Then, in December 1989, the Army became the executive agent for developing a new ground-launched ASAT system. Thus, despite all the advances in military space technology and capability, the U.S. ended the cold war without an operational ASAT system -- the same situation it has been in since October 1970 when the Program 437 ASAT system essentially was deactivated. Overall, ASAT developments during this period appear to represent another instance where operational military systems and advocacy were out of phase with political support for high ground or space control military space applications.

By the early 1980s the MHV ASAT system had taken a definitive shape.[216] After considering several basing modes, the Air Force decided on an air-launched version of this system and developed plans to modify 40 F-15 fighters as ASAT launch platforms.[217] The ASAT weapon consisted of three parts: the first stage was a modified Boeing short-range attack missile (SRAM), the second stage a Vought Altair III booster, and the final stage was the MHV itself. The MHV was a small KEW about the same size as a juice can (12 by 13 inches) which used eight cryogenically cooled infrared telescopes to acquire its target and several dozen small solid rocket thrusters designed to align the MHV laterally on course to its target. The Air Force and Boeing also developed a prototype missions operations center (PMOC) within SPADOC designed to determine ASAT launch windows and vector F-15s into launch positions. Due to developmental

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[216]Information in this paragraph is drawn from the following sources: Stares, Militarization of Space, 206-9, 220-22; Craig Covault, "Antisatellite Weapon Design Advances," Aviation Week & Space Technology, 16 June 1980, 243-47; and House, Defense Appropriations, 84, 498-501. The complete MHV ASAT weapon weighed about 2600 pounds and was approximately 17 feet long and 18 inches in diameter. In 1981, the official name of this program was changed to the prototype miniature air-launched system (PMALS), but the MHV, MV, or air-launched MV (ALMV) terminology is still used most often. A GAO report critical of the MHV ASAT system was completed in January 1983 and estimated that the total procurement costs would total at least $3.6 billion versus the $3.45 billion estimated by the Air Force. The Air Force planned to station one squadron (20 aircraft) of F-15s modified for the ASAT mission at McChord AFB, WA, and another squadron at Langley AFB, VA.

[217]An air-launched, direct-assent ASAT system has significantly greater operational flexibility in rapidly attacking many types of LEO than does a ground-launched system with a limited number of fixed launch points. With air-refueling, an F-15 has a range of approximately 5000 nautical miles and can attack satellites from virtually an unlimited number of locations whereas a ground-launched system must wait for the target satellite to pass within range overhead. The drawbacks of an air-launched system include the significant difficulties in command and control for this type of operation and the weight (and therefore range) limitations imposed by the payload capability of the aircraft launch platform. "Space Systems Glossary" in Military Uses of Space, 165.

difficulties in integrating several state-of-the-art technologies, the IOC of the MHV was slipped from 1985 to 1987; thirteen tests of the MHV against target satellites in space were planned prior to IOC. Finally, the Air Force estimated that the total developmental costs for the MHV system through FY 1987 would be approximately $3.45 billion.

Meanwhile, Soviet ASAT testing and ASAT arms control proposals continued. In January and March 1981, the Soviets tested their dedicated co-orbital ASAT system with the former being an unsuccessful test of their newer optical-thermal guidance system and the latter being a successful test of their older radar guidance system.[218] Then, on 18 June 1982 the Soviets conducted their last unambiguous ASAT test as a part of a major strategic forces exercise.[219] The Soviets were also busy on the ASAT arms control front during this period. On 20 August 1981, Soviet Foreign Minister Anrdei A. Gromyko submitted a "Draft Treaty on the Prohibition of the Stationing of Weapons of Any Kind in Outer Space" to the UNGA. Overall, this draft treaty contained a number of significant conceptual shortcomings including a failure to define adequately the types of weapons which would be covered under its terms, a lack of any coverage for ground-based ASAT weapons, and the apparent sanctioning of the use of force against space objects which a State Party to the treaty determines are not in accordance with the provisions of Article 1 of the treaty.[220]

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[218]Stares, Militarization of Space, 222-23.

[219]Ibid., 223; and "Soviets Stage Integrated Test of Weapons," Aviation Week & Space Technology, 28 June 1982, 21. This final Soviet ASAT test was only a small part of a coordinated strategic exercise which included test launches of two ICBMs, two ABMs, one SLBM, and one SS-20 IRBM, as well as the launch of a navigation and photoreconnaissance satellite which may have simulated the reconstitution of "Soviet satellites negated by Allied forces during the war scenario." This test was similar to but more comprehensive than an earlier Soviet strategic forces test on 16 February 1976. The U.S. has never conducted a similar comprehensive test of its strategic forces involving actual test firings. On this test see also Nicholas L. Johnson, The Soviet Year in Space, 1982 (Colorado Springs: Teledyne Brown Engineering, 1983), 25. Johnson is the source of the quote above.

[220]See Rebecca V. Strode, "Commentary on the Soviet Draft Space Treaty of 1981," in Gray, American Military Space Policy, 85-91; and Stares, Militarization of Space,

During the Summer of 1983, the Soviets initiated a second and more comprehensive ASAT arms control offensive which was undoubtedly designed, at least in part, to strengthen domestic U.S. anti-ASAT forces in Congress and elsewhere. On 19 August 1983, Soviet General Secretary Yuri V. Andropov informed a group of U.S. Senators visiting Moscow that the U.S.S.R. would not "be the first to put into outer space any type of antisatellite weapon" and would impose "a unilateral moratorium on such launchings" so long as other countries "will refrain from stationing in outer space antisatellite weapons of any type."[221] The following day, Gromyko introduced a second draft treaty at the UN. The second draft treaty was a considerable improvement over the first draft in that it was more comprehensive and used more precise language. However, the Reagan administration remained quite cool to these Soviet initiatives and still did not seek ASAT negotiations; the administration cited significant difficulties including problems with the U.S. ability to verify the apparent Soviet offer to dismantle their existing co-orbital ASAT system, more general verification issues, and the continuing problem of the significant residual ASAT capabilities of both sides.[222] Thus, while

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229-30. Strode concludes that "[t]he Soviet Union may have presented the Draft Treaty merely for propaganda benefit." According to Stares, "[t]he Reagan administration dismissed the Soviet draft treaty as a hypocritical propaganda ploy." One of the few specific prohibitions in this draft treaty was against carrying weapons "on reusable manned space vehicles," an obvious reference to the STS. The Soviet 1981 draft treaty is reprinted in Gray, 115-17.

[221]Quoted in Stares, Militarization of Space, 231.

[222]The divergent responses to this Soviet ASAT arms control initiative provide an excellent example of the generally polarized and contentious broad strategic setting for arms control during this period. The ASAT issue was a relatively minor element of the overall strategic setting but was largely shaped by perceptions related to this overall situation. The group who saw considerable utility in general arms control efforts and the use of arms control to curtail U.S. military space efforts was spearheaded by individuals such as Senators Larry Pressler (D.-SD) and Paul E. Tsongas (D.-MA); Representatives Norman D. Dicks (D.-WA), Les AuCoin (D.-OR), and George E. Brown, Jr. (D.-CA); space policy analyst Paul B. Stares; and Federation of American Scientists Spokesman John E. Pike and was willing to overlook the potential problems in this second draft treaty in order to get space-related arms control efforts restarted. By contrast, many top members of Reagan's administration in arms control-related positions such as Under

these Soviet draft treaties did not serve as the direct basis for reopening U.S.-U.S.S.R. ASAT arms control negotiations, they were certainly important in conditioning the general arms control setting at this time. Superpower ASAT negotiations were restarted in March 1985 as a subset of the broad Defense and Space Talks.[223]

High-level political forces within the U.S. also interacted with these Soviet initiatives to fundamentally shape the MHV ASAT program during the mid-1980s. Varying types of Congressional restrictions on the MHV ASAT program began in 1983 and continued throughout the next five years. The first major hearing on this issue was called by Senator Larry Pressler (D.-SD) on 20 September 1982.[224] ACDA Director Eugene Rostow and UDRE Dr. Richard D. DeLauer were the principal witnesses at this hearing. In making his case for a measured approach towards ASAT arms control, Director Rostow highlighted the threat posed to U.S. forces by Soviet space systems, the need for a U.S. ASAT to address the current asymmetrical situation and as a possible "inducement for the Soviet Union to explore constructive limits on space weapons[.]", and the difficulties in verifying ASAT arms control.[225] Many of the exchanges between Senator Pressler and UDRE DeLauer centered around semantic arguments regarding

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Secretary of Defense for Policy Fred C. Ikle, Assistant Secretary of Defense for International Security Policy Richard N. Perle, and ACDA Director Kenneth L. Adelman were skeptical of arms control in general and of space-related arms control in particular due to the asymmetries caused by the Soviet lead in ASAT weapons, the difficulties in crafting and verifying any ASAT arms control agreement, and the U.S. lead in most areas of space-related technology.

[223]Bilateral arms control negotiations had been suspended in December 1983 following the Soviet walkout from the INF negotiations in response to the first NATO deployments of these systems. The Defense and Space Talks remain the only one of the three negotiations begun in March 1985 in which a major agreement has not been reached.

[224]U.S. Congress, Senate, Committee on Foreign Relations, Subcommittee on Arms Control, Oceans, International Operations and Environment, Arms Control and the Militarization of Space: Hearing before the Subcommittee on Arms Control, Oceans, International Operations and Environment, 97th Cong., 2nd sess., 20 September 1982. (Hereinafter SFRC, Arms Control and Militarization of Space).

[225]Ibid., 11-12.

whether or not the U.S. development of the MHV ASAT fueled an arms race in space. Interestingly, in this hearing only six months prior to President Reagan's "star wars" speech, both UDRE DeLauer and DARPA Director Cooper attempted to assuage Senator Pressler's concerns about a spiraling arms race in space by strongly asserting that the DoD was not planning for a major space-based BMD program such as advocated by High Frontier and that they believed the DoD was unlikely to initiate this type of major undertaking in the near future.[226]

Further hearings on ASAT and related issues were called in April and May of 1983.[227] These hearings were primarily designed to build support within Congress for Senator Pressler's "sense of the Senate" Resolution 43 and Senator Tsongas's Joint Resolution 28. Joint Resolution 28 was more comprehensive and indicated:

> That the President shall resume immediately bilateral talks with the Soviet Union for the purpose of negotiating a comprehensive treaty prohibiting --
>
> (1) the testing, production, deployment, or use of any space-based, air-based, or ground-based weapons system which is designed to damage, destroy, or interfere with the functioning of any spacecraft of any nation; and
>
> (2) the stationing in orbit around the Earth, on any celestial body, or at any other location in outer space of any weapon which has been designed to inflict injury or cause any other form of damage on the Earth, in the atmosphere, or on objects placed in space.[228]

Clearly, at this time a combination of factors including President Reagan's "star wars" speech, the impasse in superpower arms control and the general worsening of U.S.-U.S.S.R. relations, as well as the growing strength of the nuclear freeze movement was pushing the Senate towards the belief that it had to act firmly and rapidly to preserve space as a sanctuary free from further ASAT developments. On 18 July 1983, Senator Tsongas's amendment to the FY 1984 DoD Authorization Act was approved. The Tsongas amendment withheld DoD funds for testing the MHV ASAT system unless the

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[226]Ibid., 36-37.

[227]SFRC, Controlling Space Weapons. The principle administration witnesses at these hearings were ACDA Director Adelman and Under Secretary of Defense for Policy Ikle.

[228]Ibid., 8.

president certified both that the U.S. was negotiating with the Soviets in good faith on this issue and that such testing was in the interests of U.S. national security.[229] The House Appropriations Committee went even further and withheld $19.4 million in FY 1984 advanced procurement funds from the MHV ASAT; following intense administration lobbying, the conference with the Senate restored this funding with the proviso that the administration provide Congress with a report on U.S. ASAT policy by 31 March 1984.[230]

The Reagan administration mounted significant efforts to counter these Congressional restrictions on testing the MHV ASAT system. On 21 January 1984, the Air Force was able to conduct a limited first test firing from an F-15 of the MHV system's booster stages one and two.[231] The "Report to Congress: U.S. Policy on ASAT Arms Control" delivered to Congress on 31 March 1984 raised several questions concerning the basic strategic utility of an ASAT ban and strongly reiterated the administration's many concerns with ASAT arms control.[232] The report detailed more than four pages of "Problems Facing ASAT Arms Control" and summarized the current situation facing U.S. space systems as follows:

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[229]Stares, Militarization of Space, 232.

[230]Ibid., 232-33. This withholding of the $19.4 million in advanced procurement funding for the MHV ASAT in FY 1984 until 45 days after the administration's report was submitted to Congress was also known as the McHugh amendment. See Under Secretary Aldridge testimony in U.S. Congress, House, Committee on Armed Services, Defense Department Authorization and Oversight for Fiscal Year 1985: Hearings before the Committee on Armed Services, Part 2, 98th Cong., 2nd sess., 1984, 30. (Hereinafter HASC, DoD Authorization, FY 85).

[231]"Chronology" in Military Uses of Space, 56. Because the MHV warhead was not a part of this test and the boosters were not aimed at any specific target, this test avoided Congressional restrictions.

[232]Executive Office of the President, "Report to Congress: U.S. Policy on ASAT Arms Control," 31 March 1984; microfiche document 00075 in Military Uses of Space. (Hereinafter "ASAT AC Policy Report to Congress, 84"). This is the unclassified version of the report; a more detailed classified version was also delivered to Congress at the same time.

> Deterrence provided by a U.S. ASAT capability would inhibit Soviet attacks against U.S. satellites, but deterrence is not sufficient to protect U.S. satellites. Because of the potential for covert development of ASAT capabilities and because of the existence of non-specialized weapons which also have ASAT capability, no arms control measures have been identified which can fully protect U.S. satellites. Hence, we must continue to pursue satellite survivability measures to cope with both known and technologically possible, yet undetected, threats.[233]

In hearings on the FY 1985 DoD appropriations, Under Secretary Aldridge indicated that the Air Force did have "some concerns" with the Tsongas and the McHugh amendments.[234] Despite this rather limited and unenthusiastic Air Force support for removing the Congressional restrictions on MHV ASAT testing, the administration was successful during the Summer of 1984 "in preventing further limitations on US ASAT testing and also managed to water down the restrictive language of the Tsongas Amendment."[235]

The lessening of these restrictions was important in allowing MHV ASAT testing to continue during 1985. The most complete test of this system took place on 13 September 1985 when the MHV successfully intercepted and destroyed Air Force satellite

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[233]Ibid., 9. The ASAT arms control problem areas listed included: verification, breakout, disclosure of information, definitions, vulnerability of satellite support systems, and the Soviet non-weapon military space threat. Assistant Director of ACDA, Dr. Henry F. Cooper, and Deputy Under Secretary of Defense for Strategic and Theater Nuclear Forces, T.K. Jones, did most of the drafting of the report. The services "were not principle participants" in any of the discussions leading to this report but they did, along with the CIA, draft the appendices in the classified version of the report. Cooper interview, 1993.

[234]HASC, DoD Authorization, FY 85, 9. At these hearings, Representative Kramer indicated that "I think the decision was made internally, as I understand it, within the Department or within the Air Force not to engage in a floor fight on this [the Tsongas and McHugh amendments]." Aldridge basically agreed that this had been the approach of the DoD but added that DoD had "attempted to try to provide -- I guess you would call it limit the amount of restraint of the amendment." Moreover, Aldridge indicated that the Air Force was interpreting the Tsongas amendment "as a permanent law" and later added that "we believe we can live with it in spite of those conditions." Quotes from pages 29-32.

[235]Stares, Militarization of Space, 233.

P78-1.[236] Although it was not clear at the time, this proved to be the only MHV ASAT test against a satellite in space. In December, an amendment sponsored by Representatives Norman D. Dicks (D.-WA) and Les AuCoin (D.-OR) banned testing of the U.S. MHV ASAT against objects in space unless the President certified that the Soviets had violated their moratorium by conducting a dedicated ASAT test.[237] This restriction gave the Soviets, who had developed two types of guidance systems and conducted at least 20 tests in space of their dedicated co-orbital ASAT system between 1968-1982, a virtual veto over further U.S. testing of its MHV ASAT. In February 1986, the Air Force developed a plan to skirt this Congressional restriction on testing against objects in space by testing the MHV's ability to lock onto the heat of a distant star.[238] On 22 August and 30 September, the Air Force conducted two "successful" ASAT tests in space against the infrared energy of stars under the interpretation of the Congressional restriction it had developed in February.[239]

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[236]The Air Force Space Test Program satellite P78-1 was an experimental system launched in February 1979 which was designed to study the sun's corona. P78-1 was still operational in a LEO between 319 to 335 nautical miles in altitude when it was destroyed by the MHV.

[237]On 12 December, immediately prior to this new and much more serious restriction, the Air Force had placed two instrumented target vehicle (ITV) satellites into LEO of approximately 200 by 480 nautical mile orbits. See "Launch Listing" in Military Uses of Space, 118-19. These ITVs cost $20 million, had a limited lifetime, and were specifically designed to provide data on MHV intercepts, see Michael R. Gordon, "Air Force to Test a Weapon in Space," New York Times, 20 February 1986, p. A18. For a discussion of a possible Soviet violation of their self-imposed moratorium which took place on 21 June 1985, see James E. Oberg, "A Mysterious Soviet Space Launch," Wall Street Journal, 21 January 1986, p. 16. Oberg is the author of several major books on the Soviet space program including Red Star in Orbit (New York: Random House, 1981).

[238]Gordon, "Air Force to Test Weapon in Space."

[239]"Chronology" in Military Uses of Space, 59; and "Anti-Satellite System Tested Successfully," Los Angeles Times, 23 August 1986, p. 24. The 30 September 1986 test marked the fifth and final test of the MHV system in space. Of course, since this system was not designed to lock onto the infrared energy of stars it is difficult to determine from open sources just how useful or "successful" such tests might have been.

Despite continuing controversy and administration efforts to ease testing restrictions, Congress imposed similar bans on testing the MHV unless the Soviets tested first during FY 1987 and 1988 as well.[240] By this time, these testing restrictions combined with major funding cutbacks were starting to have a very serious impact on the prospects for completing the testing and development of the MHV system.[241] At a news conference on 10 March 1987, Secretary Weinberger announced plans to resume MHV testing against points in space during the last quarter of 1988 as one part of a three part plan to enhance U.S. ASAT capabilities and field operational systems by the early 1990s.[242] At this same conference, Air Force Brigadier General Robert R. Rankine, Jr., Director of Space Systems in the Air Force Research Development and Acquisition Office, discussed plans to study a new ground-launched ASAT system which would double the range of the MHV.[243] Most significantly, however, Rankine appeared to

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[240]Representatives AuCoin, Brown, and Dicks continued to spearhead the restrictive amendments for FYs 87 and 88.

[241]Colonel Charles E. Heimack, Department of the Air Force, HQ USAF, "Point Paper on Antisatellite (ASAT) Study," 27 October 1986; microfiche document 00081 in Military Uses of Space, lists specific Congressional restrictions on MHV development and testing for FY 87. Total expenditures were limited to $200 million versus the $324 million requested and funds for long lead missile components and the mission control center were completely eliminated. Additionally, this point paper indicated that NSSD 4-86 called for a thorough exploration of U.S. ASAT options and was signed by President Reagan on 20 October 1986. Heimack is apparently quoting from study directive 4-86 when he indicates that the air-launched ASAT is "a good first step[.]" but notes that "[s]upport has eroded due to high costs, limited capability." Finally, this point paper also indicates that a report from Secretary Weinberger to the president on "Air-Launched ASAT continuation/alternative program options" was due no later than 12 December 1986.

[242]"Defense Department Unveils $1.2-Billion Asat Restructuring Plan," Aviation Week & Space Technology, 16 March 1987, 19-21; Rudy Abramson, "New Space Satellite-Killer Tests Planned," Los Angeles Times, 11 March 1987, p. 11. Although not specifically stated, this restructured ASAT program was apparently the result of the ASAT report submitted by Weinberger in December 1986.

[243]"$1.2 Billion Asat Restructuring Plan," 20. These plans called for a study to compare using a more powerful first stage booster on the air-launched MHV system with

contradict Weinberger's earlier statement about the value of resumed MHV testing by indicating that the program had "reached the point where it is 'not meaningful' to proceed unless tests can be conducted against space targets."[244] In December 1987, the Air Force, publicly citing continuing Congressional testing restrictions for FY 1988 and the need to cut the DoD budget, proposed cancellation of the MHV ASAT program.[245] Following the lifting of Congressional ASAT testing restrictions for FY 1989, in December 1989 the Army took the lead in developing a new U.S. ASAT system.[246]

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switching to a much larger ground-launched system using a modified Pershing 2 booster. Rankine indicated that doubling the range of the MHV would give the U.S. the about same ASAT range capability already demonstrated by the Soviets (approximately 700 miles). The third part of the overall ASAT restructuring plan called for a joint project with SDIO "to develop an excimer laser system for use against satellites." Ibid.

[244]Abramson, "New Satellite-Killer Tests Planned," the interior quote is from Rankine.

[245]"Chronology" in Military Uses of Space, 60. A 1990 DoD report to Congress listed three "key negative factors [which] culminated in a decision to terminate the F-15 ALMV program in March 1988: (1) severe Congressional funding reductions in the program over a 3 year period; (2) continuing Congressional testing prohibitions on the ALMV that would not permit confidence for an effective operational system, and diminished prospects for future support; and (3) limited capability for system growth to meet expanded threats at higher altitudes." See U.S. Department of Defense, "Anti-Satellite: A Report to Congress," (Washington: DoD, February 1990), 2-4. (Hereinafter "ASAT Report to Congress, 90").

[246]"Chronology" in Military Uses of Space, 61. Following the Air Force's cancellation of the MHV, both the Army and the Navy expressed considerable interest in developing ground- or sea-launched ASAT systems. According to "Navy space officials," the Navy "is the only service that has a defined mission for the Asat -- the requirement of fleet commanders to be able to eliminate low-orbiting Soviet satellites used to target U.S. ships," see "Pentagon Preparing to Restart Antisatellite Program in January," Aviation Week & Space Technology, 14 November 1988, 33-34. On 13 December 1989 the Defense Acquisition Board (DAB) selected four candidate KEW ASAT system designs from which Under Secretary of Defense for Acquisition (USD(A)) Robert B. Costello selected "a land-based system with the minimum scope to meet USCINCSPACE's highest priority ASAT mission needs." See "ASAT Report to Congress, 90," vi. The initial Army ASAT system proposed for this program was canceled in December 1990, see "Chronology" in Military Uses of Space, 62.

The most important area for our focus within this ASAT section is an examination and analysis of the role of DoD and especially the Air Force in attempting to sell the MHV ASAT to Congress and in attempting to overturn the Congressional restrictions on this system. The strength of these efforts should provide an excellent indication of the doctrinal importance of an operational ASAT system to DoD and the Air Force. In this regard, it is immediately apparent that neither DoD or the Air Force mounted anything near an all-out effort to sell the MHV ASAT or to remove the Congressional restrictions on this system. Granted that the ASAT was not a large program in comparison with many other important and troubled programs of this era and that many broader strategic concerns during this volatile time were more important, it is nonetheless remarkable how little overall support the MHV ASAT received from the Pentagon. Even more telling is the fact that the MHV generally received its strongest Pentagon support from the civilian defense officials of OSD and the Office of the Secretary of the Air Force rather than from the uniformed military. Cumulatively, this lack of support for the MHV, especially from the officers of the Air Force, would seem to indicate that, in spite of its general rhetorical support, in practice, the Air Force did not at this time fully support the administration's ASAT policy outlined in NSDD-42 or even believe its own space control doctrine statements in AFM 1-6 and therefore did not strongly support the development of one the types of weapons required to begin to create an actual space control capability.

Supporting the thesis that the DoD and the Air Force did not promote the MHV ASAT very strongly is somewhat difficult because it requires an analysis of actions which might have taken place but did not. However, a few examples of the DoD's and Air Force's lukewarm support for the MHV contrasted with USSPACECOM's far more forceful support for ASAT weapons after the cancellation of the MHV should help to make this point more clear. Undoubtedly, much of the problem with the lack of enthusiasm towards the MHV stemmed from the fact that the MHV lacked a strong constituency of individuals or groups who would be responsible for its operation within either DoD or the Air Force. Moreover, the novel political restrictions imposed on this system created unique and difficult bureaucratic cross currents within the Pentagon related to arms control, developmental considerations, and operational concerns.

Generally, DoD officials did not mention the MHV forcefully o[illegible]he mid-1980s.[247] Overall, the MHV received even less support f[illegible]ce organizations at this time. Indeed, at times it would have been difficult determining that the MHV ASAT was an Air Force program. Under Secretary Aldridge's 1984 testimony noting his limited concerns with the Tsongas and McHugh amendments was already discussed above. During 1985 and 1986, neither the Office of the Secretary of the Air Force, AFSPACECOM nor USSPACECOM mounted effective campaigns on behalf of the MHV or the general need for U.S. space control capabilities.[248] Thus, as discussed in the section on USSPACECOM above, it was not until the beginning of the tenure of USCINCSPACE Piotrowski in February 1987 that the MHV received forceful, sustained, and comprehensive support. However, by this time, the MHV was on its last legs within the Air Force due to the continuing Congressional restrictions and funding limitations.

The course of ASAT developments during this period again clearly demonstrates that, for this issue in particular, civilian defense decision-makers were dominant over the military and that perceptions of national security rather than organizational behavior shaped these developments. This dominance of civilian decision-makers and of national security considerations related to ASAT weapons had been true for other periods as well,

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[247]For example, Secretary Weinberger's Annual Report for FY 1986 did not even mention the Congressional restrictions placed on the MHV thus far. The Annual Report for FY 1988 unrealistically did its best to try to ignore the deleterious effects which the Congressional restrictions had already caused for the MHV program: "In FY 1988, building on the results from our successful test program, we will begin producing the [MHV] missiles. Further congressional restrictions on ASAT testing will, however, needlessly delay attaining an operational capability with the system." See U.S. Department of Defense, Annual Report to the Congress, Fiscal Year 1986 (Washington: GPO, 1985), 60-61, 215; and Annual Report to the Congress, Fiscal Year 1988 (Washington: GPO, 1987), 214.

[248]In an extensive interview in July 1986, Aldridge discussed several space issues in considerable depth, but did not even mention the MHV ASAT program. See Edgar Ulsamer, "Aldridge on the Issues," Air Force Magazine 69 (July 1986): 84-89. Note also that the AFA also did not even mention the MHV ASAT it its 1986-87 Statement of Policy adopted on 15 September 1986. This policy statement is reprinted as "Government's First Responsibility," in Air Force Magazine 69 (November 1986): 6-9.

but it is particularly revealing that it was still so strongly operative during this period in light of the continuing technological improvements for both offensive and defensive space systems, the significant U.S.-U.S.S.R. tensions of this period, and the growing threat to U.S. forces posed by Soviet space-based targeting systems. USSPACECOM's strong, coherent, and persistent advocacy for ASAT systems and the development of a broader space control capability did not begin until the very end of this period and it is unclear whether this strong advocacy will be enough to help create an actual operational capability of this type in the post cold war environment.

DoD and Air Force Military Space Doctrine Statements

One of the most significant factors which distinguishes this period from all of the pervious periods is the fact that the U.S. military issued its first official military space doctrine statements of the cold war era during this time. The first of these doctrinal statements was developed in conjunction with NSDD-42 and was completed during the Summer of 1982. Unfortunately, this first official "DoD Space Policy" remains classified and only a brief fact sheet was provided to describe this policy. Shortly thereafter, on 15 October 1982, the Air Force finally released its long-awaited Air Force Manual (AFM) 1-6, "Military Space Doctrine." This detailed space doctrine manual represents the synthesis and clarification of previous Air Force thinking about space and, while it clearly suffers from substantial shortcomings, it is, nonetheless, a very significant milestone in the development of U.S. military space doctrine during the cold war. As the single most important military space doctrine statement of the cold war era, AFM 1-6 is examined in considerable detail and analyzed in relation to AFM 1-1, "Basic Aerospace Doctrine."

Following the release of these first U.S. military space doctrine statements in 1982, military space doctrine continued to evolve in response to changes in U.S. national space policy as reflected by the SDI, the CELV decision, and the new National Space Strategy produced in the wake of the *Challenger* disaster. These evolutionary changes were consolidated and presented along with the now-familiar four part military space activity typology in the new "Department of Defense Space Policy" issued on 10 March 1987. This approach helped to make this statement the most clear and concise yet comprehensive exposition of U.S. military space doctrine during the cold war. The final major military space doctrinal statement of the cold war period was issued by the Air Force on 2 December 1988. This "Air Force Space Policy" statement resulted from a comprehensive Air Force review of the role of the Air Force in space and reflects one of the strongest, if not the strongest, official Air Force commitments to the space control and high ground schools of thought on space. A key factor for analysis throughout this section is the match between these various doctrinal statements and the actual military space plans and programs of this period. It is this match between doctrine and programs which provides the final check of the validity and support for doctrinal statements.[249]

As discussed in several sections above, the incoming Reagan administration was greeted with increasing turmoil related to military space doctrine due to the many military space developments of the late 1970s and early 1980s which contributed to the growing realization of the military importance of space. However, when the Reagan administration came into office the DoD apparently still lacked a single official statement of military space doctrine.[250] The direct roots of the first DoD space policy statement go back to August 1981 when Secretary of Defense Weinberger directed Dr. Ikle, Under Secretary for Policy, to conduct a study to review the space environment and the military uses of space.[251] More broadly, this DoD military space policy study was developed

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[249]Dana Joyce Johnson, "The Evolution of U.S. Military Space Doctrine: Precedents, Prospects, and Challenges," (Ph.D. diss., University of Southern California, December 1987), 196. Johnson emphasizes the distinctions between written and implemented doctrine.

[250]Given the extensive security classifications surrounding many aspects of military space doctrine, it is possible that comprehensive DoD military space policy or doctrine statements were issued prior to 1982 but they would have to be among the most successfully guarded secrets of the cold war.

[251]U.S. Department of Defense, "Fact Sheet: DOD Space Policy," 11 August 1982, 2. This "study was prepared in collaboration with" UDRE Dr. Richard D. DeLauer and then-CJCS General David C. Jones. As pointed out to me by Air Force Historian Cargill Hall, generally speaking, the DoD and the Air Force do not independently make "policy" for military space applications or other areas of major national security interest. Therefore, at least the titles of the DoD's military space statements in 1982 and 1987 and

in coordination with the concurrent formulation of NSDD-42 during late 1981 and early 1982 and also reflected the general renewed interest in military space applications which began in the late 1970s. Not surprisingly, according to the very brief (two page) fact sheet released on 11 August 1982, the details of the DoD space policy are apparently very similar to the publicly released portions of NSDD-42. Specifically, "the policy recognizes that since a number of military missions can be very effectively supported by space systems, future use of space should have an operational focus[.]", "directs the continued development of an operational anti-satellite (ASAT)", and "contains no new directions in space weaponry, but provides for continued research and planning."[252] Thus, this first DoD space policy statement apparently reflected and emphasized the mainstream military space thinking of the Reagan administration at this time.

The five-plus years which elapsed between the time that the first drafts of AFM 1-6 were prepared in 1977 and when the final product was finally released on 15 October 1982 provides a graphic illustration of the complexity of the many conceptual challenges and divergent bureaucratic positions with which the Air Force was struggling in its attempts to craft its first official military space doctrine manual.[253] This delay in producing AFM 1-6 meant that the manual was not available to help guide the Air Force

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the Air Force's 1988 statement are inappropriate. Mr. R. Cargill Hall, interview by author at Center for Air Force History, Bolling AFB, DC, 20 December 1993.

[252]"Fact Sheet: DoD Space Policy," 1-2.

[253]Moreover, it is far from clear that the very long review and approval process for AFM 1-6 resulted in a stronger final version of this manual. Several of the specific shortcomings of the final AFM 1-6 had been addressed in earlier versions (which were substantially longer than the final product) but these sections apparently did not survive the review process. For example, one draft version discussed the doctrinal implications of different orbit types; more clearly outlined military objectives in space; used the more clear space support, force enhancement, space defense typology to describe Air Force missions in space; and provided more detail on how to organize, train, equip, and sustain space forces than did the final version. See Department of the Air Force, Air Force Manual 1-6: Aerospace Doctrine: Military Space Doctrine, (Draft, undated; OPR: XOXID [Colonel D.R. McNabb]; approved by Major General E. N. Block, Jr.). Copy provided to author by Dana J. Johnson, 25 October 1993.

through several critical doctrinally charged issues such as early DoD STS infrastructure and employment plans, the need for a separate space command, and the debate over whether space is a mission or a place. Apparently, protracted debates over whether to consider space a separate military mission area or a place from which to conduct militarily significant missions was one of the most significant causes of delay in issuing AFM 1-6.[254] Eventually, the debate and the final version of AFM 1-6 came down very strongly on the side of space as a place. In March 1983, Major General John H. Storrie, Director of Space on the Air Staff, testified as follows concerning the doctrine in AFM 1-6:

> The bottom line of that is: space is a place; it is not a mission. We are going to continue to do those things in space that we do in the atmosphere and on the ground and on the seas.
>
> We are not going to go out and do those things in space just because the technology is there.
>
> Dr. Cooper [DARPA Director] has already said this. We are going to do them because we can do them better from space, or we can do them more cost effectively.[255]

Several portions of AFM 1-6 deserve special attention. First, it is interesting to note that in his Foreword, Air Force Chief of Staff, General Charles A. Gabriel, began simply by stating that "[s]pace is the ultimate high ground." but that he closed the Foreword by indicating that "[f]rom the battlefield to the highest orbit, *airpower* will provide that capability."[256] In its Preface, AFM 1-6 makes clear that it must be studied

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[254]Recall that the mission versus place distinction had been a major issue raised in 1977 by Colonel Sandborn in "National Military Space Doctrine" as discussed in chapter five above. Although the desire of space cadets to build the importance of military space applications through emphasis on space as a mission is understandable, to me this approach seems difficult to sustain logically without the space as a mission concept being linked specifically to some important definable current mission, e.g. space control to facilitate force enhancement.

[255]House, Defense Appropriations, 84, 475.

[256]Department of the Air Force, HQ USAF, Air Force Manual 1-6: Military Space Doctrine (Washington: GPO, 15 October 1982), ii. Emphasis added. (Hereinafter AFM 1-6). This conceptual and semantic disconnect in Gabriel's foreword is symptomatic of

in conjunction with AFM 1-1 and notes that AFM 1-6 can provide "the foundation for developing detailed operational space doctrine."[257] The Preface also emphasizes several key points regarding the scope and orientation of this space doctrine:

> This space doctrine summarizes our national space policy, executive guidance, and both civil and military interest in space. It also summarizes basic principles to be considered when developing potential space capabilities for manned and unmanned military systems. It is based on the concept that space is the outer reaches of the Air Force's operational medium -- the aerospace, which is the total expanse beyond the earth's surface. Space, then, is an operational environment that can be used for conducting Air Force missions.[258]

Finally, the Preface indicates that the space doctrine in this manual is designed to achieve space control and charters the Air Force "to provide forces for controlling space operations and gaining and maintaining space superiority. These concepts are aimed at achieving freedom of actions in space for friendly forces while denying or deterring enemy actions contrary to national interests."[259]

Chapter 1 of AFM 1-6 is entitled "National Space Policy, Executive Guidance, and Legal Constraints" and provides an excellent brief summary of the major political factors shaping U.S. military space operations. These factors go back to before the opening of the space age and have been discussed in detail throughout this study. The "Executive Guidance -- Military" section of Chapter 1 is drawn verbatim from the "National Security Space Program" section of the fact sheet on NSDD-42. Chapter 2, "Military Interests in Space," outlines five somewhat unclear and indistinct major military objectives in space including: maintaining freedom of space for friendly military and civil

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similar conceptual problems related to the insufficient development of the doctrinal implications of differences between the characteristics of space and air forces throughout the manual.

[257]Ibid., iii.

[258]Ibid.

[259]Ibid., iv. However, in On Space Warfare, Lupton indicates that he believes that "[b]ased on the emphasis on 'survivability' and the characteristics used to describe space forces, AFM 1-6 seems firmly planted in the survivability school." See note 17 on page 48.

systems; force enhancement for terrestrial forces; protection of space assets "as well as the ability to deter and neutralize identified threats to our national security[.]"; "preventing space from being used as a sanctuary for aggressive systems" by enemies; and "exploiting the potential of space to conduct operations as required to further military objectives."[260] Next, Chapter 2 lists six useful attributes of space systems: global coverage, economy, effectiveness, flexibility, efficiency, and redundancy.[261] Chapter 2 also emphasizes that survivability, endurance, and reconstitution of space systems are attributes needed "to achieve increases in warfighting potential."[262]

Chapter 3, "Air Force Functions and Missions in Space," affirms that the Air Force will: maintain its space primacy within DoD and "ensure close coordination and cooperation" as DoD liaison with NASA; "develop space systems that support national security objectives[.]"; and develop "clearly defined, presented, and understood[.]" goals for the military use of space which are based on space doctrine.[263] In developing these statements, much of the remainder of this chapter explains how the Air Force will develop and operate space forces with the attributes and capabilities "to contribute to the defense of US interests in all media."[264]

More specifically, Chapter 3 divides space activities into "support missions and tasks" and "potential warfighting missions." The former category includes force enhancement activities such as: communications; distribution of intelligence information "to reduce the time required for observation-orientation-decision-action-feedback[.]"; support for national and international rescue plans; and "space environmental and life

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[260]AFM 1-6, 5. These objectives are not further clarified.

[261]Ibid., 5-6.

[262]Ibid., 6.

[263]Ibid., 7.

[264]Ibid.

support capabilities over the full scope of aerospace functions."[265] The support missions and tasks category also include missions such as: launch services, on orbit support, command and control, support personnel, data and object recovery from space, and logistics support for all areas. The potential warfighting missions section discusses the possibility of deploying space-based weapons systems "consistent with national policy and national security objectives."[266] This section notes that space-based weapons could be used at the strategic level: "to provide target damage against widely distributed and increasing numbers of enemy counterforce and countervalue surface targets[.]"; and "to enhance the value of current weapons systems" by suppressing enemy defenses and improving the penetration effectiveness of these systems.[267] Space-based weapons could also "perform Air Force warfighting missions against targets on earth or in space[.]" and "establish space control and superiority".[268] Finally, Chapter 3 states that space systems will be used when they are consistent with national security objectives and are the best method to achieve the military objective due to one or more of the following:

> a. operational considerations, such as reliability, survivability, security, and flexibility favor the use of military space systems.
> b. The effectiveness of military space systems is attractive in comparison to alternative solutions.
> c. The combined surface and space operations have a positive effect on the national security objectives.[269]

Chapter 4 of AFM 1-6 describes Air Force plans for "Organizing, Training, Equipping and Sustaining Space Forces." This chapter starts out by noting that a development strategy for space operations requires "clearly defined objectives[.]" and that

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[265]Ibid., 8. This is an unclear and incomplete list of force enhancement capabilities from space.

[266]Ibid.

[267]Ibid., 8-9. The types of space-based weapons to be used for these potential missions are not specified.

[268]Ibid., 9.

[269]Ibid.

"[o]perational requirements must define and drive systems development."[270] This chapter also states that AFSPACECOM is likely to evolve into a unified or specified command and that the Air Force will help to "maintain US technological superiority in the aerospace and ensure a prolonged warfighting capability by developing the potential for combat operations in the space medium."[271]

Before turning to critique the Air Force's space doctrine as presented in AFMs 1-1 and 1-6, we must analyze the space-related developments in the AFM 1-1 series and examine the linkages between AFM 1-6 and AFM 1-1 because, as noted above, AFM 1-6 was specifically designed to work with the revised version of AFM 1-1 which was issued on 16 March 1984. AFM 1-1, "Basic Aerospace Doctrine of the United States Air Force," is designed to stand alone as the basic doctrine for the use of all aerospace forces at all levels of conflict as well as to provide the foundation for more specialized doctrines for specific Air Force missions and tasks such as space operations. The Air Force first published a basic doctrine manual in 1953. However, it was not until the mid-1970s that the basic doctrine manual had very much to say about Air Force space missions.[272]

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[270]Ibid., 10.

[271]Ibid.

[272]Lieutenant Colonel Charles D. Friedenstein, "The Uniqueness of Space Doctrine," Air University Review 37 (November-December 1985): 14-16. The Air Force's basic doctrine manual was revised in 1954, 1955, 1959, 1964, 1971, 1975, 1979, 1984, and 1992. Major space-related AFM 1-1 doctrinal changes not discussed in the text include: The simple substitution of "aerospace" for "air" in the 1959 revision made without examining the environmental characteristics of space forces. A major emphasis on national policy objectives as overall doctrinal constraints beginning with the 1964 revision. The first separate space emphasis in the 1975 revision which emphasized that "[t]he underlying goal of U.S. national space policy is that the medium of space must be preserved for peaceful use for the benefit of all mankind[.]" but also noted that there was "a need to insure that no other nation gains a strategic military advantage through the exploitation of the space environment." And the alignment in the 1992 revision of the "Roles and Typical Missions of Aerospace Power" with the same DoD four part typology used in the 10 March 1987 DoD Space Policy statement (control of the combat environment, force application, force enhancement, force support). Overall, however, even in the 1992 edition of AFM 1-1 there is still very little specific discussion of the doctrinal implications of the characteristics of the space environment or of the attributes

One of the major changes between the 1979 version of AFM 1-1 and the revised version issued in 1984 was "to recognize space as a medium and not as a separate mission."[273] Accordingly, "Space Operations," one of the nine USAF missions and specialized tasks discussed in the 1979 AFM 1-1, no longer appears as a separate category in the 1984 edition of AFM 1-1. The 1979 version listed three types of military space activities under the category space operations: space support, force enhancement, and space defense.[274] While the listing of only these three types of military space activities might seem unnecessarily to restrict potential space applications, this approach actually might be more useful conceptually than the 1984 revision which does not discuss space separately.[275]

By synthesizing the major Air Force space doctrine critiques in Johnson, Friedenstein, and Myers and Tockston, three major and interrelated problem areas in AFMs 1-1 and 1-6 stand out.[276] The first major difficulty with this space doctrine is

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and capabilities of space systems. For example, neither the principles of war, the tenets of aerospace power, nor the supporting essay on the tenets of aerospace power in this latest AFM 1-1 address the doctrinal implications of space operations. A more specific doctrinal discrepancy occurs in this latest version when the primary function of space systems today -- force enhancement -- is not even discussed in Essay S, "Aerospace Force Enhancement." Moreover, this essay discusses spacelift, which is a function previously placed under the space support category. See Department of the Air Force, HQ USAF, Air Force Manual 1-1: Basic Aerospace Doctrine of the United States Air Force, Vol. I and II (Washington: GPO, March 1992).

[273]AFM 1-6, 8.

[274]Johnson, "Evolution of Military Space Doctrine," 208.

[275]On the conceptual constraints imposed by the limited military space applications listed in the 1979 version of AFM 1-1 see ibid., 206-8; and Major William E. Savage, USAF, "Let Doctrine Lead the Way," in Swan, USAFA Symposium Reading Book, Vol. IV, 959-60.

[276]Johnson, "Evolution of Military Space Doctrine," 196-244; Friedenstein, "Uniqueness of Space Doctrine," 13-23; and Colonel Kenneth A. Myers, USAF and Lieutenant Colonel John G. Tockston, USAF, "Real Tenets of Military Space Doctrine," Airpower Journal 2 (Winter 1988): 54-68.

caused by the Air Force's natural emphasis in the AFM 1-1 series on the characteristics of aircraft and the air environment rather than on the characteristics of spacecraft and the space environment. Of course, this problem has its roots in the decision of Chief of Staff General Thomas D. White and the Air Force in the late 1950s to emphasize the aerospace concept of a single theater of operations above the earth's surface as discussed in chapter four above. While the advancement of the aerospace concept has a consistent internal logic and is certainly understandable from an organizational behavior standpoint, this devaluation of the environmental and operational distinctions between air and space systems has also created an intellectual blinder of sorts on the development of doctrine optimized for the space environment.[277] Unfortunately, most sections of even the recent versions of AFM 1-1 often merely seem to replace "air" with "aerospace" without carefully analyzing the doctrinal distinctions implied by these very different environments and the dissimilar characteristics and capabilities of space systems versus aircraft.[278] At the deepest level, this neglect of distinct space doctrine undoubtedly also reflects the Air Force's ongoing internal bureaucratic tensions and ambivalence concerning its desire to preserve its space primacy within DoD against the possible incursions of the other Services while at the same time protecting its primary air and missile missions against the possibility that these missions might be usurped functionally or financially by space activities.

More specifically, this critique of the impact of the aerospace concept on the development of Air Force's space doctrine centers around the lack of a basic

[277]On the negative impact of the aerospace concept on space doctrine see Friedenstein, "Uniqueness of Space Doctrine," 15, 17; Myers and Tockston, "Real Tenets of Military Space Doctrine," 55-62.

[278]Johnson, "Evolution of Military Space Doctrine," 209, indicates that the blurring of the distinctions between air and space has resulted in "a clumsy treatment of operations in both media, which further emphasizes the need to treat both independently in doctrine."

environmental doctrine in AFMs 1-; ‿ 1-6.[279] This critique refers to Drew's doctrine tree model discussed in chapter two above and emphasizes that the Air Force's space doctrine statements of the mid-1980s did not develop focused and technologically informed "compilation[s] of beliefs about the employment of military forces" in space.[280] After listing and discussing the principles of war found in AFM 1-1, Friedenstein finds that few of these principles have been adapted to account for the space environment or the characteristics and capabilities of space systems:

> Close examination of the principles of aerospace war reveals that the principles do not all fit where military space operations are concerned. The principles of the objective, economy of effort, control, logistics, and cohesion are very general in nature and do apply to space; the principles of concentration, flexibility/maneuver, and simplicity do not apply. The principles of the offense and defense do seem applicable to space but only after space technology reaches a more mature state. The principles of security, surprise, and timing and tempo apply only in a way unknown before the era of space operations.[281]

Myers and Tockston posit that three major "compromises" were made in space doctrine in order to "force fit" it into the mold of air doctrine.[282] First, they argue that, despite the "oft-posed" aerospace concept of one operational environment above the earth's surface, "[a]ctually, the space environment is readily discerned from air when a vehicle attains *orbital flight* capability outside the earth's atmosphere."[283] The authors

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[279]This point is best developed during this period in Friedenstein, "Uniqueness of Space Doctrine"; and Myers and Tockston, "Real Tenets of Military Space Doctrine."

[280]Lieutenant Colonel Dennis M. Drew, "Of Leaves and Trees: A New View of Doctrine," Air University Review 33 (January-February 1982): 44. Both Friedenstein, "Uniqueness of Space Doctrine"; and Myers and Tockston, "Real Tenets of Military Space Doctrine," begin their critique of Air Force space doctrine by referring back to Drew's doctrine tree model.

[281]Friedenstein, "Uniqueness of Space Doctrine," 21.

[282]Myers and Tockston, "Real Tenets of Military Space Doctrine," 56.

[283]Ibid., 59. Emphasis in original. The authors also state that this threshold is crossed when the aerodynamic forces of powered flight yield to a hard vacuum and a state of weightlessness where "dynamical motions are governed solely by natural forces."

find that the second major compromise comes from inappropriately attempting to attribute the three chief characteristics of air forces -- speed, range, and flexibility -- to space systems.[284] Finally, Myers and Tockston argue that the "canonical set of capabilities attributed to 'aerospace' forces in current doctrine . . ."

> are quite appropriate for air power. Some of them apply only indirectly to space forces, but others are highly inappropriate. Moreover, they are far removed from the on-line, pervasive, and timely capabilities available to military commanders from satellites.[285]

Clearly, both Friedenstein and Myers and Tockston are arguing that the Air Force must move down the ladder of abstraction in its attempts to create space doctrine and first focus on the attributes and capabilities of space forces and the characteristics of the space environment before attempting to build Air Force organizational doctrine for space. Referring again to Drew's doctrine tree model, Friedenstein argues that the Air Force was attempting to produce "leaves on a nonexistent branch[.]" in creating the organizational space doctrine found in AFM 1-6.[286] While this line of reasoning may seem somewhat esoteric, it does seem very clear that there were conceptual costs to the aerospace concept. Inappropriately applying the characteristics of the atmosphere and of airbreathing systems to the space environment and space systems led to insufficient efforts on the part of the Air Force to understand the dynamics of space operations as shaped by the unique characteristics of the space environment, the different attributes of space systems, and the potential capabilities of space systems.

A second and related major area for critique of the Air Force space doctrine

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[284]Ibid. Myers and Tockston suggest that the three chief attributes of space forces should be emplacement, pervasiveness, and timeliness.

[285]Ibid., 61. The authors argue that force capabilities are the product of the environment times the force characteristics. Instead of the list of the capabilities of aerospace forces found in AFM 1-1 (responsive, mobile, survivable, presence, firepower, and observation), they recommend and describe the following list of capabilities for space forces: access, linkage, high ground, elusive, information, and unimpeded force. Pages 61-62.

[286]Friedenstein, "Uniqueness of Space Doctrine," 22.

released in the mid-1980s finds that these space doctrine statements are too constrained and unimaginative.[287] In particular, the constrained and unclear doctrinal guidance in AFM 1-6 is singled out for critique. The individuals making this critique are not arguing that U.S. military space doctrine should or will be freed from the constraints imposed by political and policy considerations. Rather, they argue that the unique military potential of space could be studied more directly, accurately, and productively via an unencumbered environmental-level space doctrine developed below the level of these inevitable constraints. Lorenzini provides four basic reasons why the military should develop an unencumbered doctrine for space: political and policy guidance are already provided by other sources; military space doctrine statements are likely to be the only place where such unencumbered space doctrine is developed; unencumbered space doctrine can provide continuity as a "repository for tried and proven principles;" and national leaders need to be provided a complete picture of what is militarily possible in space in order more accurately to make tradeoffs and weigh opportunity costs when developing national space policy.[288] Friedenstein extends this reasoning by arguing that it would not be helpful to constrain military space doctrine at this early stage in its development:

> air doctrine had decades to mature before this restriction [1964]. Space doctrine is still in its infancy. It is one thing to know the best way to conduct military operations and still work under constraints in an implementation strategy. (There are always real-world restrictions: civilian policy is but one of them.) But it is a risky matter to allow outside influences to hinder the formulation of basic

[287]Lieutenant Colonel Dino A. Lorenzini, USAF, "Military Space Doctrine Considerations," in Swan, USAFA Symposium Reading Book, Vol. I, 169-79; Lorenzini, "Space Power Doctrine," Air University Review 33 (July-August 1982): 16-21; Johnson, "Evolution of Military Space Doctrine," 220-22; and Friedenstein, "Uniqueness of Space Doctrine," 16.

[288]Lorenzini, "Space Power Doctrine," 17. Recall also Holley's closing admonition at the Air Force Academy Military Space Doctrine Symposium: "we must not delay our effort to *conceptualize* the eventual combat role of spacecraft even if current treaty obligations defer the actual development of hardware." Quoted in Viotti, USAFA Symposium Final Report, 55. Emphasis in original.

military truths.[289]

Cumulatively, these critiques convincingly make the point that the constrained space doctrine in AFM 1-6 was less useful conceptually than an unencumbered doctrine would have been and that the constrained approach was inappropriate for this stage of doctrine development.

Finally, several commentators also argue that, regardless of its other alleged conceptual weaknesses, AFM 1-6 simply fails a basic test of any doctrine: it does not provide very clear or consistent guidance on what the Air Force should do in space or how it is to proceed in attempting to achieve those goals.[290] AFM 1-6 does not clearly spell out military objectives in space or even completely list current military space support missions and tasks. Moreover, this lack of clear military objectives or tasks in space leads to confusion regarding the prioritization or importance of the divergent space support missions and tasks versus the potential warfighting missions listed in chapter 3 of AFM 1-6. Finally, chapter 4 of AFM 1-6 provides very little basic or specific guidance on how U.S. space forces should be organized, trained, equipped, or sustained for space operations.[291] Cumulatively, these basic doctrinal weaknesses in AFM 1-6 are well illustrated by applying the eight doctrine evaluation criteria developed by Johnson to this space doctrine. At best, AFM 1-6 meets perhaps half of Johnson's doctrine evaluation criteria.[292] Unfortunately, AFM 1-6 was not the clear and strong doctrinal

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[289]Friedenstein, "Uniqueness of Space Doctrine," 16. Of course, this line of reasoning begs the chicken-and-egg question of how to arrive at these basic military truths about the best way to conduct space operations without first developing and operating the type of space weapons which might be constrained by politics or policy.

[290]Johnson, "Evolution of Military Space Doctrine," 217-40.

[291]Ibid., 229-31.

[292]Ibid., 231-40. According to Johnson's analysis of AFM 1-6 using her doctrine evaluation criteria, the space doctrine in AFM 1-6: does not very clearly identify military space objectives; establishes only vague priorities for development and employment of space systems; has played only a limited role as a frame of reference for testing, evaluation, and employment of new concepts due to its limited acceptance by the whole Air Force; does not address the basic principles of war; is well integrated with U.S.

statement which many expected and the Air Force needed at this time.

As discussed in the sections above, numerous fundamental changes and shifts in U.S. space policy took place during the period between the publishing of AFM 1-6 in October 1982 and the release the updated DoD Space Policy on 10 March 1987. The most significant of these changes included the SDI; the changed launch strategy following the *Challenger* disaster; the MHV ASAT testing and restrictions; and the creation of the unified, naval, and army space commands.[293] The doctrinal impact of these fundamental changes is a primary focus of the new DoD Space Policy. Moreover, this period also witnessed the first emergence of joint, Navy, Army, and SDI requirements for space doctrine.[294] While these broader requirements for military space doctrine clearly emerged at this time, almost none of them had been developed, synthesized, or approved as official statements of miliary space doctrine by the end of this period.[295] Thus, these

political and national security objectives but is insufficiently innovative in exploring the range of military options available in space; may or may not be flexible depending upon how it is applied; may or may not be consistent with available resources depending upon how it is applied; and does not appear to be clearly understood or accepted by the whole Air Force.

[293]Officially, the Army Space Agency was established on 1 August 1986 and this agency was not established as a command within USSPACECOM until 7 April 1988. Mitchell, Chronology of Army Exploitation of Space, 113.

[294]Johnson, "Evolution of Military Space Doctrine," 245-84, covers these emerging joint, Army, Navy, and SDI space doctrine requirements in considerable detail. Accordingly, she discusses the quite limited space doctrine content of publications such as the 1 December 1986 JCS Publication 2: Unified Action Armed Forces (UAAF); the Army's AirLand Battle doctrine contained in the 5 May 1986 version of Field Manual 100-5: Operations; Naval doctrine statements in support of the Maritime Strategy; and SDI doctrinal requirements derived from the SDIO's annual Report to the Congress and other policy statements.

[295]One of the major differences of opinion which became public knowledge during the end of this period was over how best to achieve assured mission capability. This debate was primarily between the Air Force and the Navy over the development of small, single-purpose, and inexpensive satellites (generally known as Lightsats) which could be launched during the course of hostilities more easily than current satellite types. The Air Force fought very hard against this concept which threatened to undercut its status as the

broader military space doctrine requirements were not adequately addressed by the latest version of DoD Space Policy or covered by other space doctrine statements before the end of the cold war.

The classified version of the latest edition of DoD Space Policy was completed on 4 February 1987 and an unclassified version was released on 10 March. The major headings on this five page release are "Scope and Purpose, Background, DoD Space Goals, General Policy, Space Support Policy, Force Enhancement Policy, Space Control Policy, and Force Application Policy."[296] The major points in each of these headings is discussed below.

Under the "Scope and Purpose" heading the space policy statement indicates that it "applies to all space-related activities of the Department."[297] It is to guide all space-related DoD activities and "serve as an input to the formulation of national space policy."[298] The "Background" section briefly discusses the major developments and changes in U.S. space policy since 1982 and emphasizes that the Soviet Union "continues its major national commitment to the military exploitation of space[.]" and concludes that

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single manager for space within DoD (many Lightsat concepts called for the ability to launch these satellites from sea-based platforms). See, for example, the disparaging remarks about "Cheapsats" by Secretary Aldridge in United States Space Foundation, Fourth National Space Symposium Proceedings Report: Space Challenge '88 (Colorado Springs: United States Space Foundation, 1988), 119-20. However, during this same time a blue-ribbon panel was making recommendations that "[t]he U.S. should support efforts to develop low-cost satellites and mobile launchers." Commission on Integrated Long-Term Strategy, Working Group on Technology, Recommended Changes in U.S. military Space Policies and Programs (Washington: Department of Defense, October 1988), 7.

[296]U.S. Department of Defense, "Department of Defense Space Policy (Unclassified)," Washington, 10 March 1987, 1-5. (Hereinafter "DoD Space Policy, 87"). Again, the use of the term "policy" is probably inappropriate in this document, see Johnson, "Evolution of Military Space Doctrine," 288-89; and Hall interview, 1993.

[297]"DoD Space Policy, 87," 1.

[298]Ibid.

"[t]he Soviet space efforts aim at Soviet dominance of space."[299] The three "DoD Space Goals" listed are very general and indicate that DoD space efforts will contribute to "deterrence, or if necessary, defense"; assure that hostile forces "cannot prevent our own use of space; and enhancing operations of U.S. and Allied forces by space systems."[300]

The "General Policy" section contains the first detailed guidance in this space policy statement. First, in keeping with longstanding DoD policy, "[s]pace is recognized as being a medium within which the conduct of military operations in support of our national security can take place, just as on land, at sea, and in the atmosphere," rather than being conceptualized as a part of the indivisible aerospace operating environment as defined by the Air Force since the late 1950s.[301] This definitional distinction not only has the significant doctrinal implications discussed above but also indicates that the Air Force had made little headway in convincing the rest of DoD on the validity of its aerospace concept. Another major portion of this section indicates that DoD "supports the potential use of" and "will actively explore roles for military man-in-space focusing on unique or cost effective contributions to operational missions."[302] The remainder of this section deals straightforwardly with other major space policy topics such as "research and technology, contingency response, arms control, acquisitions and operations, space debris, security, cooperation with other sectors, and public affairs."[303]

The "Space Support Policy" section defines space support as the functions "required to deploy and maintain military equipment and personnel in space. They include activities such as launching and deploying vehicles, maintaining and sustaining space vehicles while on orbit, and recovering vehicles if required."[304] The major

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[299]Ibid.

[300]Ibid., 1-2.

[301]Ibid., 2.

[302]Ibid.

[303]Ibid., 2-3.

[304]Ibid., 3.

portion of this section indicates that DoD will develop and maintain an "Assured Mission Capability" defined as the ability "to execute space missions regardless of failures of single elements of the space support infrastructure."[305] This space policy statement also indicated that DoD would develop and maintain this assured mission capability "through robust satellite control, assured access to space, and on-orbit sparing, proliferation or other means as appropriate."[306] Thus, assured mission capability was clearly a far more comprehensive and operationally meaningful concept than the assured access to space concept which had been so emphasized following the *Challenger* disaster. It also marked a subtle shift away from the space developer and operator mindset prevalent within the Air Force and Air Force space doctrine towards the space user outlook favored by DoD and the other Services.

The remaining sections in this space policy statement are very short. The "Force Enhancement Policy" section defined this mission as "those space-related support operations conducted to improve the effectiveness of both terrestrial- and space-based forces. Force enhancement includes such capabilities as communications, navigation, and surveillance."[307] This section also indicated that DoD would develop contingency plans for using civil, commercial, or allied space systems to augment U.S. military space force

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[305]Ibid.

[306]Ibid. Robust satellite control was further described as programs which might "include autonomous satellite operations, survivable command links, and internetting of space operations control centers into an architecture employing interoperability and mobility to enhance survivability." Assured access to space was to be achieved via "a mix of both manned and unmanned systems balanced to support national security mission needs best. Unmanned vehicles will be the primary launch vehicles for national security payloads not requiring a manned presence in space. DoD will control all phases of military space launch missions." Additionally, the concept of "distributed access" called for critical payloads to be capable of launch by more than one system and from more than one launch site while critical payloads with "similar or overlapping primary mission capabilities," "should be launched on different launch systems when possible." Finally, this DoD space policy was designed to bolster the U.S. commercial space launch industry by facilitating "commercial launches on a non-interference basis." Ibid., 4.

[307]Ibid., 4.

enhancement capability requirements. It is noteworthy that the most important current military space mission received so little emphasis in this unclassified policy statement but this probably reflects the non-controversial nature of this mission.

The "Space Control Policy" section defined these missions as "operations that ensure freedom of action in space for friendly forces while limiting or denying enemy freedom of action when so directed by the National Command Authority. They include satellite negation and satellite protection."[308] This section built upon earlier requirements for space surveillance and monitoring by indicating that "complementary terrestrial- and space-based systems[.]" would be required to achieve this capability.[309] This section also indicated that "DoD will develop and deploy a robust and comprehensive anti-satellite capability with programs as required and with initial operating capability at the earliest possible date."[310] Finally, this section indicated that DoD would provide for "Space System Protection" by developing and operating systems "which balance capability and survivability to deter attacks by creating a dilemma for adversary attack planners by responding to these attacks with both space and terrestrial force options."[311] Unfortunately, there is no discussion in this unclassified policy statement on how DoD would seek actually to achieve these comprehensive space control capabilities in light of the significant ongoing DoD budget cutbacks and the continuing ASAT funding and testing restrictions imposed by Congress.

The final section, "Force Application Policy," is the shortest section in this policy statement. It reads:

> Force application functions consist of combat operations conducted from space.
>
> Consistent with treaty agreements and national policy, DoD will conduct research on, plan for, and develop, to the point of readiness for use, the space

[308]Ibid., 5.

[309]Ibid.

[310]Ibid.

[311]Ibid.

technologies which may permit a defense against ballistic missiles.[312]

Thus, this policy statement is strongly linked to the ongoing SDI efforts. It is interesting that the many other potential combat operations conducted from space are not even mentioned in this unclassified policy statement. This omission of any other potential space force application missions as well as the placement of the force application section beneath the space control section are both indicative of the strong conceptual impact of SDI on broader space doctrine at this time. As important as space-based systems for ballistic missile defense may be, conceptually, this mission is only one potential force application mission from space. Likewise, building a substantial force application infrastructure in space cannot be considered apart from the space control capabilities required to protect and sustain such an infrastructure; indeed, the space control requirement would seem to be logically prior to the creation of a substantial space-based force application infrastructure. Thus, the force application section in the 1987 DoD Space Policy seems to represent another instance where the SDI tended to obscure other potential force application missions from space.

The final major military space doctrine statement of this period was issued by the Air Force on 2 December 1988. This final Air Force space doctrine statement followed the completion of an intensive Air Force review of space operations which "concluded that space operations can have a decisive influence on future terrestrial conflict."[313] Rather than waiting for the process of incorporating the findings from this review into formal doctrine manuals, the Chief of Staff and Secretary of the Air Force apparently felt that these findings were important enough to be disseminated rapidly via a memorandum to all USAF Major Commands and Separate Operating Agencies. Moreover, this memorandum calls for the Air Force to "make a corporate commitment to integrate

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[312]Ibid.

[313]General Larry D. Welch and Secretary E. C. Aldridge, Jr., "MEMORANDUM FOR ALMAJCOM-SOA, SUBJECT: Air Force Space Policy -- INFORMATION MEMORANDUM," Department of the Air Force, HQ USAF, 2 December 1988, 1. (Hereinafter "Air Force Space Policy, 88").

spacepower throughout the full spectrum of Air Force capabilities. The attached policy lays the groundwork, but your cooperation and commitment are essential to the success of this effort."[314]

The policy statement itself is only two pages long. It is most noteworthy for its tenor of very strong military space support and its alignment of Air Force space roles with the four part typology in the 10 March 1987 DoD Space Policy statement. The policy statement first lists three "tenets of Air Force space policy:"

> Spacepower will be as decisive in future combat as airpower is today.
>
> We must be prepared for the evolution of spacepower from combat support to the full spectrum of military capabilities.
>
> The Air Force will make a solid corporate commitment to integrate space throughout the Air Force.[315]

The policy statement next indicates that the "Air Force envisions a role in space that encompasses the following:

> a. SPACE CONTROL. The Air Force will acquire and operate anti-satellite capabilities. The Air Force will provide battle management/C^3 for US space control operations, and will perform the integration of ASAT and surveillance capabilities developed for space control operations. When technology permits cost-effective deployment, the Air Force will acquire and operate space-based anti-satellite capabilities.
>
> b. FORCE APPLICATION. Should a BMD deployment decision be made, the Air Force will acquire and operate space-based ballistic missile defense assets, will provide battle management/C^3 for BMD and will integrate BMD forces. The Air Force will acquire and operate space-based weapons when they become a feasible and necessary element of our force structure.
>
> c. FORCE ENHANCEMENT. The Air Force will continue to acquire and operate space-based systems for navigation, meteorology, tactical warning and attack assessment, NUDET detection, and multi-user communications. The Air Force will continue to support the multi-service approach to conducting space surveillance and for providing mission-unique, space-based communications. The Air Force will acquire and operate a space-based wide area surveillance, tracking and targeting capability and will provide space-based means for space surveillance.
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> d. SPACE SUPPORT. The Air Force will continue its long-standing role as the

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[314]Ibid., 1.

[315]Ibid., 2.

provider of launch and common-user, on-orbit support for the Department of Defense.[316]

The policy statement indicates that "the Air Force must achieve assured mission capability" in accomplishing the space roles listed above.[317] Moreover, the policy statement calls on the Air Force to "increase the understanding of and involvement in space issues at all levels, and take actions to institutionalize space within the Air Force. To facilitate the process the following steps are underway:

> a. Rewrite Air Force doctrine to integrate space operations into the basic missions and tasks of the Air Force.
> b. Reorganize the Air Staff to normalize space responsibilities within the planning, programming, budgeting and acquisition and support processes.
> c. Change personnel management procedures to expand space expertise throughout the Air Force, and other operational expertise within Air Force Space Command.
> d. Encourage all MAJCOMs to routinely consider space-based means of accomplishing traditional missions. Each Air Component Command should establish itself as the center of space expertise within its supported Unified Command.
> e. Consolidate space system requirements, advocacy, and operations, exclusive of developmental and, for the near term, launch systems, in Air Force Space Command.[318]

The policy statement concluded that:

> Based on its heritage, expertise and infrastructure the Air Force remains uniquely capable of conducting DoD space activities. Just as we have in the past been the major provider of air forces for this nation's defense, the Air Force will in the future be the major provider of space forces for this nation's defense. It is the responsibility of each Air Force member to make this goal a reality.[319]

Clearly, this succinct policy statement represents a significant evolution of Air Force thinking about space which addresses many of the doctrinal weaknesses in AFMs 1-1 and 1-6 identified above. First, while this short statement did not define or assess

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[316]Ibid.

[317]Ibid., 3.

[318]Ibid. On 1 October 1990, AFSPACECOM began to take over responsibility for space launch from AFSC.

[319]Ibid.

the doctrinal implications of the space environment, space system attributes, or space system capabilities; it is highly significant that the term "aerospace" is not used once in the document. This policy statement is clearly responsive to the definition of space in the 10 March 1987 DoD Space Policy, focuses directly on space throughout, and does not begin to make the case that air and space should be considered as one indivisible operational medium. Second, the tone of this policy would seem to go a long way towards satisfying the critics of the constrained approach of AFM 1-6. The single tenet that "spacepower will be as decisive in future combat as airpower is today" implies a great deal since a long standing and central doctrinal tenet of the Air Force has held that airpower is *the* decisive form of combat power. Third, this statement provides guidance concerning broad space mission categories as well as on specific space systems. For example, the statement correctly places the space control mission at the top of the space mission hierarchy and emphasizes Air Force interest in acquiring space-based ASAT capabilities, a space control capability seldom previously mentioned in unclassified sources. Other important space system capabilities called for include: space-based weapons not associated with BMD; a space-based wide area surveillance, tracking and targeting capability; and space-based space surveillance. Finally, unlike the earlier Air Force space doctrine statements, this statement outlines a wide range of significant initiatives designed to build the Air Force's doctrinal and organizational commitment to space.

Several other aspects of this policy statement are also noteworthy. The statement's arms-length treatment ("should a BMD deployment decision be made") rather than advocacy of BMD deployment is indicative of the Air Force's generally reserved approach towards SDI. Given all of the Air Force preparation and infrastructure for DoD STS missions and the general support for military man-in-space in the 1987 DoD Space Policy, it is very interesting that this statement says nothing about military man-in-space. The statement also says nothing about the Air Force position on the various intense launch vehicle controversies of this period. Finally, this statement can also be viewed in organizational behavior terms as a strong defense of the current Air Force space role within DoD and as an attempt to build upon this role in the future.[320]

Of course, this 2 December 1988 Air Force Space Policy left unresolved many significant and complex issues related to the continuing evolution of Air Force and DoD military space doctrine. Moreover, it was (and is) unclear exactly how far and how fast the Air Force and DoD would move in response to this last major space doctrine statement of the cold war era. Thus, while the December 1988 policy statement represents a clear improvement over the somewhat muddled Air Force space doctrine statements of the mid-1980s, the growing disparity between the fairly unconstrained doctrine indicated in this statement and the very limited actual hardware or national policy steps towards implementing this doctrine poses the looming problem of a significant gap between policy and capabilities with all of its attendant conceptual difficulties.

<u>Air University Review and Air Force Magazine Positions</u>

The type and number of space-related articles in Air University Review (<u>AUR</u>) during this period provides another excellen[illegible] with the previous period. During this period [illegible] R and [illegible] <u>urnal</u> p[illegible] ral excellent articles specifically on space doctrine such as those discus[illegible] These articles on space doctrine and

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[320]This defense of the Air Force's bureaucratic space position within DoD is made more explicitly in Secretary Aldridge's memorandum to the Secretary of Defense explaining the Air Force Space Policy statement. In his memo to Secretary Frank C. Carlucci, Aldridge indicates that the growing military importance of space has caused the other services to become more interested and involved in space matters. Nonetheless, Aldridge argued that "the single manager concept is valid and should continue to be applied to many of the DoD's space activities in the interests of efficiency and joint operational effectiveness." He particularly emphasizes Air Force expertise in "space launch and common-user on-orbit" support when indicating that the Air Force is "uniquely suited" to continue to serve as the DoD single manager for these areas. Aldridge also argued for keeping the Air Force as single manager for multi-user programs such as GPS, DMSP, and Milstar. See E. C. Aldridge, Jr., "MEMORANDUM FOR SECRETARY OF DEFENSE, SUBJECT: The Air Force Role in Space -- INFORMATION MEMORANDUM," Department of the Air Force, Office of the Secretary, 7 December 1988, 1-2.

[321]In Summer 1987, <u>AUR</u> changed its title to <u>Airpower Journal</u> and reverted to a quarterly publication schedule from a bimonthly publication schedule.

several other articles reflect a growing sophistication in treatment of space issues within these publications and illustrate the divergent opinions on military space issues within the Air Force. However, it is perhaps more interesting to emphasize what is not present in these journals during this period: there are virtually no articles which strongly advocate Air Force backing for SDI, the STS, or general military man-in-space missions. Moreover, during this period, these journals steered away from the doctrinal questions swirling around the need for a separate space command or a unified space command. More generally, they were reactive rather than proactive in relation to every major space-related issue of this period with the important exception of the space doctrine area. The examples below help to illustrate the general space-related tenor of these journals in greater detail.

The first major space-related article during this period is a very interesting piece by Representative Cecil Heftel (D.-HI).[322] Heftel's basic point is that the Air Force should vigorously pursue space exploration as a conceptual avenue to reach beyond its narrow and unimaginative role in nuclear deterrence. Heftel is sympathetic with young Air Force pilots who rapidly become very uninspired with the primary Air Force missions. He indicates that "at the heart of the Air Force is the longing to *fly*, higher and ever higher, to chart the stars. It is one of humanity's oldest and noblest impulses. The Air Force should not be charged with burying it."[323] Accordingly, Heftel offers four specific recommendations:

> 1. There should be a renewed commitment at the executive level and in Congress to an expanded space program.
> 2. The heart of our space program should be manned space flight, and the Air Force should be accorded primary responsibility in that area.
> 3. The Air Force should lend its influence, and, more important, its ingenuity and expertise, to the efforts now underway to reach an agreement halting the trend towards an arms race in outer space.
> 4. The United States government should initiate talks with the Soviet Union and

[322]The Honorable Cecil Heftel, "A Space Policy for the 1980s -- And Beyond," AUR 32 (November-December 1980): 2-16.

[323]Ibid., 10. Emphasis in original.

other interested nations with a view towards a major new international effort in deep space, with the Air Force acting as lead operational agency for this country.[324]

Heftel's article provides one of the best examples of how space developments and improving space technology provide a Rorschach test of sorts for the viewer of these developments and open weighty questions concerning the ultimate ends of these developments. It is also very interesting that the AUR editors chose an article with such an imaginative and unconventional space-related theme.[325] While Heftel's basic theme and specific recommendations are certainly representative of certain aspects of Air Force aspirations in space, it is also clear that mainstream Air Force thinking about space was generally moving in nearly the exact opposite direction during the early 1980s.

These opposite perspectives on space were soon provided by AUR in the July-August 1982 edition. The Lorenzini article, "Space Power Doctrine," appears in this issue.[326] Apart from the specific doctrinal prescriptions from this article discussed in the section above, Lorenzini also clearly indicates his belief that the strategic importance of space is rapidly growing and that the U.S. must quickly prepare for the security implications of these developments. Lorenzini even suggests that DEW battle stations of the type being described by the Clarence Robinson series in Aviation Week & Space Technology hold "the potential for freezing other nations out of the high ground of space, thus achieving total military dominance."[327] In light of his belief in high ground potential such as this, Lorenzini issued his urgent calls for developing unconstrained military space doctrine. A second high ground outlook on space is provided by Ronald

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[324]Ibid., 10-14. These four points were completely italicized in the original.

[325]Of course, the editors also would have great incentive for publishing unsolicited articles from Congressmen.

[326]Lieutenant Colonel Dino A. Lorenzini, "Space Power Doctrine," AUR 33 (July-August 1982): 16-21.

[327]Ibid., 21.

Humble in the "in my opinion" section of this issue.[328] Humble reviews the most important strategic positions in "the tactical space environment" of the earth-moon system as well as the recent technological developments related to space-based weaponry. Like Lorenzini, Humble concludes that the U.S. must carefully consider and be prepared rapidly to use the strategic military potential of space. Humble offers few specific recommendations in his short article but his tone is clearly among the most strongly supportive of the high ground school of articles published in AUR.

In contrast with these strident high ground articles, Air Force Chief of Staff, General Charles A. Gabriel's review of Air Force plans and programs in early 1984 did not provide any Air Force support for SDI and mentioned space only very briefly at the end of the article.[329] Noting that the creation of AFSPACECOM and the Space Technology Center reflected the Air Force's commitment to space, Gabriel also briefly looked at future Air Force challenges in space:

> Among those challenges is the need to maintain the freedom of space and prevent its use by our enemies as a sanctuary for aggressive systems. In the years ahead, we will be upgrading our space surveillance capability and improving on recent advances in weather predicting and communications. The next quarter century will produce many more exciting advances in space technology, and the Air Force will continue its effort to capitalize on the efficiencies and advantages of space operations.[330]

This quite restrained support for space from the Chief of Staff is a telling reminder of the airpower focus of the Air Force and of the fact that many top Air Force leaders did not and do not identify with the tenet from the 1988 Air Force Space Policy that "spacepower

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[328]Ronald D. Humble, "Space Warfare in Perspective," AUR 33 (July-August 1982): 81-86.

[329]General Charles A. Gabriel, "The Air Force: Where We Are and Where We're Heading," AUR 35 (January-February 1984): 2-10. Between these two articles, AUR published a piece by Major General I.B. Holley, Jr., Air Force Reserve (Retired), which was based upon and very similar to his presentation at the Military Space Doctrine Symposium at the Air Force Academy in April 1981. See "Of Saber Charges, Escort Fighters, and Spacecraft: The Search for Doctrine," AUR 34 (September-October 1983): 2-11.

[330]Ibid., 10.

will be as decisive in future conflict as airpower is today."

The November-December 1985 issue of AUR was not entirely devoted to space issues but it did contain several major articles on space. In addition to Friedenstein's important article on "The Uniqueness of Space Doctrine" discussed in the section above, there were four other major articles on space in this issue.[331] The first of these, "Military Uses for Space," by Major General Thomas C. Brandt provided an historical review of military activities in space to emphasize that, contrary to popular current discussions, space had been militarized long before the MHV ASAT or SDI.[332] Brandt also indicated that while "U.S. planners generally viewed space as a sanctuary" the Soviets "see space as geopolitical high ground."[333] Brandt does briefly mention the SDI and the potential of space-based BMD, but, overall, he provides few insights or recommendations for future military space activities. The second major article, "The Air Force and Its Military Role in Space," by Major General Robert A. Rosenberg made more specific points and recommendations.[334] Rosenberg's article emphasized three major points: the need for the Air Force to help explain to the American public the military significance of current military space systems, the need to emphasize to the American public the link between space and technological progress, and the need to carefully consider how best to organize and employ space assets.[335] Rosenberg emphasized that the technologies involved with BMD were maturing fast and provided a strong endorsement (by Air Force standards) for the SDI by listing several famous

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[331] Lieutenant Colonel Charles D. Friedenstein, "The Uniqueness of Space Doctrine," AUR 37 (November-December 1985): 13-23.

[332] Major General Thomas C. Brandt, "Military Uses for Space," AUR 37 (November-December 1985): 40-51.

[333] Ibid., 45.

[334] Major General Robert A. Rosenberg, "The Air Force and Its Military Role in Space," AUR 37 (November-December 1985): 52-57.

[335] Ibid., 52.

examples of erroneous expert opinion.[336] Finally, in his recommendations on organizations, Rosenberg called for a "single manager" to optimize the use of various current space systems and provide a single operational chain of command running through the Secretary of Defense to the JCS and then to the systems operators.[337] He also argues that the newly created USSPACECOM should have "two missions: operational space activities and strategic aerospace defense."[338]

The final two major articles in this issue by Drs. Robert M. Bowman and Colin S. Gray detail the arguments for and against space-related arms control. Bowman is strongly opposed to every strategic initiative of the Reagan administration. His article emphasizes the destabilizing impact of space-based weaponry or ASAT systems and notes that a nuclear freeze might actually stimulate competition in these areas.[339] Bowman attempts to describe and base his recommendations upon the larger strategic picture -- a situation in which he sees great danger as the U.S. moves towards some type of BMD under the SDI program, develops elements of a first strike nuclear capability with the MX, D-5, and Pershing II systems, and at the same time is pursuing a potent ASAT capability with the MHV system. Bowman argues that when combined these capabilities "are devastating and are very likely to destroy our security by bringing on a war which neither we nor the Soviets want".[340] Accordingly, Bowman argues that "it is probably no longer possible to deal with either ASATs or BMD alone."[341] A large portion of Bowman's article attempts to highlight the many severe technical and political problems

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[336]Ibid., 55.

[337]Ibid., 57.

[338]Ibid.

[339]Dr. Robert M. Bowman, "Arms Control in Space: Preserving Critical Strategic Space Systems Without Weapons in Space," AUR 37 (November-December 1985): 58-72.

[340]Ibid., 63.

[341]Ibid., 65.

facing any BMD system. He concludes by stating that an ASAT "testing moratorium *can* be verified[.]" and urges this as the best first step that the Reagan administration could take.[342]

Gray also argues that the U.S. cannot and should not view the strategic situation is space apart from the strategic situation on earth but he clearly sees the strategic situation very differently than Bowman and is "profoundly skeptical of the likely practical value of the arms control process to help fashion a military space environment conducive to the best interests of the United States."[343] Gray starts by presenting what he sees as four "noncontroversial 'enduring truths' about arms control:" progress in arms control reflects the quality of political relations, "the arms control paradox," the historical record "that arms control regimes have been either essentially trivial or harmful in their effects on international security[.]", and that western democracies have proven to be particularly inept at managing the arms control process since the 1920s.[344] According to Gray, keeping weapons out of space has become the "first priority of business[.]" for the American arms control culture.[345] Gray also emphasizes that ASAT arms control is the stalking horse for the larger and more important SDI arms control battles to come. Thus, Gray's discussion of the arguments for and against ASAT arms control are subsumed

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[342]Ibid., 72. Emphasis in original.

[343]Dr. Colin S. Gray, "Space Arms Control: A Skeptical View," AUR 37 (November-December 1985): 73-86. Quote from 74.

[344]Ibid., 75. The arms control paradox indicates that arms control works best when it is needed least and vice versa. Further, Gray finds that these general problems with arms control are exacerbated by the Soviet propensity to at least push the limits if not cheat on arms control agreements, the technical difficulty in identifying and monitoring potential ASAT systems, the large military impact which even a few ASAT weapons might have, and U.S. verification problems as illustrated by its response to the Krasnoyarsk LPAR. Despite these formidable difficulties, Gray finds that there is an "arms control culture" in the U.S. Of course, members of this arms control culture such as Bowman would not find Gray's truths about arms control to be self evident or noncontroversial.

[345]Ibid., 77. This includes both space-based BMD and ASAT.

within the larger context of the debates over the SDI and the ABMT.[346]

Overall, other than the Friedenstein and Gray articles, the space-related articles in this issue are fairly innocuous and conceptually limited. The Friedenstein and Gray articles also are by far the most serious and scholarly and are the only ones to include extensive footnotes. It is doubtful whether the Brandt or Rosenberg articles would have been published if their authors had not been General Officers. It is also very telling that there are no articles on the general strategic implications of space-based weaponry or which specifically support SDI. The support for these concepts comes indirectly and mainly from Gray, a civilian. Finally, it is also very interesting that the professional journal of the Service responsible for developing and operating both the MHV ASAT and the space-based portions of a BMD system would provide so much respectful attention to a major opponent of these developments.

USCINCSPACE General Robert T. Herres provides some very interesting insights into the space bureaucracy mindset of USSPACECOM and the Air Force in his article "The Future of Military Space Forces," published early in 1987.[347] Herres's primary objective is to demonstrate that there is no need for a fourth military department -- a Department of Space -- within DoD. He offers four primary reasons why such a new department is not needed: because the intentionally imprecise demarcation between air and space would make it very difficult to attempt to divide operational responsibilities between these areas, the aerospace structure already "is largely provided by the Air

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[346]Gray discusses and finds major flaws in four major arguments for ASAT arms control: ASAT is a technology push initiative which can be stopped politically, the U.S. is more dependent upon space than the Soviets, ASATs would be destabilizing by threatening important warning and communications satellites, and ASAT is only the tip of the SDI iceberg. He also discusses five arguments in favor of ASAT arms control: ASAT arms control cannot usefully "bound the threat" to U.S. space systems, great verification problems would be present, the potential gains from Soviet cheating are great, the U.S. does not want to allow Soviet space-based targeting systems a sanctuary, and ASAT arms control would stifle SDI efforts. See pages 78-82.

[347]General Robert T. Herres, "The Future of Space Forces," AUR 38 (January-March 1987): 40-47.

Force[.]", "[t]he Air Force recognizes that much of its future is in space[.]", and suggestions to create a Department of Space fail to appreciate how the DoD is structured and operates.[348] Under this final point, Herres emphasizes that it is the DoD's unified and specified command structure rather than the Services which "is the *only* legal structure for the employment of forces."[349] Finally, Herres explains USSPACECOM's missions and notes that even if there were a Department of Space, the forces of this new Department would still be employed through USSPACECOM.[350]

While Herres makes these points convincingly, he is late in making these arguments and mostly is kicking a strawman which was already down. The most intense debates about the need for a separate space force came in the early 1980s, before the creation of AFSPACECOM, SDI, and USSPACECOM.[351] Moreover, despite convincingly making the narrow case against a new Department within DoD, by choosing to use this important forum to make these arguments but virtually ignoring military space advocacy at this time, Herres actually undercuts his own case in broad and significant ways. This article is Herres's only contribution to AUR as USCINCSPACE and one of his few major publications during his tenure as the first commander of USSPACECOM but instead of using this opportunity to bolster the case for SDI, aid the beleaguered

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[348]Ibid., 42-44.

[349]Ibid., 44. Emphasis in original. Herres also notes that the Goldwater-Nichols Defense Reorganization Act of 1986 significantly strengthened the power of the unified and specified commanders.

[350]Ibid., 46.

[351]For example, Representative Kramer's bill to change the name of the Air Force to the Aerospace Force was introduced in December 1981. Moreover, Kramer and most other Congressional space enthusiasts were more interested in prodding the Air Force and DoD into taking the space mission more seriously than in actually creating a new space force. The establishment of AFSPACECOM and USSPACECOM went a long way towards indicating to Congress the serious intent of the Air Force and DoD in this area and in stifling calls for a separate space service. Likewise, the creation of SDIO also removed considerable steam from the arguments of those who believed that a separate space force was needed to develop and employ space-based weaponry.

MHV ASAT program, or make the case for space-based acquisition and targeting systems he is busy defending the Air Force's space record against passe arguments which had been largely overtaken by organizational developments.[352] Thus, despite the creation of AFSPACECOM and USSPACECOM, Herres's article could be used as evidence that space forces were still not receiving the type of advocacy which a separate space force would provide.

The Myers and Tockston article was discussed in detail in the space doctrine section above.[353] The strong attack on the doctrinal implications of the aerospace concept within this article is probably the strongest objection to this concept in an Air Force publication during the cold war. The Myers and Tockston article along with the Friedenstein piece represent the best and most strident critiques of Air Force space doctrine published during the cold war. AUR and Airpower deserve credit for bringing these strong critiques of Air Force space doctrine to a wide audience within the Air Force.

In the 1989 article, "US Space Doctrine: Time for a Change?" Lieutenant Colonel Alan Parrington argues the need for stronger doctrinal guidance for U.S. military space activities.[354] Much of Parrington's article focuses on the hardware weaknesses and policy missteps in developing U.S. space launch capabilities. He also critiques the weak support that the MHV ASAT received from DoD and the Air Force: "Although Defense Secretary Caspar Weinberger, before his retirement, gave some lip service to the need

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[352]One of the primary rationales behind the idea of creating a separate space force was to create a stronger organizational base for advocating military space systems. If Herres, as USCINCSPACE, is not performing this military space advocacy role than the arguments on the need for a separate space force to perform this advocacy role would appear to remain valid.

[353]Colonel Kenneth A. Myers, USAF and Lieutenant Colonel John G. Tockston, "Real Tenets of Military Space Doctrine," Airpower Journal (Winter 1988): 54-68.

[354]Lieutenant Colonel Alan J. Parrington, USAF, "US Space Doctrine: Time for a Change?" Airpower Journal 3 (Fall 1989): 51-61. Parrington wrote this article as a research fellow at the Air University Center for Aerospace Doctrine, Research, and Education (AUCADRE).

for space control, official Air Force space doctrine remained passive and was at odds with all other US military doctrines."[355] Referencing Lupton, Parrington finds that the U.S. should focus on the space control school rather than the survivability school. He concludes that the U.S. must develop a joint basic space doctrine, operations space doctrine, and tactical space doctrine and that these doctrines must emphasize new launch concepts and assured access to space.[356]

The final space-related article of this period, "Antisatellites and Strategic Stability," by Marc Berkowitz presents what is probably the strongest defense of ASATs found in Airpower or AUR during the cold war.[357] Berkowitz first describes two sets of arguments concerning ASATs: that they contribute to arms race instability by provoking successive rounds of offensive and defensive developments in space systems; and that they foster crisis instability because they can target satellites performing time-sensitive and stabilizing functions such as attack warning, arms control verification, and communications.[358] Berkowitz next shows how these two basic sets of arguments against ASATs are directly linked to four broad assumptions about the broader strategic setting: the causes of the U.S.-U.S.S.R. arms competition; the capabilities of the Soviet ASAT system; Soviet acceptance of western crisis stability criteria; and the role of satellites in conflict control, limitation, and termination.[359] Berkowitz concludes that

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[355]Ibid., 56. Parrington does not mention the support for ASAT in the 2 December 1988 Air Force Space Policy.

[356]Ibid., 59-60. From his footnotes, it appears that Parrington did not study or incorporate the space doctrine critiques found in Friedenstein or Myers and Tockston. This is unfortunate because he is plowing much of the same ground but with an emphasis on space launch needs.

[357]Marc J. Berkowitz, "Antisatellites and Strategic Stability," Airpower Journal 3 (Winter 1989): 46-59.

[358]Ibid., 49-51.

[359]Ibid., 51-57. Here, Berkowitz argues that "the action-reaction model is not a satisfactory explanation for Soviet arms behavior." That the Soviet dedicated ASAT system along with their other types of ASAT capabilities present a significant threat to

"[t]he faulty assumptions that underpin the argument that ASATs are destabilizing should not influence the debate over the proposal for a new US ASAT program."[360] What is most interesting for our focus is that these strong arguments against limiting U.S. ASAT development did not come until after the case for the MHV ASAT had already been lost and were made by a civilian. Overall, AUR and Airpower did very little to support and defend SDI or the MHV ASAT during this period.

Contrasting the restrained space emphasis in the Air Force Association's (AFA) Air Force Magazine (AFM) during the previous period with the considerable space emphasis in AFM during this period provides an excellent indication of the changed perspective of the AFA between these two periods. Although the AFA did not return to the same extreme level of space boosterism it displayed in the late 1950s and early 1960s, it was clearly very supportive of expanded and focused Air Force efforts in space during the 1980s. Again, however, the specific areas of strong support and relatively weaker support discussed in AFM are very interesting in illustrating the space priorities of the AFA and the Air Force. These priorities are made more clear in the examples below.

In light of the considerable civilian interest in space-based lasers for BMD during the late 1970s and early 1980s and subsequent developments, the comments of UDRE William J. Perry and AFSC Commander General Alton D. Slay in the June 1980 edition of AFM are quite interesting.[361] Here, both Slay and Perry are optimistic about the future potential of laser weapons but neither specifically mentions the critical BMD laser application. According to Perry, "perhaps before the end of this decade, we may see high-energy lasers in use on the battlefield. In the 1990s, we can expect them to play a

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U.S. space systems. That it is questionable whether the Soviets accept western notions of crisis stability criteria. And that nuclear effects and other vulnerability considerations already limit the ability of satellites to contribute to war limitation and termination.

[360]Ibid., 58.

[361]Edgar Ulsamer, "A More Liberal, Avant Garde R & D Program," AFM 63 (June 1980): 42-45.

role in the air and in space."[362] During this time, the AFA seemed to be attempting to establish a position away from the strong space weaponry advocates such as Senator Wallop and the High Frontier although it perhaps embraced this potential a bit more closely than did the mainstream Air Force itself.

In any event, AFM did not comment often or forcefully on many space-related issues in the early 1980s. It did find time briefly to reject the calls for a separate space force and oppose changing the name of the Air Force to the Aerospace Force.[363] But it contributed very little to the strategic debate on the potential of space-based BMD prior to President Reagan's "star wars" speech. Moreover, it was also generally reserved in addressing the more Air Force specific doctrinal issues swirling around DoD STS use and was especially reluctant to examine the question of the need for a separate space command within the Air Force prior to the actual creation of AFSPACECOM.

The only major article which addressed these issues at this time was an interview with AFSC Space Division Commander, Lieutenant General Richard C. Henry in the June 1982 issue.[364] Emphasizing that "every space system we put up is either national in character or serves more than one service[.]", Henry noted "that the Air Force today is in a state of honest debate on the use of space."[365] Henry then addressed the crux of the matter:

> The Air Force, as the most technical service, feels that it is the leader in the use of space; certainly it is spending the predominant share of the DoD budget in space. Yet those who use space constitute all services, all agencies in the DoD, and as a result of that, we have a continuing debate about how the space program should be paid for -- whether it should be Air Force money or OSD money. We have a debate as to what space operations are, whether we're still in R & D or

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[362]Ibid., 42.

[363]Edgar Ulsamer, "In Focus: The 'Aerospace Force' Controversy," AFM 65 (August 1982): 12.

[364]F. Clifton Berry, Jr., "Space Is a Place: An Interview With Lt. Gen. Richard C. Henry, USAF," AFM 65 (June 1982): 36-42.

[365]Ibid., 38.

operations.[366]

This space system budgetary issue emphasized by Henry was (and is) not often discussed in public but is undoubtedly one of the greatest sources of bureaucratic concern over space within the Air Force. Moreover, in this interview Henry also basically argues against the need for a separate space command by noting that "I would be sad to see us forced into, for organizational reasons, the customer-developer relationship that we have today on the airplanes."[367] Finally, Henry indicated his lack of enthusiasm for space-based BMD by emphasizing that the beam weapons needed for such concepts were only available in theory and that "[w]e probably could short-circuit the national treasury two or three times trying to do that".[368]

Several important space doctrine issues were addressed at the 1982 AFA Symposium on "Space: Military Challenges and Opportunities" which was held on 16 September.[369] At this forum, former Secretary Mark indicated that he felt that the space doctrine in AFM 1-6 with its emphasis on international law and legal constraints represented a process that was nearly the reverse of the Soviet approach to space.[370] Lieutenant General James A. Abrahamson, NASA's Associate Administrator for Manned

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[366]Ibid. Henry later discusses "a space appropriation within OSD" as "a better way" to fund military space activities. He also notes that "[t]he problem we have today is that, in the budgetary process, space systems compete in a fragmentary sense with airplanes and missiles and so forth. That forces us into a situation where we lose touch with the correlation of the individual programs to each other. We have reached a point in the maturation of space activity where a relationship between space systems is now important, because we are now in a phase where the use of space in war is becoming an important thing." Pages 39-40.

[367]Ibid., 41.

[368]Ibid., 40.

[369]Edgar Ulsamer, "Space: The Fourth Dimension," AFM 65 (November 1982): 102-4. Major speakers at this symposium included Senator Schmitt, Science Advisor Keyworth, Under Secretary Aldridge, Deputy Administrator Mark, and Generals Hartinger, Henry, and Abrahamson.

[370]Ibid., 103.

Space Flight at this time, emphasized the role of the STS in facilitating military man-in-space missions indicating that these missions "will be broadened to include such reliable, low-cost orbital systems as manned space stations . . . ."[371] The other major focus by many of the speakers at this symposium was on the continuing and growing Soviet space threat, both in terms of their ASAT capability and their improving space-based targeting systems.

Beginning in 1984, AFM began to support the development of a manned transatmospheric vehicle (TAV). The early TAV concept was described by the Deputy for Development Planning at AFSC's Aeronautical Systems Division as:

> a military flying machine that will be able to take off from a military airfield, insert itself into the upper reaches of the atmosphere and the lower regions of space, and go around the planet in ninety minutes. We're not looking for a cargo machine. We're looking for a killer Air Force weapon system that can go out and get the enemy.[372]

Two major developments were cited as spurring the reawakening of the TAV concept: President Reagan's "star wars" speech of 23 March 1983, and the Air Force Space Plan developed during 1983 which emphasized the development of capabilities for space combat. AFSC Commander General Robert T. Marsh asserted that the Air Force "should move into warfighting capabilities in space -- that is, ground-to-space, space-to-space, and space-to-ground capabilities."[373]

In this article, Canan also discusses some very interesting space bureaucracy and

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[371]Ibid., 104.

[372]James W. Canan, "Bold New Missions in Space," AFM 67 (June 1984): 88-93.

[373]Ibid., 88. According to this article, the top-secret 1983 Air Force Space Plan discusses these concepts in detail under the "space combat" category. This category is further divided into the "space control" and the "force application" headings with the former including concepts for space superiority such as the MHV ASAT and the latter providing one of the first comprehensive reviews of the potential for space-to-ground systems. On the force application mission Under Secretary Aldridge was quoted as saying "[l]et me add a word of caution, [t]here are lots of implications here, in putting vehicles into space that can attack targets on the ground, that we haven't thought through as part of national policy and national security objectives." Pages 88-90, quote from 90.

organizational issues. He asks:

> Are space defense and offense becoming so vital to national security as to demand top funding priority? Even at the risk of skimping on funding for tried-and-true terrestrial systems?
>
> The affordability question is even broader than that. It may also entail tough choices of pace by USAF among nonspace systems, such as fighters, bombers, ICBMs, and airlifters.[374]

Canan next raised "another question of growing concern to the Air Force:

> Will the DoD's SDI program, as it picks up steam, coopt such programs as ASAT and, later possibly, the TAV that the Air Force must control in order to perform the extraterrestrial missions it has now set forth for itself? . . . USAF seems increasingly wary of SDI encroachment, the General's [Abrahamson's] blue suit notwithstanding.[375]

Finally, Canan reaches the ultimate space-related bureaucratic question: Noting that a unified space command is "now taken as a given," he also finds that "some officers in all the services and at least a few officials at the DoD and White House levels foresee the creation of a fourth branch of the military: a US Space Force."[376] Canan's questions clearly capture the flavor of the Air Force's extremely difficult space-related bureaucratic dilemmas during this period. The Air Force faced several knotted and unresolved doctrinal issues posed by the creation of SDIO and by the continuing development and potential of more potent space systems.

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[374]Ibid., 92.

[375]Ibid. The AFA's often arms-length support for SDI is well illustrated by Edgar Ulsamer, "Charting a Course for SDI," AFM 67 (September 1984): 106-121; and Ulsamer, "The Battle for SDI," AFM 68 (February 1985): 44-53. What is even more apparent from these articles is the lack of strong support for SDI among the uniformed military.

[376]Ibid., 93. On the creation of a separate space force Canan quotes AFSC's Deputy Chief of Staff for Plans and Programs, Brigadier General Robert D. Eaglet as saying "[i]t is a very good possibility, [i]n fact it is a likelihood. Space is a medium, just like air, sea, and land, and there are a lot of things different about space. So why not a separate force for it?" Eaglet did, however, doubt that the idea of a separate force would "build up any serious momentum within the next ten years." Eaglet apparently missed the aerospace concept and the past twenty-five years of Air Force positions on space including the recently released AFM 1-6.

AFM focus on space-related issued built to a peak during the mid-1980s with 1985 having the most space-related articles of any year during this period. By this time, new issues such as assured access to space and the CELV controversy, ASAT funding and testing restrictions, and the potential of other programmed or projected space systems had come to the forefront of space doctrine issues. Not surprisingly, AFM provided strong support for and approval of Under Secretary Aldridge's quest to gain approval to develop the CELV.[377] The CELV matched well with the traditional Air Force role in space launch and returned control over the launch vehicle back into the hands of the Air Force. Closely related to the arguments in favor of the CELV were the numerous discussions in AFM on the various general shortcomings of the STS and especially its problems for launching national security payloads.[378]

Support for the CELV in AFM is much more frequent and forceful than support for the MHV ASAT. Nonetheless, AFM, unlike AUR, did provide some very specific support for the MHV at this time. Quoting Aldridge, a November 1984 article noted that completing testing and making the MHV operational was imperative to "correct a glaring imbalance of capabilities between us and the Soviets."[379] The strongest AFM support for the MHV and ASAT in general came in an article specifically devoted to this topic in the July 1985 issue.[380] In this article, Oberg attempts to point out the weaknesses in the arguments against the U.S. testing and deploying the MHV or other ASAT

[377]See, for example, Edgar Ulsamer, "Assuring Access to Space," AFM 67 (November 1984): 80-84; James W. Canan, "High Space Heats Up," AFM 68 (July 1985): 61-67; and Ulsamer, "Slick 6," AFM 68 (November 1985): 46-52.

[378]Shuttle shortcomings are especially emphasized in Ulsamer, "Slick 6." Under Secretary Aldridge was to have flown as a "payload specialist" aboard *Discovery* on the first STS launch from VAFB scheduled for 20 March 1986.

[379]Ulsamer, "Assuring Access," 83.

[380]James E. Oberg, "A Dozen Anti-ASAT Fallacies," AFM 68 (July 1985): 79-81.

systems.[381] However, following this very strong support in 1985, the support for the MHV found in AFM tapered off substantially despite the continuing and increasing political difficulties facing this program.

Other major Air Force space initiatives such as the manned TAV, capabilities for space weaponry, and the Milstar system also received considerable attention in AFM during this time. As noted above, the TAV had already received considerable attention in AFM and by 1985 AFM was noting that "[t]he heaviest pressure to get on with the TAV, or at least to step up the development of its technologies, is coming from outside the Air Force -- straight from the space-oriented White House."[382] Despite this highest level support for developing new manned military space systems, according to Lieutenant General Bernard T. Randolph, Vice Commander of AFSC, "[t]he Air Force has not yet decided that man in space will be useful militarily. I think the whole business of man in space [for military purposes] will have to be looked at a long time."[383] Air Force ambivalence towards potentially revolutionary military space applications such as space-based radar, the Teal Ruby infrared tracking experiment, and general space-based laser applications outside of SDI was well illustrated at the AFA's 1-2 November 1984 "Military Imperatives in Space" Symposium.[384] Finally, AFM also displayed

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[381]Some of the anti-ASAT fallacies which Oberg attempts to dispel include: that the Soviet system is primitive or unreliable, that a ban could be easily verified, that the U.S. system is far more reliable and would trigger an ASAT arms race, that the MHV is a "first-strike" system, and that the Soviets have pledged to dismantle their current dedicated co-orbital system. Oberg's article is the strongest defense of the MHV found in either AUR or AFM during this period.

[382]James W. Canan, "Space Plan 2000," AFM 68 (July 1985): 73. Canan also noted that Science Advisor Keyworth was a TAV supporter. When accelerated following the 1986 State of the Union Address, the TAV was redesignated as the National Aerospace Plane (NASP) and the peaceful applications of this "orient express" were emphasized in public.

[383]Ibid., 70.

[384]Ulsamer, "Military Imperatives in Space," 92-96. The AFA and AFM did not make any major efforts to support these systems.

considerable support at this time for the next generation Milstar communications satellite under development throughout the 1980s. Naturally, the Air Force and AFM focused on the Air Force applications of the Milstar system but one of the bureaucratic problems encountered on this system has been that Congressional pressure has consistently moved the program away from Air Force preferred capabilities and applications.

Following the *Challenger* disaster, AFM backed away from its intense space focus and published fewer articles about space. At the 14-15 November 1985 AFA Symposium on "The Military Uses of Space," USCINCSPACE General Herres provided some support for the MHV ASAT program by emphasizing the capabilities of the Soviet ASAT system and the threat posed to the Navy by Soviet RORSAT and EORSAT targeting systems.[385] AFM's most enthusiastically supported new space initiative continued to be the NASP.[386] Additionally, AFM strongly supported Secretary Aldridge's efforts to make the U.S. space launch infrastructure more robust, capable and cost-effective and called for making ELVs the primary launch vehicle for the Air Force.[387] Other articles congratulated Aldridge "for having led the way in persuading the Administration and Congress to authorize the Titan IV (formerly the Titan 34D-7) CELV program in 1985."[388]

By the very end of this period, the space focus of AFM had revived somewhat. USCINCSPACE, General Piotrowski strongly emphasized the need for improved U.S. space surveillance and tracking capabilities in a 1988 AFM article entitled "Our Blind Spots in Space."[389] Citing the gaps in present U.S. space surveillance capabilities and the potential of the Soviet Shuttle system and their mobile ICBMs (SS-20s and SS-25s) to serve as flexible launch platform, Piotrowski indicated that the Soviets had a growing

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[385]Edgar Ulsamer, "What's Up in Space," AFM 69 (February 1986): 46-47.

[386]James W. Canan, "Mastering the Transatmosphere," AFM 69 (June 1986): 48-54.

[387]Ibid., 51-52.

[388]James W. Canan, "Coming Back in Space," AFM 70 (February 1987): 50.

[389]James W. Canan, "Our Blind Spots in Space," AFM 71 (February 1988): 45-51.

capability to "fill up deep space with things we never knew existed."[390] As with so many other areas, however, Piotrowski's advocacy of improved space surveillance capabilities did not receive much support from other sources and did not result in actual program upgrades.

The Air Force's space priorities and the increasing pressures on the DoD's space budgets were other factors which received increasing attention during this time. Noting that the SBR concept had already fallen victim to increasing budget pressures, Secretary Aldridge noted that "ALS is going to suffer budgetary pressures. So will the National Aerospace Plane."[391] More generally, Aldridge also took this opportunity to address concerns about the strength of the Air Force's commitment to space. Aldridge noted that:

> "there's a concern that we [USAF] may be backing away from that commitment because of budgetary pressures. We've had a lot of criticism in the past about our adherence to that commitment."
>
> Such criticism has come from those who claim that the Air Force was not "stepping up fast enough to ASAT [antisatellite weapon]," was "pinging at" its GPS and Milstar satellite development programs in its annual budgets, was slighting space-based radar, and was, in general, favoring air-oriented operations and systems over those oriented to space, especially as the latter became more and more expensive.[392]

In responding to these criticisms, Aldridge indicated that the military was becoming more aware of just how valuable space systems had become to all terrestrial operations and cited the Air Force's long-term commitment to the GPS ($10 billion) as a specific example of the depth of Air Force commitment to space. Nevertheless, questions about Air Force space priorities and the depth of its commitment to specific space systems persisted in the face of ever-increasing costs for space systems and the shrinking DoD budget. Of course, these questions about space priorities and space systems costs also exacerbated interservice rivalries related to space, a sentiment well captured when an

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[390]Ibid., 45.

[391]James W. Canan, "Recovery in Space," AFM 71 (August 1988): 73.

[392]Ibid., quotes are from Aldridge.

anonymous Navy Admiral quipped that "[o]ur idea of a joint program is one the Air Force pays for and the Navy uses."[393]

Overall, while both the professional journals and AFM increased their space coverage considerably during this period, the impact of these publications in helping to develop space doctrine was probably quite minimal in most cases. The primary reason why their impact on doctrinal development was limited was due to their reactive approach to major doctrinal issues. Neither publication focused on major issues related to space doctrine while important decisions were underway. These publications did not examine the implications of DoD STS operations, the establishment of AFSPACECOM, the creation of SDI, or the emergence of the unified space command prior to these developments taking place. Moreover, the amount and tenor of the coverage for SDI and the MHV ASAT is indicative of a restrained approach to the high ground or space control schools of thought at this time. The one important exception to this generally mainstream and reactive approach is the number of important articles on military space doctrine in AUR and Airpower. To its credit, by this period the professional journal of the Air Force had finally established an important and quite sophisticated dialogue on the development and shortcomings of Air Force space doctrine.

Applying the Comparative Framework and Addressing the Research Questions

Having completed the analysis of the major developments related to the evolution of space doctrine during this period, this final section can now apply the comparative framework from chapter two and address the other research questions introduced in chapter one. The goal of using the comparative framework is to evaluate whether national security considerations or organizational behavior considerations were more important is shaping doctrinal outcomes during this period. As with previous periods, assessing the overall doctrinal outcomes from the major space-related developments of this period is a difficult and subjective undertaking. Moreover, the difficulties in making these judgements for this period are exacerbated by the near impossibility of placing the

[393]Cited in Richard H. Buenneke, Jr., "The Army and Navy in Space," AFM 73 (August 1990): 39.

various doctrinal outputs of this period into distinct categories, the wide range of divergent major space doctrine related developments at this time, and the frequent disparities between the positions outlined in national space policy or official doctrine statements and actual organizational behavior. The two sets of consolidated hypotheses show that national security considerations were sometimes more important than organizational behavior in conditioning most major doctrinal outputs during this period as well. However, the conceptual complexity of this period generally overwhelms the capabilities of the model developed for this study. Finally, the doctrinal outcomes predicted by table two in chapter two are compared with the actual major doctrinal outcomes of this period.

Applying the Comparative Framework

1) Mainstream U.S. military space doctrine during this period mostly centered around the survivability and space control schools of thought although sanctuary and high ground thinking were clearly evident at times as well. This broad emphasis on the survivability and space control schools best describes the overall doctrinal outcomes of this period, but, this non-distinct outcome does not match well with the application of this hypothesis area. Sanctuary thinking was most evident in the approach of Congress towards the MHV ASAT but this school also continued to influence thinking towards spysats and NASA. The survivability school was a major factor in the development of: aspects of Reagan administration space policy statements, the establishment of AFSPACECOM and USSPACECOM, and parts of military space doctrine statements. The space control school was important in conditioning other aspects of national space policy and military space doctrine statements, ASAT developments, and organizational alignments. The high ground school was obviously a large factor in the SDI decision but also helped to motivate the establishment of AFSPACECOM and USSPACECOM as well. Accordingly, it is not possible to draw the fine distinctions required to discriminate precisely between the importance of national security considerations and organizational behavior inputs for this hypothesis area. In this regard, several problem areas stand out most predominantly.

First, in areas such as SDI, ASAT, and the potential development of other new military space systems where the mainstream organizational behavior concerns of the whole Air Force overshadowed top-down national security considerations, the doctrinal preferences from the consolidated hypotheses do not match with the actual outcomes. In these cases, Air Force-wide organizational behavior considerations did not lead towards support for systems designed for more offensively oriented doctrine. What is even more revealing is that the organizational behavior inputs from USSPACECOM in these areas did lead towards support for systems designed for more offensively oriented doctrine. These findings raise interesting questions concerning the level of corporate commitment on the part of the Air Force as a whole to space missions.

A second problem within this hypothesis area concerns the fact that, contrary to the predicted relationships, the strongest support for the high ground school came from the top-down national security considerations of the White House. Of course, more expected types of different national security considerations predominated Congressional behavior during this period and these considerations did lead primarily towards support for the sanctuary or survivability schools. However, the cumulative impact of these generally divergent outlooks is difficult to grasp, let alone to apply within this hypothesis area.

Finally, it is also unclear how to weigh or evaluate divergences between policy or doctrinal statements and actual behavior. While actual behavior would generally seem to be a better measure than a doctrinal statement, the development of doctrinal statements, in and of itself, is also a very important process which may create a strong doctrinal position. For example, both the generally lukewarm support of DoD and the Air Force for the MHV ASAT in the mid-1980s and the strong support for the ASAT mission in the 1987 DoD Space Policy and the 1988 Air Force Space Policy seem to be important indications of major doctrinal positions -- but which is more important and should be applied in this hypothesis area?

2) On first inspection, most security classifications for space systems during this period seem to be primarily a response to national security considerations. Important aspects of spysat systems and plans, DoD STS operations, military space systems and plans, the ASAT program, and the SDI program remained classified due to these

considerations. Such practices seem reasonable and correspond with security classification levels in previous periods. However, we must also keep in mind that this period is very recent history and little documentary evidence is available to study most aspects of space doctrine development at this time. It is very possible that many aspects of the doctrine development process described in this chapter are inaccurate or misrepresentative of actual developments but the more complete picture is currently unavailable at the unclassified level. Thus, areas which seem particularly unclear from available sources such as the exact rationale why the Air Force abandoned the MHV or why it so rapidly and completely shifted away from the STS are examples of areas which may eventually reveal the greatest degree of organizational behavior driven security classifications. In an era where revelations about $500 hammers came to light and the general financial stewardship of DoD was widely questioned, the Air Force would obviously have great incentive to keep multi-billion dollar policy reversals as quiet as possible. Despite this speculation, at present there is no major unclassified evidence which does not support national security inputs as the major consideration in shaping most security classification levels related to military space doctrine during this period.

3) Making judgements about the degree of integration between military space doctrine and the perceptions of the military and civilian leadership as well as with national security strategy is another very difficult hypothesis area. This hypothesis area is difficult not only because major military space doctrine outputs vary considerably but also especially because leadership perceptions on the efficacy of space systems and/or weapons were largely dichotomous at this time. Questions about the need for space-related arms control, the capabilities of space systems, and the efficacy of space weaponry were among the most divisive of all issues during this period. Attempting to pick out individual national security considerations or organizational behavior inputs from this confused swirl of intense controversy would not be very helpful. It is clear that for most major military space doctrine related issues the top civilian and military leadership, including the Reagan administration and the Congress, were energized and directly involved. It is much less clear whether this generally strong intervention led towards specific types of doctrinal outcomes. For example, the SDI program undoubtedly

corresponded closely to President Reagan's perceptions on international relations and the possible efficacy of space systems and weapons. However, as discussed in the SDI section above, the president's strong SDI vision driven by top-down national security considerations did not simply translate into corresponding military space doctrine supporting strategic defense despite the fact that organizational behavior considerations would seem to favor such a doctrine.

4) If new developments in military space plans, systems, and organizations are taken to represent innovative doctrine then the preferences in the comparative framework seem to hold quite well in this area. Strong interventions by top leadership led to changed military space plans and doctrine in several areas including DoD STS operations, SDI, and ASAT developments. Moreover, generally speaking, national space policy statements continued to lead military space doctrine developments in important areas such as ASAT and space control infrastructure as well as on SDI. Under Secretary Aldridge's push for the CELV is another example of a strong intervention motivated primarily by national security considerations which led to innovative outcomes. By contrast, in many of the areas with the least intervention, military space plans and doctrine were stagnant. The lack of Service involvement with and the arrested development of projects such as space-based lasers, radar, and infrared surveillance and tracking systems seem to be prime examples of this opposite trend. Likewise, Air Force attitudes towards the military potential of the STS both for payload delivery and for investigating expanded military man-in-space applications seemed to be anything but innovative. Of course, not all developments fit this mold -- the military itself rather than outside intervention was the prime mover on the creation of AFSPACECOM and USSPACECOM. However, the degree of innovation in the doctrine created by these new organizations remains to be seen.

Finally, let us examine the relationships between the actual doctrinal outcomes of this period with the predicted doctrinal outcomes from table two in chapter two. The significant U.S.-U.S.S.R. tensions during most of this period make table two the most appropriate choice. Some of the actual doctrinal outcomes for this period match closely with the outcomes predicted by balance of power theory: Military space doctrine did often reflect the survivability school of thought; space plans and system security classification levels seemed to be set primarily on the basis of national security considerations; the degree of integration between space doctrine and national security strategy is unclear; and, generally, many doctrinal developments during this period were highly innovative.

Comparisons between the actual doctrinal outcomes and the outputs predicted by organizational theory also show some correspondence: Both the high ground and especially the space control schools of thought were important in certain military space doctrine developments during this period; the security classification levels for space plans and systems generally seemed to be more closely related to national security considerations than organizational behavior, at least when looking from the outside; the degree of integration of military space doctrine with national security objectives is unclear; and military space doctrine did seem highly innovative in many ways during this period.

In sum, then, the comparative framework is difficult to apply for this period due to the fact that both the doctrinal outcomes and the space-related portions of U.S. national security strategy were often unclear at this time. Military space doctrine centered around the survivability and space control schools, although elements from the sanctuary and especially the high ground schools were also important for certain developments during this period. From the broadest perspective, the overall trend at this time is towards the space control and high ground schools. However, no one school can begin to capture the complexity of the actual developments related to the evolution of military space doctrine for the final period of the cold war. The often divergent positions of the Reagan administration and the Congress regarding the proper military use of space within U.S. national security strategy clearly contributed the to military's difficulties in crafting coherent, consistent, and supported space doctrine during this time. Overall, by this period, these divergent positions had all built up sizable constituencies and had become firmly entrenched in the doctrine development cycle.

Addressing the Research Questions

The final section of this chapter reviews the major findings related to the three other research questions introduced in chapter one. First, to the extent possible, this section examines the links between the major doctrinal outcomes and the doctrinally-related aspects of national space policy during this period. Next, the most important interrelationships between military space doctrine and major military space organizations are reviewed. Finally, this section addresses whether the airpower development historical analogy is an appropriate tool for examining spacepower developments at this time.

Due to the difficulties in determining both the major doctrinal outcomes and the most important thrusts of national space policy at this time, it is also difficult to establish or analyze the links between these two bodies of thought. As discussed above in this section and throughout this chapter, both the doctrinal outcomes and the doctrinally-related aspects of national space policy ran the gamut from sanctuary to high ground during this time. By the end of this period, close links had developed between the administration's space policy and the 1987 DoD and the 1988 Air Force space policy statements. However, each of these statements was clearly far from being accepted or actually implemented by the end of this period. Thus, given the divergent positions regarding space doctrine and national space policy as well as the policy-capability gap which had emerged by the end of the period, it would not be helpful to attempt to focus on specific relationships within this area.

The major interrelationships between individual military space organizations and specific doctrinal preferences during this period are more clear. Space doctrine preferences were important considerations in the deliberations concerning whether new space organizations were needed at this time. AFSPACECOM, SDIO, and USSPACECOM emerged as major new major space actors with distinct doctrinal preferences as a result of these deliberations. Meanwhile, the major aspects of the doctrinal preferences of other major military space organizations remained quite stable. Finally, the Air Force as a whole, as in previous periods, faced several difficult bureaucratic dilemmas concerning space at this time and did not strongly embrace any doctrinal school.

As discussed above, the movement away from the sanctuary school and towards the survivability, space control, and high ground schools was a critical factor in highlighting the need for new space organizations during the early part of this period. The direct links between the general shift in doctrinal thinking during the early part of this period and the emergence of AFSPACECOM is an excellent illustration of the interrelationships between doctrine and organizations. The links between high ground or space control thinking and the creation of AFSPACECOM also explain the general disappointment in the degree of doctrinal leadership demonstrated by AFSPACECOM in these areas by the end of the cold war. The policy links between the origins of the SDI concept and the creation of SDIO are also very prominent and they clearly were the product of civilian efforts rather than military doctrine or preferences. Overall, the doctrinal preferences of SDIO were not very helpful in refining or clarifying military space doctrine more generally. The establishment of USSPACECOM is a final example of the links between high ground or space control thinking and a new military space organization. Moreover, in this case, the opposition within DoD (especially by the Navy) to the creation of a unified space command illustrates the internal doctrinal conflict over the need to move towards the space control or high ground schools of thought on space. Once established, USSPACECOM remained true to its roots and became the strongest organizational advocate for the space control and high ground schools within the military during the entire cold war era.

The interrelationships between doctrine and most of the established military space organizations were less dramatic during this period. The drift towards the more ambitious military space doctrine had a negative impact on the NRO and AFSC's Space Division. All of the discussion of very significant military space applications during this period moved the NRO out of the position of near total preeminence it enjoyed during the previous period, although it remained a very important space actor. Moreover, continuing technological developments seemed to make the NRO's preferred sanctuary doctrine less and less tenable and the NRO moved towards a survivability emphasis. AFSC's Space Division saw its institutional clout decline in a more dramatic way following the creation of AFSPACECOM. AFSC and Space Division were lukewarm at best regarding the need for a new major command mainly because they correctly perceived that such a new command would take control of space operations away from

Space Division. Interestingly, while AFSC and Space Division reverted to an almost exclusive space R & D focus, a similar R & D oriented space operator focus lived on within AFSPACECOM. The links between doctrine and the positions of top civilian space decision-makers within OSD and elsewhere were also important during this period. Indeed, it was largely these civilian space decision-makers who drove DoD and Air Force space policy statements into their eventual alignment with administration space policy statements by the end of this period.

For this period, as in previous periods, attempting to understand and analyze the various links between doctrinal positions and the position of the Air Force on space is most difficult. The internal Air Force debate over the need to establish a new major command for space indicated the space-related tensions within the Air Force. Likewise, the Air Force's ambivalence on embracing STS operations and rush off of the STS following the *Challenger* disaster and its lukewarm support for the MHV ASAT can also be seen as reflections of these internal tensions. Moreover, by this period, even the most basic Air Force space doctrine tenet on the aerospace concept came under increasing attack by DoD (in the 1987 DoD Space Policy statement), by the other Services due to the lack of Air Force space leadership, and even from within the Air Force from those who believed that the aerospace concept constrained the development of more useful Air Force space doctrine. The Air Force Space Policy statement of December 1988 attempted to address many of these issues but, as we have seen, this statement opened a wide policy-capability gap and was far from being fully accepted throughout the Air Force by the end of this period. Cumulatively, therefore, it is not surprising, given all of these divergent pressures, that the Air Force did not have an agreed or supported position on most space issues for most of this period.

Finally, we must consider the major relationships between the airpower development historical analogy and the spacepower developments of this period. The ultimate question within this area is whether the airpower development historical analogy is a useful conceptual tool for examining the actual course of spacepower developments for this period. Overall, there were more references to and analogies which emphasized direct links between airpower development and spacepower development during this period than at any other time during the cold war era. The many papers written for the USAF Academy Military Space Doctrine Symposium which specifically examined these links are an excellent illustration of the importance of the airpower development analogy in conditioning spacepower thinking during this period. These links were again emphasized in the deliberations leading to the creation of AFSPACECOM and USSPACECOM. Moreover, the path of airpower development leading to the creation of the Air Force was, of course, strongly emphasized by those advocating the creation of a separate space force at this time.

Despite these frequent general analogies being drawn during this time, a comparison of the actual spacepower developments with the three critical steps in airpower development again shows that this analogy does not seem to cover actual spacepower developments during the cold war very well. Advocates of space-based BMD or more general high ground military space applications were very vocal during this period but almost all of the strongest advocates in advancing these concepts were outside of the military. By the end of this period, however, any actual demonstrations of these type of high ground military space applications remained as far in the future as they had been projected to be at the beginning of this period. Moreover, the lack of military support for these type of innovative space applications is apparent from the military's failure to back the DARPA Triad space-based laser experiment, space-based radar systems, or the Teal Ruby wide-area infrared surveillance and tracking system. The 1987 DoD and 1988 Air Force space policy statements may prove to be important milestones in moving the military towards offensive military space doctrine analogous to AWPD-1. However, as we have seen, by the end of this period the support for these statements was unclear and they were far removed from actually guiding the development of forces capable of implementing these doctrinal statements. Finally, although there were significant calls for an independent space force during this period, few of these calls came from within the military. Indeed, the establishment of AFSPACECOM and USSPACECOM was at least implicitly partially a response to these calls for a separate space force. In turn, these new military space organizations took much of the impetus away from further calls for a separate space force. Moreover, as General Herres's article shows, the Air Force and USSPACECOM were keenly aware of the implications of the airpower development historical analogy in this area and were attempting to, at least superficially, mitigate against the perceived need for a separate space force. Cumulatively, this period shows the closest movement towards each of the three critical steps in airpower development. However, in each area, the actual spacepower developments fall significantly of the comparable airpower development steps and the usefulness of this analogy as a comparative tool remains questionable.

During this final period of the cold war, developments related to military space doctrine moved in many different directions. Not surprisingly, the divergent and confusing developments related to military space doctrine during this period do not fit easily into any of the categories or hypotheses developed for this study. This suggests that the vigorous doctrinal sorting re-energized in the late 1970s and early 1980s was not near completion by the end of the cold war era. Because broad doctrinal trends cannot be easily identified or fit into the hypothesis for this study, it is difficult to draw overall conclusions for this period. This conceptual confusion accurately reflects the vigorous and unsettled doctrinal activity of this period. Thirty-two years after the opening of the space age, little consolidation had taken place regarding the four schools of thought on the military uses of space. While there was a general trend away from the sanctuary school during the cold war era, each of the four schools continued to maintain loyal supporters at the end of the cold war. With the doctrinal sorting of the cold war era remaining unfinished, problems in building coherent and supported military space doctrine for the post cold war era will probably be exacerbated. Because there are not agreed upon "lessons" or schools of thought on military space applications which emerge from the cold war period, there is not a strong base upon which to build approaches to military space applications which are responsive to the changed security environment of the post cold war world.

CHAPTER SEVEN: SUMMARY AND CONCLUSIONS

This study has completed the detailed chronological analysis of developments related to the evolution of U.S. military space doctrine during the cold war era contained in chapters three through six above as called for in the research design. This chapter can now complete the study by summarizing the major findings from this analysis and briefly drawing implications from the most important points uncovered during the course of this study. Accordingly, this chapter first presents and discusses a summary of the findings generated by applying the comparative framework to the major doctrinal outcomes uncovered during each period of the cold war. These major findings from the comparative framework are presented in table four below. Next, this chapter outlines a brief response to the research question on the most important links between military space doctrine and the doctrinally-related segments of U.S. national space policy during each period. This chapter also provides a summary which responds to the research question on the most prominent interrelationships between doctrinal preferences and major U.S. space organizations during each period. The final research question on the suitability of the airpower development historical analogy for describing spacepower developments during the cold war is addressed by summarizing the findings in this area and discussing some of the implications of these findings. Finally, the last section of this chapter discusses important research questions related to this study which remain open, and indicates some of the most important factors for analysis in examining the continuing evolution of U.S. military space doctrine during the post cold war era.

<u>Summary of Findings From Comparative Framework</u>

1) According to the comparative framework, national security considerations were

TABLE 4 : SUMMARY OF MILITARY SPACE DOCTRINAL OUTCOMES DURING THE COLD WAR

Categories of Doctrinal Outcomes

Periods During the Cold War	Doctrine School	Primary Rationale for Security Classification Level	Degree of Integration	Degree of Innovation
"Squandered Inheritance" 1945 — *Sputnik* I	Sanctuary	National Security Considerations	Very High	Very High
"Clash of the Titans" *Sputnik* I — 1963	Sanctuary	National Security Considerations	High	Moderate
"Sanctuary Supreme" 1964 — 1978	Sanctuary ↓ Survivability	National Security Considerations & Organizational Behavior	High	Low
"Increasing Militarization and Possible Weaponization" 1979 — 1989	? Survivability Space Control ?	National Security Considerations	?	High

generally much more important than organizational behavior in conditioning doctrinal outcomes throughout the cold war. However, a definite pattern of evolution away from the sanctuary school also indicates the increasing importance of organizational behavior over time. During the "Squandered Inheritance" period, the sanctuary school and national security considerations were completely dominant. Eisenhower's space policy was highly secret and centered on building space into a sanctuary for spy satellites; moreover, there were few space-related organizations at this time and therefore few powerful organizational behavior interests. By the "Clash of the Titans" period, significant space-related organizations and organizational behavior concerns had emerged, however, due to the continuing top-level intervention by both the Eisenhower and Kennedy administrations the national security considerations served by spy satellites and the sanctuary school explicitly remained the top space doctrine considerations. The Air Force, especially, proposed many space plans based upon high ground thinking and fought very hard against this total dominance by the sanctuary school but in the end was denied any hardware tools with which to examine more ambitious military space goals. The low-tension "Sanctuary Supreme" period represents a time of less interest in military space doctrine and less intervention in the doctrine development cycle, however, the sanctuary school remained dominant throughout most of this period. This indicates that the military had largely given up on more ambitious military space plans and had adapted itself to the sanctuary school. Most significantly, it was top-down civilian inputs from the Ford and Carter administrations which revived U.S. ASAT efforts rather than bottom-up inputs from military organizations. Finally, by the end of the "Increasing Militarization and Possible Weaponization" period overall doctrinal outcomes were unclear but centered around the survivability and space control schools. Thus, both national security considerations and organizational behavior were actively involved and influential over aspects of doctrinal development at this time. Additionally, the widely dichotomous doctrinal positions and the discrepancies between doctrinal statements and actual behavior both indicate the vigorous and incomplete doctrinal sorting of this period.

Two interesting major implications emerge from the findings in this doctrine school hypothesis area. First, administration positions on space doctrine were the dominant factor in conditioning most types of space doctrine school outcomes during most times. However, the complete reversal from Eisenhower's emphasis on sanctuary to Reagan's emphasis on high ground is not well explained or predicted by this model or hypotheses. This reversal of the "traditional" positions of the administration and the military on space doctrine during the Reagan era makes theorizing about this last period more difficult. However, the impact of this reversal does seem to indicate that the military has enduring doctrinal preferences and timetables which are motivated by organizational behavior and that these preferences cannot be rapidly altered by top-down inputs, even when these inputs are towards doctrinal preferences which the military should prefer.

Second, some of the findings in the doctrine schools hypothesis area during the last two periods also call into question the strength of the Air Force's commitment to more ambitious military space activities. From the late 1970s on, the various administrations, rather than the Air Force, led the drive to develop a new U.S. ASAT system. Moreover, the Air Force's cool response to SDI and its lack of enthusiasm towards several other potential military space applications in the 1980s were not indicative of strong support for the high ground or even the space control schools. Finally, contrast the strong support of USSPACECOM for high ground and space control missions with the much lower level of Air Force-wide support for these missions. Clearly, if the comparative framework is correct about organizational behavior doctrinal preferences, then the bureaucratic ambivalence towards space displayed by the Air Force since the opening of the space age had grown along with the potential of military space systems. By the late 1970s, this Air Force ambivalence was apparently a significant institutional impediment to fully investigating the military potential of new space technologies or to thinking in innovative new ways about space doctrine.

2) Overall, the comparative framework reveals that national security considerations were clearly more important than organizational behavior in providing the rationale behind security classification levels for space-related developments during the cold war. During the "Squandered Inheritance" period all of the most important aspects of Eisenhower's space policy remained highly classified due to national security

considerations despite the organizational preferences of the military and IGY scientists for providing data more openly. The blackout directive imposed on all DoD space activities during the "Clash of the Titans" period is probably the high water mark of national security driven classification preferences prevailing over Air Force organizational security preferences. During the "Sanctuary Supreme" period the organizational behavior driven classification preferences of the NRO emerged as a very important factor in conditioning outputs in this area. However, national security considerations remained an important factor in setting classification levels in many areas (such as for the MOL) and, overall, neither national security considerations nor organizational behavior predominated in this area during this period. For the "Increasing Militarization and Possible Weaponization" period, most classification outcomes again seemed to be mostly associated with national security considerations rather than organizational behavior. However, for this final period in particular, the details behind several developments such as the Air Force's termination of the MHV ASAT and its rush off of the STS following the *Challenger* disaster remain unclear from open sources. In these and other issue-areas currently obscured by security restrictions, organizational behavior may be more responsible for keeping potentially embarrassing material away from public view than national security considerations.

At present, many important details concerning the development of U.S. military space doctrine during the cold war remain obscured by security classification levels. I do not wish to minimize security classification requirements based on legitimate national security considerations, however, I would like to see a continuation of the trend towards greater openness in space-related developments. Clearly, the development of theoretical insights in this area could be improved by greater openness. More specifically, greater openness could help to reveal more clearly those areas where security classification levels are driven more by organizational behavior consideration than by national security considerations.

3) A summary of the findings from the comparative framework in the area of doctrinal integration with national security strategy also reveals that national security considerations were generally more important than organizational behavior in space

doctrine outcomes during the cold war. In the "Squandered Inheritance" period, Eisenhower strongly intervened in the development of space policy and the resulting policy corresponded closely to his perceptions on international relations and beliefs about the efficacy of spy satellites in opening up the Soviet Union and stabilizing superpower relations. During the "Clash of the Titans" period, top-level civilian decision-makers again intervened very strongly and again doctrinal outcomes were closely integrated with the national security strategy they had created. Developments which shaped doctrinal outcomes such as NSC 5814/1, McNamara's limited ASAT deployments, and the spy satellite and arms control related efforts of the NSAM 156 Committee all strongly reflected the national security considerations of the Eisenhower and Kennedy administrations rather than organizational behavior. The continuing high level of doctrinal integration with national security strategy during most of the low-tension "Sanctuary Supreme" period does not correspond to the low level of integration predicted by the comparative framework for this period. This continuing generally high level of integration between doctrinal outcomes and national security strategy despite the low tensions and limited intervention by top decision-makers in the doctrine development cycle during this period is evidence that the military had largely acquiesced to the sanctuary school and was no longer actively developing more ambitious military plans for space. Finally, attempting to make a single overall judgement about the degree of doctrinal integration with national security strategy for the "Increasing Militarization and Possible Weaponization" period would not be helpful due to the widely dichotomous national security strategies and space doctrines advanced at this time. This was clearly a period of generally high tensions which was marked by strong interventions into the doctrine development cycle on the part of the Reagan administration and the Congress yet the overall impact of these developments did not provide a consensus on national security strategy or doctrinal outcomes.

Other than the overall finding that national security considerations were generally more important than organizational behavior in determining the amount of integration between doctrinal outcomes and national security strategy during the cold war, the most important finding in this area is that the doctrinal outcomes during the "Sanctuary

Supreme" period were nearly the inverse of those predicted by the model. Why did the overall doctrinal outcomes during this period generally continue to correspond to the sanctuary school despite the fact that this was a period of low tensions and few interventions by top decision-makers into the doctrine development cycle? There are several interrelated factors which may account for this unexpected outcome: First, because the Services largely adapted to the sanctuary school during this period, they were not active in developing new doctrines which might have moved away from the sanctuary school; doctrine, therefore, remained well integrated with the sanctuary school due to stagnation. Second, the emphasis on the sanctuary school and the stagnation in thinking about other space doctrines matched well with the doctrinal preferences of the most powerful military space organization of this time, the NRO. Finally, the general lack of military concern about space during this period meant that there were few issues within this area which could stir up interservice rivalries or other debates on how best to conduct military space activities. The fact that the comparative framework is far closer in predicting the actual types of doctrinal integration with national security strategy for the other periods during the cold war probably indicates that the erroneous prediction for this one period is an anomaly.

4) Finally, the fairly high degree of innovation in doctrinal outcomes during the cold war generally supports the strength of national security considerations in conditioning this doctrinal outcome as predicted by the comparative framework. U.S. space policy was probably at its most innovative during the "Squandered Inheritance" period when the civilian leadership strongly intervened in the policy development cycle to nurture the revolutionary ICBM and spy satellite military systems. This strong civilian intervention was instrumental in the development of these systems and the concepts for using them in the face of general Air Force indifference if not outright hostility. Assessing the degree of doctrinal innovation during the "Clash of the Titans" period is more difficult. The Services continually proposed innovative doctrinal positions during this time but by the end of this period all of these ambitious plans had been shot down politically. Meanwhile, the top civilian decision-makers did intervene strongly in the doctrine development cycle but, as noted above, their primary purpose was to restrain the

proposed high ground military space plans. The most innovative space-related outcomes of this period such as Project Apollo or the arms control initiatives of the NSAM 156 Committee were only tangentially related to military space doctrine. Likewise, for the "Sanctuary Supreme" period, it is difficult to see much evidence of doctrinal innovation. However, since this is a period of low tensions and low intervention, this lack of innovation in doctrine is predicted by the comparative framework. Clearly, doctrinal outcomes become far more innovative once again during the "Increasing Militarization and Possible Weaponization" period. Of course, SDI is the shining example of an innovative approach in a development related to doctrine during this period but other innovative approaches would include aspects of DoD STS operations, the CELV, and the Congressional response to the MHV ASAT. In those areas without strong intervention, such as the development of space-based wide-area surveillance systems, the military continued along its predicted non-innovative path.

The findings in this area definitely confirm the hypothesis that civilians are more likely to intervene strongly in the development cycle during periods of high tension and that these interventions are likely to produce more innovative doctrine. ICBMs, spy satellites, and SDI, the most innovative developments related to military space doctrine during the cold war era, were all conceptualized and championed by civilians. Indeed, it is difficult to think of an innovative major development related to military space doctrine conceptualized and brought to fruition by the military. At least in the earliest days of the space age the military thought big: General Boushey's doomsday moon base plan was certainly innovative but like so many of these overly ambitious plans it was clearly far removed from the technical and political realities of the period. By the end of the cold war, it seemed that few in the military were thinking in big or innovative ways about space any longer. While the military's restrained approach towards space by the end of the cold war reflected a certain hard-earned maturity, it also virtually insured that civilians would have to do the innovative thinking about space in the future as well.

Summary of Major Relationships Between Military Space Doctrine and U.S National Space Policy

This section briefly reviews the most important findings on the interrelationships between major space doctrine outcomes and doctrinally-related elements of U.S. national space policy. During the "Squandered Inheritance" period, there was a very close relationship between doctrine and space policy. During most of the time that the top leadership within the Eisenhower administration was conceptualizing the technical and political requirements for space-based intelligence collection, military space doctrine was so underdeveloped that it generally did not fully consider more ambitious military space applications. Clearly, civilians were way ahead of the military in conceptualizing and creating the first militarily useful applications of space and it is, therefore, not at all surprising that the space policy and space doctrine of this period were largely compatible and that both reflected the sanctuary school of thought.

By the advent of the "Clash of the Titans" period, this compatible relationship between military space doctrine and national space policy was already strained but these positions would move further apart during the course of this period. The development and operation of spy satellites and the creation and protection of a space sanctuary for their use were the overriding space policy goals of both the Eisenhower and Kennedy administrations. During this same period, however, the unclear security implications of the opening of the space age and very significant superpower tensions prompted the military to embrace high ground doctrinal beliefs more strongly than at any other time during the cold war. The result was the greatest divergence between space policy and space doctrine during the cold war. When considering these widely divergent positions, it is most instructive to note how sanctuary concerns completely dominated over high ground considerations within the U.S. governmental structure. It is also interesting to contrast this ability of civilian decision-makers to completely stifle the programs resulting from military high ground initiatives during this period with the lesser success of top civilian decision-makers in attempting to energize high ground military space efforts during the final period of the cold war.

In the "Sanctuary Supreme" period, military space doctrine again showed more congruence with national space policy. The primary elements of doctrinally-related national space policy during this period were a continuing emphasis on space as a sanctuary and the development of the concept of space-based NTMV for the significant arms control negotiations of this period. After being repeatedly denied the hardware required for more ambitious military space applications, during this period the military came to adapt to the requirements of the sanctuary school and generally neglected to think about space very often or seriously. The major national space policy initiatives during this period, Project Apollo and the creation of post-Apollo space policy goals, were only tangentially related to military space doctrine. Overall, the sanctuary school emphasis of this period matched well with the civil space focus of Apollo and was certainly well matched with the ASTP of 1975.

The relationships between military space doctrine and national space policy became more unclear and complex during the "Increasing Militarization and Possible Weaponization" period. In many ways, the STS seemed to be the focus of U.S. national space policy during this period. As such, STS operations reveal the significant level of friction between DoD and NASA over space policy goals and space transportation policy. Under Secretary Aldridge's struggle to develop the CELV in the face of determined NASA opposition not only revealed the clout of the NRO but also underscored the substantially different launch vehicle requirements of DoD and NASA. In terms of national space policy, one of the most pronounced differences in the area of space transportation policy was the far greater degree of support for the development of a commercially viable U.S. launch industry from DoD than from NASA. The interfaces between space doctrine and national space policy on issues such as space station *Freedom* or the Space Exploration Initiative were quite minimal. Finally, the unclear support for, requirements of, and rationale for the SDI were a primary cause of the disarray in U.S. national space policy objectives at the end of this period which, in turn, also caused much of the continuing confusion in military space doctrine at the end of the cold war.

Summary of Major Interrelationships between Space Organizations and Military Space Doctrine

This chapter must also summarize the major findings on how major doctrinal tenets influenced space organizations and how particular space organizations developed specific doctrinal preferences. During the "Squandered Inheritance" period, there were few major space organizations capable of exerting influence on military space doctrine.

Eisenhower's NSC made U.S. space policy with few inputs from outside organizations. Despite having direct responsibility for the two highest priority space projects of this period, the WS-117L and the Atlas ICBM, the Air Force as a whole put very little thought into space or space doctrine at this time. General Schriever and the WDD were thinking more seriously about space but they had their hands full with technical and bureaucratic issues. General Medaris, von Braun and the ABMA were also thinking seriously about space and hoped to revitalize the downsized and demoralized Army of the new look period through space activities. Before the opening of the space age, however, none of these space-related organizations had very much bureaucratic clout.

The first space-focused and bureaucratically powerful space organizations of the cold war era emerged during the "Clash of the Titans" period. Of course, NASA was the most important of these new space organizations. NASA's creation and charter (especially in the administration's original proposed bill developed by Science Advisor Killian) were a reflection of the Eisenhower administration's emphasis on space for "peaceful purposes" and its sanctuary school focus. NASA was in a precarious position at its inception; it scored a major coup in obtaining the von Braun group from ABMA while working not to offend the Air Force. Another very important space organization, the NRO, was also created at this time in response to Eisenhower's sanctuary focus as well as due to his perception that the Air Force was not handling the development of spy satellites very effectively. The creation of this secret but powerful organization gave the sanctuary school an important organizational advocate within space policy and doctrine development circles. The primary doctrinal emphases of the Air Force as a whole during this time were focused on the high ground school and on the aerospace concept. Both of these concepts flowed from national security considerations but the aerospace concept, especially, also served Air Force organizational interests as well. Moreover, the Air Force pushed very hard for control over the national space program and was especially eager to develop a major military man-in-space program. The final major space organization of this period, AFSC, was emblematic of the Air Force's R & D focus on space hardware development. Conspicuously absent from these organizations is any major group specifically designed around *using* military space applications.

Space-related organizational structures and doctrinal preferences were more stable during the "Sanctuary Supreme" period. With the growth in Project Apollo, NASA had less use for and fewer doctrinally-charged interactions with the military during the first part of this period. After the STS emerged as NASA's primary post-Apollo space objective, NASA was again forced to deal extensively with the military and to structure STS capabilities around Air Force requirements in order to enlist the support of the military in initiating and sustaining the STS program. The NRO undoubtedly reached the peak of its relative influence during this period due to the general emphasis on sanctuary, the lack of attention on other military space doctrinal schools, and the top-priority of arms control and NTMV. The exact extent of the NRO's power and influence is difficult to ascertain due to security classifications in this area but the organizational security interests of the NRO apparently held up very well even against top-level attempts to open up the black world. The NRO's power and outlook undoubtedly also influenced general Air Force attitudes on space during this time as the Air Force as a whole gradually accommodated itself to the sanctuary school. Finally, throughout this period SAMSO continued its R & D mindset and space users still lacked concentrated organizational representation.

Space organizations and related doctrinal issues were again significantly reordered during the "Increasing Militarization and Possible Weaponization" period. The most significant organizational-related space developments during this period were the creation of AFSPACECOM in September 1982 and of USSPACECOM in September 1985. To a large degree, both of these organizations owed their existence to the renewed interest in military space applications as well as to the revival of the high ground school and the emergence of the space control school. The doctrinal influence of AFSPACECOM appeared to be quite limited and it was characterized by a space operator's mindset. USSPACECOM rapidly became the single military organization most committed to the high ground and space control schools during the entire cold war era. Additionally, USSPACECOM moved slightly away from the space operator's mindset of AFSPACECOM and AFSC Space Division by attempting to better serve its users through emphasis on the space user's needs and perspectives. With the development of these new space organizations and the emergence of the potential for new and very significant military space applications, the relative power of the NRO declined during this period but it remained a very powerful force in supporting the sanctuary or at most the survivability schools. The interrelationships between NASA and military space doctrine at this time centered on the STS and the CELV. Finally, the Air Force as a whole had a difficult time adapting to this period. The Air Force did not know how to respond to the SDI and this ambivalence colored all of its subsequent efforts to develop space doctrine. Moreover, Air Force organizational space doctrine moved from a sanctuary focus at the beginning of this period through the survivability school with AFM 1-6 in 1982 and on to the strong support for space control and high ground applications contained in the 1988 Air Force Space Policy statement. By the end of this period it remained quite unclear whether the mainstream space doctrine beliefs within the Air Force had kept pace with these changes in written doctrine or where mainstream Air Force space doctrinal beliefs were heading.

Summary and Implications of the Airpower Development Historical Analogy

The final research question is addressed by reviewing the findings on whether the historical analogy of U.S. airpower development is a useful way of looking at U.S. spacepower developments during the cold war. The question asks whether the U.S. military headed into space along a technical, doctrinal and organizational path during the cold war similar to the course followed by the military in creating ways to exploit the air medium and an independent air force. As this study has illustrated, there are certainly many important similarities between these two developmental paths. However, as of the end of the cold war, spacepower technology, mainstream spacepower thinking, and military space organizations had yet to develop in ways specifically comparable to the three critical steps in the evolution of airpower prior to the creation of the USAF.

The differences in these developmental paths are made clear by noting the lack of spacepower developments during the cold war comparable to the three critical steps in the evolution of U.S. airpower prior to 1947. First, during the entire cold war neither the U.S. military as a whole nor prominent individual military members pushed for a single spacepower demonstration comparable to Billy Mitchell's sinking of the *Ostfriesland* in

1921. While there were countless actual military uses of space at the force enhancement level during the cold war, there were no significant demonstrations of the new types of force applications possible through spacepower. Second, military thinking about space during the cold war did not reach a point where it clearly and consistently supported a high ground doctrine for significant force application from space comparable to the unescorted daylight precision strategic bombardment doctrine developed by the ACTS and embodied in AWPD-1. Various military members and organizations clearly supported high ground space doctrines at various times during the cold war. However, these high ground military space doctrinal beliefs of the cold war era were not as conceptually rigorous, did not come close to enjoying the type of support given to AWPD-1 and, especially, did not lead to the creation of the type of forces required to implement such a doctrine. Finally, during the cold war era there were not significant calls from within the military for the creation of a separate space force comparable to the support generated for a separate Air Force by Mitchell's outspoken advocacy. Additionally, there were no combat situations during the cold war which provided lessons comparable to the airpower lessons of World War II which indicated the need for a separate Air Force due to the major strategic and tactical impact of airpower as well as the operational costs of applying airpower piecemeal or subordinating air operations to ground commanders.

Thus, in relation to the three critical steps in the evolution of airpower, by the end of the cold war the U.S. military and military spacepower were not evolving along a similar developmental path in terms of demonstrating spacepower applications, developing and embracing refined doctrine for significant force application missions, and calling for a separate space force. At best, the state of U.S. military spacepower development by the end of the cold war might be considered analogous to the state of U.S. airpower development prior to Mitchell's 1921 airpower demonstration. No Alfred Thayer Mahans or Billy Mitchells of spacepower had emerged from within the U.S. military by the end of the cold war. These comparisons between the actual state of spacepower development during the cold war and the three critical steps in airpower development call into question the utility of the airpower development historical analogy for describing the actual route which was taken by the evolution of U.S. military thinking about space or the actual spacepower developments during the cold war.

This airpower development historical analogy also raises several questions concerning the evolution of U.S. military spacepower thinking during the cold war. First, why was there so little offensively-oriented, high ground military space doctrine developed during the cold war? Were political impediments such as the high degree of top-level civilian decision-maker intervention into the doctrine development cycle and the high level of government and public concern with and focus on space issues the primary factors in inhibiting the development of more ambitious military thinking about space during the cold war? Is it even possible in this kind of environment for the military to develop the type of unconstrained military space doctrine advocated by Lorenzini and Friedenstein? Second, how does the creation of AFSPACECOM and USSPACECOM fit into this historical analogy? Can these new major space organizations play a role similar to the ACTS in the development of spacepower doctrine? Finally, was the type of narrow emphasis on high ground force application missions which did emerge during periods of the cold war era analogous to the first emphasis on *unescorted* daylight precision strategic bombardment in the evolution of airpower doctrine? More specifically, would not spacepower, like airpower, require a balanced mix of space combat forces to achieve any significant force application mission?

Outstanding Research Questions and Future Research Directions

These questions generated from the historical analogy of airpower development lead into a series of other research questions related to this study which remain open. First, how does the role of military man-in-space fit into the evolution of spacepower or conceptually into the space control or high ground schools? The role of military man-in-space is an important aspect of these development from the perspective of both the historical analogy and the actual developments in spacepower doctrine evolution but military man's role in space has not usually been addressed in a conceptual way. Second, how well do the four schools correspond to the actual development of spacepower technology and applications during the cold war? I do not believe that force enhancement, the primary military application of space during the cold war, is adequately integrated into this conceptual framework. For example, is the force enhancement mission significant enough to require a major investment in space control capabilities or are force application missions the first type of military space applications which would justify a major investment in space control capabilities? Several additional open research questions are more general: What are the conceptual relationships between written and implemented doctrine and which type of doctrine is most important to analyze? How do technological developments fit into the doctrine development cycle and directly impact the conceptualization of new doctrine? Finally, how might a model for doctrinal development best account for the state of international relations; the roles played by individual military space organizations; the impact of public opinion and popular support; and the different roles played by the administration, the Congress, and other governmental players?

In concluding this study, let us look very briefly at the major implications of this work for studying the continuing evolution of U.S. military space doctrine in the post cold war era. First, it is appropriate to continue to use the three major steps in the evolution of airpower doctrine as a measure of the continuing evolution of spacepower doctrine. Developments moving towards any of these three prominent steps will provide distinct analogies with particular stages in the evolution of airpower doctrine. Second, in accordance with the model and hypotheses for this study, the degree of top-level civilian decision-maker interest and intervention in the doctrine development cycle has already declined and we can expect this decline to continue. Organizational behavior and organizational behavior preferences should become much more important in the development of military space doctrine in these circumstances. Finally, the role and importance of USSPACECOM in formulating U.S. military space doctrine in these circumstances should continue to expand. The unified command structure of the modern U.S. military bears little resemblance to the organizational structures of the military during the interwar period. It is now more likely that a doctrine development organization comparable to the ACTS would emerge from within USSPACECOM and that USSPACECOM, rather than the Air Force, will become the primary military organizational actor in the continuing evolution of spacepower doctrine.

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