THE POLITICS OF INNOVATIVE MILITARY DOCTRINE: THE U.S. NAVY AND FLEET BALLISTIC MISSILES

by

Owen Reid Cote, Jr.
BA Social Studies
Harvard University, 1982

Submitted to the Department of
Political Science in Partial Fulfillment of
the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

in Political Science
at the
Massachusetts Institute of Technology

February 1996

Signature of Author ______________________________
Department of Political Science
January 1996

Certified by ______________________________
Professor Harvey M. Sapolsky
Thesis Supervisor

Accepted by ______________________________
Professor Barry R. Posen
Chair, Graduate Program Committee

THE POLITICS OF INNOVATIVE MILITARY DOCTRINE: THE U.S. NAVY AND FLEET BALLISTIC MISSILES

by

Owen Reid Cote, Jr.

Submitted to the Department of Political Science
in January 1996 in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy in
Political Science

ABSTRACT

The Polaris and Trident II SLBM weapon systems were developed by the U.S. Navy during periods of major strategic nuclear modernization, when national leaders were concerned about the vulnerability of U.S. Air Force land based nuclear forces to Soviet attack. Both Navy systems provided a superior alternative to bomber and ICBM weapon systems of the time, but only Polaris provoked innovative changes in U.S. nuclear doctrine. These cases of innovative and stagnant doctrine are compared and used to test the explanatory power of three competing theories of the sources of innovative military doctrine. The three theories hypothesize independent, explanatory roles for civil-military conflict, intraservice bargaining, and interservice competition. The first case shows a strong causal link between intense interservice competition, a Navy decision to develop Polaris as an alternative to Air Force land based forces, and an ensuing improvement in the survivability of those land based forces. The second case shows a somewhat weaker correlation between institutionalized interservice cooperation, a Navy decision to develop Trident II as a complement rather than an alternative to land based forces, and the absence of any ensuing improvement in the survivability of those forces. Thus, Polaris caused an innovative change in nuclear doctrine while Trident II did not, and the cases show that differing patterns of interservice relations had more to do with these outcomes than civil-military or intraservice relations. The thesis concludes with a discussion of the sources of different patterns of interservice relations, and argues that civilian defense leaders can manipulate interservice competition to cause doctrinal innovation.

Thesis Supervisor: Harvey M. Sapolsky
Title: Professor of Political Science

BIOGRAPHICAL SKETCH

Owen Reid Cote, Jr received the B.A. degree in Social Studies from Harvard College in November 1983 and the Ph.D. in Political Science from the Massachusetts Institute of Technology in February 1996. He has worked at the Hudson Institute and been a research fellow in the Defense and Arms Control Studies Program at MIT. He is currently Assistant Director of the International Security Program, Editor of *International Security*, and Adjunct Lecturer at the Kennedy School of Government's Center for Science and International Affairs at Harvard University.

ACKNOWLEDGMENTS

When I was an undergraduate, Jeff Weintraub, Shannon Stimson, and Michael Smith presented me with the first intellectual challenges that I found irresistable, and for that I am deeply grateful. As I developed an interest in the study of war and peace, I continued to benefit from good teachers, colleagues, and role models, including John Mearsheimer, Steven Van Evera, Josh Epstein, Paul Stares, Herman Kahn, Kurt Guthe, Frank Armbruster, William Kaufmann, Jack Ruina, George Rathjens, Charlie Glazer, Ashton Carter, Leo Mackay, and Mike Brown. In different ways, they all set examples worth emulation, difficult as that has proven to be in practice.

I am deeply in debt, intellectually and otherwise, to the three members of my dissertation committee. My chairman, Harvey Sapolsky, taught me how to think about organizations, and has supported my efforts to write about them with endless supplies of insight and patience. Barry Posen, whose book *The Sources of Military Doctrine* established the research program that I and many other international security scholars of my generation now pursue, challenged me to clarify and sharpen my arguments, and provided extensive comments on two prior drafts. Steve Miller, who has been saddled for more than 15 years with the task of looking out for me, continued to do so in this endeavor, listening and providing the frank guidance for which he is widely and justly noted.

Finally, I owe incalculable personal debts to Owen Reid Cote, Sr., who I used to think was the greatest hockey player in the world, and who turned out to be the greatest father instead; and to Jennifer Beber, who provided the reason to persevere when giving up had its attractions, and to whom I dedicate this dissertation with love and respect.

TABLE OF CONTENTS

CHAPTER 1: Summary Introduction

This thesis is about the sources of innovative military doctrine in the U.S. during the cold war. This introduction summarizes my argument in five parts. First, I define innovative military doctrine and describe its significance.

Second, I describe three theories of the sources of innovative military doctrine. These theories ascribe independent causal significance to three sets of relationships: civil-military, intraservice, and interservice. Each theory argues that innovative military doctrines will result from conflict in the relationship it considers decisive, and that stagnant doctrine will result when conflict in that area is suppressed.

Third, I identify the parties involved in these relationships in the U.S. Department of Defense (DOD) during the cold war. This discussion provides the context for the test I construct to compare the explanatory power of these three competing theories.

Fourth, I introduce the two cases that I use in this test. In the first, the Navy develops the innovative Polaris FBM system and Finite Deterrence doctrine in conflict with Air Force nuclear delivery systems and doctrine, and in the absence of civilian or internal naval pressure. In the second, the Navy suppresses the

most innovative aspects of the Trident II system in order to avoid conflict with Air Force systems and continues to embrace existing nuclear doctrine, despite civilian and internal naval support for more innovative technology. In both cases, the U.S. was experiencing cold war nuclear vulnerability crises, the Missile Gap of the late 1950s and the Window of Vulnerability of the late 1970s, and it was during these periods when the need for innovative nuclear systems and doctrines was at its peak.

Fifth, and last, I summarize my findings at three ascending levels of generality. Here, I argue that interservice conflict can independently cause radical innovation and that interservice cooperation can stifle it, that civilian leaders control the incentive structure that determines whether the services compete or cooperate, and that civilian leaders have generally encouraged interservice cooperation rather than competition.

The Significance of Innovative Military Doctrine.

What is Military Doctrine? Military doctrine is that set of tools, people, and beliefs about how to employ them in battle that the major organizational elements of the military develop as a guide to fighting wars. Although the military services of the U.S. differ

in their definitions and uses of doctrine, one can think of it as applying to each service as a whole, i.e. Army doctrine; to the major branches or combat arms within a service, i.e. Armor doctrine; or to the interaction between services, i.e. Joint doctrine. In this thesis, I will be focussing on Air Force and Navy doctrines for strategic nuclear forces. In particular, I look at cases where these services, or branches within them, produced both competing nuclear doctrines and cooperative, joint nuclear doctrine. In describing these doctrines I will exploit the fact, noted by Barry Posen, that "Force posture, the inventory of weapons any military organization controls, can be used as evidence to discover military doctrine."[1] Force posture is easier to divine than training and tactics from a distance, and it provides insight into those realms that is hard to obtain directly.

What is Innovative Military Doctrine? Innovation is a word that is often used to describe an improvement or increase in efficiency in an established way of doing business. In this thesis, I use a more restrictive definition to describe a process that is more than an improvement or increase in efficiency.

---

[1] Barry Posen, The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars (Ithaca: Cornell University Press, 1984) p. 14.

Innovative doctrine exploits radically new weapons and/or new beliefs about how to fight, and destroys old, outmoded doctrine. Innovation is akin to Schumpeter's concept of market driven *creative destruction* in civil society where new products, processes, and markets are constantly being created on the wreckage of old ones.[2] This definition makes two important points. First, innovative doctrine occurs on a relatively large organizational scale and usually requires that a military service destroy or thoroughly redirect an important part of itself. Second, and because of the first point, doctrine is difficult to change and radical innovation is rare. Theories abound concerning the causes of stagnant, or uninnovative military doctrine. It is innovative doctrine that is both hard to cause and to explain.[3]

Is Innovative Military Doctrine Important? Innovative military doctrine is important because it is the primary internal response available to a state whose military security environment has changed. Such changes, whether they involve the emergence of new enemies, new alliance responsibilities, or new technologies,

---

[2] Joseph Schumpeter, Capitalism, Socialism, and Democracy (N.Y.: Harper and Row, 1976) p. 83.

[3] Stephen Rosen, Winning the Next War: Innovation and the Modern Military (Ithaca: Cornell University Press, 1991) p. 5.

often undermine and render obsolete existing military doctrine. Battles between forces employing innovative and stagnant military doctrines often result in the catastrophic defeat of the latter. A classic case of such a catastrophe occurred during the fall of France to Germany in the Spring of 1940. During the cold war, national leaders perceived at least two periods when innovative new Soviet nuclear forces threatened the survivability of important elements of the existing U.S. nuclear force structure. In both cases, the elimination of the threat required technical *and* doctrinal innovation on a large scale. In the first case, the threat was quickly eliminated, while in the second it was not. No battles were fought in either case, but the "Missile Gap" *was* decisively closed while the "Window of Vulnerability" remained open.

The Sources of Innovative Military Doctrine.

This thesis sets up a comparative test of three theories of the sources of innovative military doctrine using cases drawn from the U.S. experience during the cold war. The three theories are developed in Barry Posen's The Sources of Military Doctrine, Stephen Rosen's Winning the Next War, and in the next chapter where

I introduce in more detail my own theory. These theories emphasize the independent, explanatory power of, respectively, civil-military, intraservice, and interservice conflict.

Civil-Military Conflict and Innovation. Posen argues that states behave in essentially rational fashion. When security is relatively easy to obtain, civilian leaders ignore military doctrine and allow it to stagnate. When security becomes scarce, those same civilian leaders audit military doctrines, determine the areas requiring innovation, and intervene directly to cause the needed innovation. This causes civil-military conflict. When civilian leaders prevail in these conflicts, innovative military doctrine is the result. As an example, Posen's explanation of the development of integrated air defenses in Britian during the late 1930s is as follows: "The civilians knew what they wanted and set about getting it...The development of an all-new military system in four years was no accident."[4] In the absence of civil-military conflict, Posen argues that innovation is unlikely to occur.

Intraservice Conflict and Innovation. Rosen argues instead that changes in a state's external security environment strike at

---

[4] Posen, Sources, p. 175. Earlier in the book, Posen makes a similar point: "(Civilian) demand created (military) supply, and it did so in response to emerging threats, and in the hope of exploiting political opportunities." p. 169.

the underpinnings of existing doctrine, provoking intraservice conflict over the consequences of these changes between the branches representing the different combat arms within a military service. Gradually, he argues, a new doctrine will emerge that reorders intraservice relationships between branches to accomodate new combat arms more relevant to the changed external security environment. These innovations take a generation to emerge because they proceed "only as fast as the rate at which young officers rise to the top."[5] Rosen's definition of a state's external security environment as those "economic, political, or technological realms that (are) beyond the role of government..., not specific capabilities or intentions of potential adversaries"[6] makes clear his belief that state behavior lacks the instrumental rationality posited by Posen. On the contrary, Rosen argues, civilian interventions designed to cause innovation in response to "the specific capabilities or intentions of potential adversaries" will fail.[7]

Interservice Conflict and Innovation. In the next chapter

---

[5] Rosen, The Next War, p. 105.

[6] Ibid., pp. 64, 74.

[7] Ibid., pp. 8-9.

where I introduce my theory in more detail, I use deductive and inductive logic to make two important theoretical hypotheses. These hypotheses acknowledge and, to a considerable extent, are derived from the two theories described above.

First, I argue that interservice conflict can accelerate doctrinal change begun as a result of civilian interventions or emerging new combat arms within the services. Likewise, interservice cooperation can moderate the innovative effects of civilian interventions and lobbying by internal service branches. Thus, competitive and cooperative patterns of interservice relations can act as powerful intervening variables affecting doctrinal innovations originally caused by other factors.

Second, I argue that interservice conflict can act alone and independently to cause innovative military doctrine, while interservice cooperation can independently suppress such doctrines. I argue that when there is intense interservice conflict, doctrinal innovation can occur even *in the face of* strong civilian and intraservice opposition. Likewise, when the need to preserve interservice cooperation is strong, innovative doctrines can be suppressed even when they have strong civilian and intraservice support.

What were the Sources of Innovative Military Doctrine in the Cold War U.S. Defense Establishment?

Civil-military, intraservice, and interservice conflicts occur between actors of varying familiarity depending on the country and the historical period. My cases are drawn from the United States during the cold war, focussing on questions of nuclear doctrine during two nuclear vulnerability crises. The following provides a brief introduction to the actors in the cold war U.S. defense establishment that the three theories described above would deem important on questions of nuclear doctrine.

Presidents, Secretaries of Defense, and OSD. Theories that treat civilian intervention as an independent cause of innovative military doctrine must, in particular cases, specify particular individuals as being responsible for a particular intervention. For example, Posen cites three civilians as being most important in causing the development of Britain's integrated air defenses during the late 1930s.[8] In the United States during the Cold War, the sources of civilian interventions have varied depending on how

---

[8] The three were Prime Minister Stanley Baldwin, Sir Percival Cuncliffe-Lister, and Sir Warren Fisher. Posen, Sources, pp. 172-173.

power has been distributed within the executive branch during the different presidential administrations. One can imagine a continuum of possible distributions of power, ranging from ones where authority is concentrated in the White House, to ones where authority is delegated to the Secretary of Defense, to ones where authority is further dispersed to Undersecretaries and Assistant Secretaries within the Office of the Secretary of Defense (OSD). Broadly speaking, these points on the continuum roughly correspond to the three styles of management that characterized U.S. defense policymaking during the cold war under President Eisenhower, Secretary McNamara, and within OSD from Secretary Laird onward.

Under Eisenhower, the White House was the locus of the most important defense policy decisions. The services rarely unanimously agreed on a defense program during the 1950s, and they routinely bypassed the Secretary of Defense to bring their contentious and often public splits to the President for resolution. By the end of his administration Eisenhower had tired of this constant conflict and he implemented a series of reforms designed to strengthen the Secretary of Defense and OSD so as to better contain and manage service budget disputes within DOD.

McNamara was the first and only Secretary of Defense to fully exploit the new powers given the Secretary and OSD by Eisenhower's

reforms. He concentrated decision making power within OSD so that, during much of his seven year tenure, the services had no recourse in the White House. In the midst of McNamara's tenure, the services decided to band together as a corporate body within the JCS and present a united front to OSD, thus finally ending the interservice conflict that had been ubiquitous during the previous twenty years. This constant opposition from the JCS, together with the war, slowly ate into McNamara's and OSD's dominance of defense policy.

Under Laird and largely ever since, Secretaries of Defense have sought unanimous JCS support for their policies in order to present a united DOD front within the executive interagency process and in front of Congress. In practice, Secretaries have focussed on DOD's external relations, while Deputy, Under, and Assistant Secretaries have increasingly shouldered the internal management function.

Naturally, these descriptions are ideal types and reality was always more complicated. Under Eisenhower, lower level officials in OSD and in the service secretariats did launch successful interventions in service doctrine relating to ballistic missiles, Assistant Air Force Secretary Gardner's role in starting the Atlas program being an example drawn from my first case. During the

McNamara years, the services did manage to appeal OSD decisions in the White House on occasion, the ABM decision in 1967 being a case in point. Finally, Secretaries of Defense since Laird have not completely delegated the internal management function to their deputies, Schlesinger's intervention to promote improved accuracy submarine launched ballistic missiles (SLBM) being an example drawn from my second case.

The Services and the JCS. The three rough patterns of civil-military relations described above have interacted with two patterns of interservice relations. During the 1950s and into the 1960s, the services engaged in a continuous set of bitter and open battles over roles, missions, and budgets. The most bitter of these battles occurred over ballistic missiles during the Missile Gap years of the late 1950s when all three services promoted their programs at the expense of the others. New doctrines were often used as a weapon in these debates, with the Navy and the Air Force in particular fashioning opposing nuclear doctrines that undermined the case for new land or sea based forces respectively. As indicated above, these conflicts were settled in the White House under Eisenhower and in OSD under McNamara. In the latter case, OSD involvement also extended to the universe of programs that were not the subject of rancorous interservice debate. Increasingly,

the services came to see OSD rather than each other as the primary threat to their budgetary and programming authority.

In 1964, the retirement of Generals Taylor and Lemay and the appointment of General Wheeler as Chairman of the JCS caused an end to open interservice conflict. Taylor and Lemay were holdovers from the bitter fights of the Eisenhower years and found cooperation difficult. More important than their departure was Wheeler's promotion from Army Chief to Chairman. As Chairman, Wheeler refused to pass along split positions from the JCS up the chain of command. Instead, he insisted that the chiefs hammer out a consensus JCS decision before he would pass it along for OSD or White House approval. This unanimous JCS front was increasingly successful in contesting McNamara's and OSD's domination of defense policy, with President Johnson's decision to overrule McNamara in favor of the JCS on ABM deployment in 1967 being a prime example.

The interservice cooperation that developed in opposition to McNamara's OSD continued with OSD's encouragement under Laird and ever since. Here Secretaries of Defense of the 1970s and 1980s have sought a united DOD just as Wheeler sought a united JCS in the 1960s. In response, successive JCS Chairman have continued Wheeler's practice of suppressing potential JCS splits by brokering least common denominator, log-rolled solutions to interservice

conflicts privately, within the confines of the "tank" where JCS meetings are held. Robert Komer, a Carter administration OSD official, referred to this JCS behavior as resulting from the "rule of unanimity," more than twenty years after it was established in 1964.[9]

The Services and their Branches. The rule of unanimity governing interservice relations during the last twenty-five years of the cold war normally applies with even greater force to relations between the branches or combat arms within a service. This is because one or several branches normally dominate the others as the decisive arms in battle and thereby gain control of the internal promotion process within the service as well. Thus, the intraservice environment is normally much more hierarchical than is the interservice one. Each service experienced significant shifts in the balance of power among its constituent branches during the cold war but, with two exceptions (Air Force missiles and Army helicopters), the combat arms organized in separate service branches have remained remarkably constant in all the services since World War II.

---

[9] Robert Komer, "Strategymaking in the Pentagon," in Robert Art, Vincent Davis, and Samuel Huntington (eds), Reorganizing America's Defense: Leadership in War and Peace (N.Y.: Pergamon-Brassey's, 1985) p. 213.

The Army. The major Army combat arms are Infantry, Armor, Artillery, and Aviation in descending order of current representation within the higher Army command. Aviation was added to the first three combat arms as a result of the large scale development and deployment of helicopters during the 1960s. The Armored branch largely replaced the Cavalry branch during the interwar period, while the Infantry and Artillery branches date from the earliest days of Washington's Continental Army. The balance between the first three branches has remained relatively constant during the Cold War, and aviation never challenged their supremacy after its formation. The Army lost an emerging new branch during the interservice battles over ballistic missiles I describe in my first case.

Of the three services, the Army has the most tightly integrated set of branch relationships. The title "General Officer" still denotes the loss of branch affiliation that occurs when soldiers rise above field grade rank. This tight integration is reflected in the Army's approach to doctrine. Army doctrine lays out in great detail the role of the combat arms and how they are to be combined on the battlefield. In this respect, Army doctrine is focussed on adjudicating and integrating intraservice relationships.

The Air Force. The Air Force is superficially similar to the Army in the sense that its rank and staff structures are drawn from what was the parent organization before 1947. In other respects the Air Force could not be more different. Compared to the Army, the Air Force is essentially a single combat arm organization whose doctrine is more oriented toward the resolution of interservice relationships. The Air Force did pick up a new combat arm in the form of ballistic missiles during the same period when the Army was losing its ballistic missile branch. Also like the Army, the Air Force never promoted the officers in its newest branch at the same rate that it promoted officers in the older one. Pilots remain in complete control of the Air Force.

The closest approximation to intraservice conflict in the Air Force occurs between the pilots of different combat aircraft. Here, there were some considerable shifts in power during the cold war. Bomber pilots from the Strategic Air Command (SAC) dominated the Air Force until the mid-1960s. After that, fighter pilots from the Tactical Air Command (TAC), especially those specializing in air-to-air combat, came to dominate. Fighter pilots specializing in the delivery of conventional air-to-ground ordnance have never dominated the Air Force and their aircraft are generally designed

first with the air-to-air mission in mind.[10] Other pilots flying aircraft for airlift, refueling, reconnaissance, radar early warning, and other support missions reach the top command echelons much more rarely even though their aircraft consume a large portion of the Air Force's operating and investment budgets.

The Navy. The Navy consists of four branches representing the four major naval platforms it deploys - aviation, submarine, surface, and amphibious warfare. These platform communities are different from Army combat arm branches because each platform community supports several quite different missions, some independent and some in combination with parts of other platform communities. Furthermore, the Navy's platform communities are traditionally much more independent of each other than are the combat arms in the Army because the Navy as a whole is probably the most decentralized of the four services. Doctrine within these communities and among them is put together in decentralized fashion and often changes.

The aviation, submarine, and amphibious warfare communities

---

[10] This trend has become particularly pronounced since Vietnam with the development of both the F-15 and the F-22. Much less support exists among fighter pilots for purpose-built air-to-ground strike aircraft like the F-111 or the F-117. See Richard Hallion, "A Troubling Past: Air Force Fighter Acquisition since 1945," *Airpower Journal*, Winter 1990, pp. 4-23.

emerged from World War II in a Navy that was largely dominated prior to that war by what is now called the surface warfare community, i.e. battleships, cruisers, destroyers, and frigates. The aviation community dominated the Naval high command during the 1950s, to be joined by the submarine community from the 1960s onward. The navy did not gain a new branch during the introduction of ballistic missiles as the Air Force did. Rather, ballistic missiles were integrated into the existing submarine community.

The Marine Corps. The Marines, like the Army, have multiple combat arms including fixed wing aviation which are combined on the battlefield. Unlike the Army, the infantry branch is completely dominant in the Marines. The relationship between the Navy and the Marines is much more integrated than the one between the Army and the Air Force, while the relationships between the Marines and the Air Force and the Army are much less integrated. In the former case, doctrine is well developed and largely cooperative while it is more confrontational and less developed in the latter case.

Like the Air Force, the Marines are dominated by a single branch, infantry, focussed largely on a single set of missions, amphibious or expeditionary operations. Also like the Air Force, the Marines as an organization remain somewhat insecure in their relationship to the other services because of their doctrinal focus

on a single mission. Should that mission be discredited, the case for independence and organizational autonomy would be compromised and the case for greater integration into the land based services strengthened.

Cases of Innovative and Stagnant Military Doctrine.

I use two cases to compare and test the explanatory power of the three theories described above. In the first case, during the Missile Gap crisis of the late 1950s, the Navy's development of the Polaris Fleet Ballistic Missile (FBM) system began a process of technical and doctrinal innovation in both the Navy and the Air Force that revolutionized U.S. nuclear forces and doctrine, leading to the deployment of the nuclear triad, the abandonment of other obsolete nuclear systems, and the replacement of the massive retaliation doctrine with flexible response. Later, during the Window of Vulnerability crisis of the late 1970s and early 1980s, the Navy's development of the Trident II FBM system failed to exploit new technological and doctrinal opportunities, thereby justifying continued investment in the now outmoded land based legs of the triad, and preventing the emergence of a new nuclear doctrine based on a withholdable response. In both cases, the

developmental history of the two Navy FBM systems provides a window into the roles of civilians, the services, and the service branches in causing doctrinal innovation and stagnation.

Polaris. Polaris was the fifth ballistic missile program begun by the Eisenhower administration in the late 1950s. The Air Force's ballistic missile program began with the Atlas ICBM program and it was largely the product of a civilian intervention by the Air Force secretariat. Almost immediately, the Titan ICBM and Thor IRBM programs were added to Atlas. The Army's ballistic missile program consisted of the Jupiter IRBM system which was the product of ongoing missile development efforts by the Army's emerging missile branch at Redstone Arsenal. These two service missile programs, to the extent that they were innovative, are easy to explain as a result of civil-military and intraservice conflict respectively. Polaris can be explained by neither of these two types of conflict, yet Polaris was the only one of all of these missile systems which was innovative enough to survive the early 1960s and become a major element of the U.S. nuclear force structure.

The Navy did not have an internal branch responsible for ballistic missile development as did the Army. There were some advocates for ballistic missiles within the Navy but they, like

their more organized Army counterparts, favored liquid fuels and were as, if not more interested in space boosters as they were in weapons. Like the Air Force, the Navy had a guided missile program that focussed on cruise not ballistic missiles and was kept under tight control by the aviators, the branch most threatened by missile development in general. All the established branches of the Navy were opposed to ballistic missile development, and its advocates lacked the organizational base to resist this opposition. The Navy also did not experience the degree of early and sustained intervention by civilians in favor of missiles that the Air Force ballistic missile program experienced. On the contrary, civilians were opposed to a Navy ballistic missile program, considering it wasteful on top of the four Air Force and Army programs already underway in 1955.

On the other hand, the Navy in this period was in the midst of an intense series of interservice conflicts over roles, missions, and budget shares that sharpened in the mid-1950s during the drawdown after the Korean War. There were two views about how to approach these conflicts held in the naval command. The first argued that the Navy should avoid battles with the Air Force and preserve its existing budget share by not losing such battles, as it had in the late 1940s during the B-36 versus Supercarrier

debate. The second argued that the existing Navy budget share would be lost as more and more of the defense budget went into Air Force and Army ballistic missile programs unless the Navy developed a superior system of its own, thereby causing the interservice battle that the first group sought to avoid.[11] The second view won, in the form of Chief of Naval Operations (CNO) Admiral Arleigh Burke, and the new CNO began the torturous process of pushing the Polaris program through the near unanimous opposition of OSD civilians and the Navy's own internal branches.

Just as Polaris' development was provoked by interservice conflict, its' development also caused further interservice conflict, particularly with the Air Force. As the first solid fuel missile, Polaris caused the Air Force to reconsider their solid fuel program. In short order, and without significant civilian or intraservice support, the Air Force rapidly shifted resources to the solid fuel Minuteman ICBM program to protect their programs from the "Polaris threat." Together, Polaris and Minuteman quickly replaced the previous four liquid fuel missile programs at much less cost and with much more survivability. The success of Polaris

---

[11] See David Rosenberg, "Arleigh Albert Burke," in Robert Love (ed), *The Chiefs of Naval Operations* (Annapolis, MD.: Naval Institute Press, 1980) pp. 277-278.

and Minuteman set an operational standard that also caused the cancellation or retirement of other less capable, largely Air Force systems like Snark, Navaho, Skybolt, the B-70, the B-47, and the B-58. Out of this wreckage emerged the triad of SLBMs, ICBMs, and B-52s that revolutionized the security of U.S. nuclear forces and allowed the replacement of the Massive Retaliation doctrine with Flexible Response.

Trident II. Unlike Polaris, Trident II enjoyed the support of civilians in OSD and the support of at least one internal branch of the Navy from the beginning of its development. At the very beginning, the Trident II SLBM required a new SSBN because of its size. Trident SSBN development was provoked by the White House in the early 1970s. *Several* branches of the Navy vied to promote their preferred design for the Trident SSBN. Once those disputes were settled, the Trident SSBN was put on a highly accelerated development schedule designed to achieve initial operational capability (IOC) in the late 1970s. In the event, IOC was achieved in the early 1980s.

After Polaris, the Navy settled on a doctrinal niche for its FBM program within Flexible Response. This niche was the assured destruction or countervalue mission of retaliation against the Soviet urban-industrial complex after an attack. The desire to

limit FBM development to fulfilling the technical demands of this doctrinal niche had a profound influence on Polaris' successors - Polaris A-3, Poseidon, and Trident I. Once the Trident SSBN had been defined, the much greater size of its launch tubes made clear that the Navy could combine in a new Trident II SLBM the long range and survivability of its predecessors with greatly increased payload or throwweight. With further improvements in accuracy and the deployment of new joint, satellite-based command, control, and communication (C3) systems for both land and sea based systems, the Trident II could perform both the traditional Navy countervalue mission as well as what had become the traditional Air Force counterforce mission. Such a program would undoubtedly provoke interservice conflict with the Air Force which was attempting to justify expensive new ICBM and Bomber modernization programs on the basis of their allegedly unique capabilities to perform parts of the counterforce mission. The key to such a scenario lay in the development of technologies for improved SLBM accuracy and improved SSBN communications. There was strong civilian and internal naval support for developing both sets of technologies.

Pressures for improved SLBM accuracy emanated from a number of civilian sources in OSD and in industry. The decisive intervention was by Secretary of Defense Schlesinger who, with the then CNO

Admiral Zumwalt's blessing, personally convinced Admiral Smith, the Director of the FBM program, to implement an Improved Accuracy Program (IAP) for SLBMs beginning in 1974. The IAP was also supported by the nuclear planning office within Admiral Zumwalt's staff. Pressures for improved SSBN communications grew later in the decade as the Navy let its airborne communications relay fleet degrade in anticipation of a new system using extremely low frequency (ELF) radio. An alternative or a complement to ELF, pushed by OSD and the Navy Electronics Lab (NAVLEX), was to use extremely high frequency (EHF) satellite communications (SATCOM) of the same type then being pursued by the Air Force in their Strategic Satellite System. EHF SATCOM would provide all nuclear forces survivable, two way C2 capabilities. By the late 1970s, both sets of technologies had been proven. Newly instrumented Navy missile test ranges had shown the FBM program the sources and means of correcting SLBM inaccuracies, and prototype EHF SATCOM systems had been flown with great success by MIT's Lincoln Lab for the Air Force and for NAVLEX.

Despite these advantages compared to Polaris, Trident II's development was much slower, and its exploitation of new technologies less complete. Even given civilian and intra-Navy support, the Navy FBM program and the SSBN operational community

did not want to leave their traditional doctrinal niches. The Strategic Systems Program Office (SSPO) resisted optimizing the Trident II for the counterforce mission and the operators resisted the deployment of EHF SATCOM on SSBNs.

In the end, Trident II was deployed with accuracy equal to MX and higher yield warheads, but SSPO did succeed in keeping the Trident II's much improved counterforce capabilities under wraps until well into the 1980s. Likewise, SSBN command systems were also improved and made as effective as those supporting land-based forces, but these improvements, though dramatic, remain largely unnoted and continue to leave unexploited the full potential of the submarine platform. SSPO and the submarine community did not encounter serious opposition to their efforts to underplay the capabilities and delay the deployment of the Trident II. In fact, civilians in OSD in both the Carter and Reagan administrations and the Navy as a whole cooperated with SSPO in portraying Trident II as an evolutionary rather than a revoultionary departure from prior FBM systems. For all of these actors, a rapid and technically ambitious Trident II development program clashed with the perceived need to avoid the kind of intense interservice conflict that both provoked and resulted from Polaris' development.

The need to preserve an atmosphere of interservice cooperation

argued against Navy strategic programs that interfered with the rationale for new Air Force ICBMs and Bombers. The latter programs were much more important to the Air Force than were SLBMs to the Navy, and interservice cooperation made it easier for all the services to justify their most important programs. Thus, continued cooperation made sense for the Navy. Continued cooperation also made great sense to SSPO which was not a powerful intraservice player and was therefore not worth a fight with the Air Force to the mainstream Navy if such a fight might threaten more important programs like an Aircraft Carrier. Finally, interservice cooperation remained an imperative to civilians in OSD intent on maintaining a united DOD front in the executive branch and in front of Congress.

The need to preserve interservice cooperation in this second case had a number of ripple effects that were the inverse of those that emanated from the interservice competition that characterized the first case. Because Trident II's capabilities remained largely undeveloped, public debate over systems like B-1, MX/MPS, B-2, Midgetman, and Rail Garrison MX presumed that these ICBM and Bomber programs were the only means available for the second strike counterforce mission. Later in the 1980s, as Trident II's counterforce capabilities became clearer, these land based systems

were justified because of their allegedly superior communications compared to SSBNs. Only in 1989 did it become clear that all systems - land and sea based - had come to rely on the *same* airborne and satellite based communications, that counterforce capabilities no longer varied across legs of the triad, and that land based forces possessed unique drawbacks rather than advantages.

In particular, the suppression of a robust Trident II alternative led to the 1983 Scowcroft Commission recomendation to base MX in vulnerable Minuteman silos, since no alternatives to MX's prompt counterforce capabilities were on the planning horizon. This deepened the dependence of U.S. nuclear forces on the use of tactical warning of Soviet attack for survival, and further reinforced already existing Air Force doctrinal proclivities to use all their forces immediately in an inflexible response rather than lose them. Alternative doctrines based on concerns with command system vulnerabilities and the dangers of accidental or inadvertent escalation depended on a survivable and withholdable force structure. Until Trident II was deployed in 1989, no element of the triad combined withholdability, reliable C2, and counterforce. Even after Trident II was deployed, the operational constraints of the less capable land based forces continued to limit a planning

process that was, in turn, still dominated by the Air Force.

Even with the end of the Cold War, the urge to modernize and maintain the land based legs of the triad continued. In response, Congress authorized a major study by the General Accounting Office, reviewing the essentially continuous strategic modernization program that had begun after SALT I, and which now spanned the Carter, Reagan, Bush, and Clinton Administrations. This study concluded that the capabilities of sea based forces, and of Trident II in particular, had been systematically understated throughout this period, and that the capabilities of new land based forces like the B-1, MX, the B-2, and Midgetman had been systematically overstated. It recommended against further land based strategic nuclear modernization, and for continued modernization of the sea based leg with Trident II.[12] The Clinton Administration followed a very different course after completion of its Nuclear Posture

---

[12] The eight volume GAO study was commissioned in 1990 by Congressman Fascell of the House Foreign Affairs Committee and completed in 1992. Unfortunately, it is classified. A short unclassified summary was inserted in *Congressional Record - House*, September 29, 1992, H9861-H9864. A much longer and more detailed unclassified summary was released in 1993 at a hearing on the report held by the Senate Governmental Affairs Committee that also included testimony by the Deputy Secretary of Defense William Perry. See *Evaluation of the U.S. Strategic Nuclear Triad*, Hearing Before the Senate Committee on Governmental Affairs, 103rd Congress, June 10, 1993, pp. 1-128.

Review.[13]

Innovative and Stagnant Doctrine. When Massive Retaliation was codified in 1953 as the Eisenhower administration's nuclear doctrine, Soviet nuclear forces capable of striking the U.S. remained nearly non-existent. As Soviet intercontinental capabilities grew, or as fears of these capabilities grew over the course of the decade, Massive Retaliation evolved into a doctrine that would have more aptly been called Massive Preemption. This doctrine was dangerous for several reasons, the most important danger being the anticipated vulnerability of U.S. forces to *Soviet preemption*. Polaris and Minuteman allowed a shift to a doctrine called Flexible Response which would have been more aptly named Massive Preemption or Retaliation. When Flexible Response was first instituted, Soviet forces were still small, vulnerable, and slow to generate. By the 1970s, Flexible Response had evolved into a doctrine for a very Inflexible Response, in which retaliatory operations in the face of much larger, more capable, and swifter Soviet attacks depended on the immediate exploitation of tactical warning for survival and were largely *indistinguishable* from

---

[13] See William Perry, "DOD Review Recommends Reduction in Nuclear Force," News Release, DOD Public Affairs, September 22, 1994.

preemptive operations based on strategic warning. Throughout the 1970s and into the early 1980s, civilian leaders declared their interest in a doctrine that allowed a truly flexible, withholdable response along with the now traditional option for counterforce preemption, and which would allow them to escape the "use or lose" bind that vulnerable, unwithholdable land based forces placed them in. This new doctrine never developed the organizational support that had helped Flexible Response in the early 1960s at least partly because the Navy chose not to use Trident II as a weapon to gain budget share at the expense of the Air Force, as it had with Polaris.

Explaining Innovative Military Doctrine.

The Sources of Innovation. The cases show that when there is intense interservice conflict, doctrinal innovation can occur even in the face of strong civilian and intraservice opposition, as it did with Polaris and Minuteman. They also show that the need to preserve interservice cooperation can suppress innovative doctrine even when that doctrine has civilian and intraservice support, as it did with Trident II. Interservice conflict needs therefore to be considered a powerful and independent source of innovative

military doctrine.

Interservice conflict also accelerates other conflicts that can be sources of innovation. In the first case, interservice conflict reduced the Air Force's resistance to Secretary Gardner's intervention on behalf of the Atlas ICBM program. Interservice competition also reduced the opposition of the other Army branches to the emerging missile branch's Jupiter IRBM program. In both cases, interservice competition was a powerful intervening variable that helps to explain the rapid acceleration of Atlas and Jupiter at the outset of the Eisenhower ballistic missile programs.

The Sources of Interservice Conflict and Cooperation. The cases also show that competitive and cooperative interservice relations reflect collective service responses to an incentive structure that is largely controlled by civilian leaders. Four variables determine the nature of this incentive structure.

Civilian leaders determine both how overall defense budget levels are determined, and how service budget shares are allocated within that topline. These leaders also determine who has the initiative in determining what programs will be supported by a service's budget. Finally, civilian leaders determine the process that produces an administration's defense policy, the bureaucratic role that policy plays, and its content. By manipulating these

variables, civilian leaders during the cold war have consciously or inadvertently caused the services to compete or cooperate with each other. By and large, civilian leaders have desired interservice copperation over interservice conflict.

The Sources of Civilian Desires for Interservice Cooperation. With the exception of McNamara, all cold war civilian leaders in the U.S. have declared their opposition to interservice competition. Eisenhower bemoaned the interservice competition that plagued his administration, even though his management style seemed designed to cause it. McNamara planned to exploit interservice conflicts but his management style seemed designed to suppress them, as it did in 1964 when General Wheeler became JCS Chairman. Ever since 1964, interservice cooperation has reigned, and ever since 1968, with the arrival of Laird as Secretary of Defense, this cooperation has been actively encouraged and sustained by OSD.

Civilian leaders, particularly in OSD, have sought to encourage interservice cooperation for several reasons. First, competition forces choice and civilian leaders have generally pursued options and flexibility. Second, competition, when it is loud and open, encourages interventions by others. Thus from OSD's perspective, interservice competition encourages intervention by other members of the executive branch in the NSC or the White

House. From an administration's perspective, interservice conflict encourages congressional interventions. Third, competition is nasty and is generally perceived to be a sign of a lack of effective management. Many believe that competition in a bureaucratic setting contributes to waste, fraud, and duplication. Finally, interservice competition is perceived to undermine and pollute what is now called the joint operational environment. In this view, services competing with each other for roles, missions, and budget shares can not be expected to cooperate on the battlefield.

An Outline of the Following Chapters.

Five chapters follow this introduction. In the second chapter, I describe in more detail the core hypotheses of the theories of doctrinal innovation of Barry Posen and Stephen Rosen and introduce, using both deductive and inductive reasoning, my theory of the role played by interservice competition.

In the third chapter, I describe and show the relevance of the two cases I use to test the explanatory power of these three theories. The two cases look at the Navy's response to two cold war nuclear vulnerability scares or "gaps" - the Missile Gap and

the Window of Vulnerability. In the first, the Navy produced a radical doctrinal innovation, while in the second it did not and its doctrine remained stagnant.

In the fourth and fifth chapters, I show the causes of these innovative and stagnant Navy doctrines. These explanations result from a comparison of the civil-military, intraservice, and interservice politics of the Polaris and Trident II programs. These cases show the powerful, independent causal effects that competitive and cooperative patterns of interservice relations have on military doctrine.

In the sixth and final chapter I summarize the effects of competitive and cooperative patterns of interservice relations, show that civilian leaders determine which pattern of interservice relations will obtain, and explain why these civilians consistently chose cooperation over competition during the Cold War. I conclude this final chapter with a plea to future civilian and military defense leaders that they reconsider the benefits of interservice competition as a source of radical doctrinal change in the post Cold War U.S. military.

CHAPTER 2: Theory and the Sources of Military Doctrine.

Theories of State Behavior.

Balance of power theory and organizational theory vie to explain the sources of state behavior in the realm of international politics. Each theory presumes a structural source for state behavior and assumes that the quality or effectiveness of state behavior is determined by that source. Balance of power theorists argue that state leaders are driven by the anarchic and self help nature of the state system to make and implement policies designed to produce security, and that they do so by marshalling the power of their states in reasonably rational and unitary fashion. Organizational theorists argue that state behavior is the aggregate output of organizations and bureaucracies within the state which are largely beyond the control of statesman and which often act in contradictary and uncoordinated ways to preserve their own rather than the state's security.

These two theories therefore provide contrasting pictures of how power is distributed within states. Balance of power theory has Hegelian roots in the sense that ideas dominate the material

world. Statesman, in this formulation, dominate the organizational instruments that comprise the modern state. Organizational theory has Marxian roots, in that ideas form a superstructure that reflect rather than determine the underlying laws of material development. Statesman, in this formulation, are unable to control the organizational instruments of the modern state.

One way to focus the debate between balance of power and organizational theory is to examine the sources of innovative military doctrine. Military doctrine is the chosen combination of people, technology, and tactics that characterizes a military organization or service. These doctrines represent their preferred style of waging war. They also represent the peacetime balance of power and distribution of resources among the component parts or branches of a military service. Changes in a state's international security environment often require radical changes in military doctrine responsive to increased or decreased threats to the national security. Balance of power theory and organizatioal theory predict very different outcomes when these external security challenges arise.

With statesman in command, change in doctrine should be rapid and reasonably effective. State behavior in this case should resemble that of a reasonably rational and unitary actor.

With organizations and bureaucracies in command, one should expect the opposite outcome. State behavior should more closely resemble the habitual and routinized output of a series of autonomous organizational and bureaucratic actors insensitive to the demands of the new security environment. When will military doctrine be innovative and when will it be stable or stagnant? Equally important, assuming the development of innovative military doctrine, is it timely and relevant to the security needs of the state, or is its appearance a matter of organizational serendipity? Finally, what causes military doctrine to be innovative or stagnant?

Competing theories of the Soures of Innovative Military Doctrine.

Two theories compete to explain the sources of radical innovation in military doctrine. Barry Posen argues in The Sources of Military Doctrine that civilian executives cause innovation by intervening to force change from the outside. Stephen Rosen argues in Winning the Next War that such civilian intervention normally fails or is essentially irrelevant. Instead, he argues that doctrinal innovations emerge from within military organizations as a result of gradual and evolutionary changes in the

internal distribution of organizational power which determines the hierarchy among competing organizational factions or subgroups. These competing theories of doctrinal innovation fall within the larger theoretical paradigms described above which provide competing explanations of the sources of state behavior in international affairs.

Posen's theory of doctrinal innovation explains how states modify their behavior in order to integrate their security policies with the externally imposed demands of the anarchic international state system. Civilian leaders interpret those demands and seek to insure that the tools of state power are integrated with them. Thus the structure of the international state system creates pressures external to the state which dominate countervailing pressures internal to it deriving from the interests and objectives of domestic actors within the state. In the case of military doctrine, civilian executives provide the path by which the evolving demands of the state's external security environment dominate organizational and bureaucratic commitments to existing doctrine.

Rosen's theory of doctrinal innovation explains how military organizations succeed in changing themselves despite the fact that the structure of the modern state grants them a high degree

of autonomy and independence from outside pressure and intervention. Here, the structure of the international state system does not dominate the interests of domestic actors within the state, i.e. military organizations. These organizations are capable of rebuffing such external pressures by civilian executives. Their doctrines change in innovative ways as a result of internal structural processes. Their own internal structure is complicated by the existence of a variety of professional communities or sub-groups. These groups have overlapping and evolving capabilities which institutionalize a certain degree of debate over their proper doctrinal division of labor. Doctrinal innovations result when an emerging element within an organization succeeds in an internal political struggle for power over the future of the organization. These internal struggles for power are moderated by tacit rules which limit the resort to external political authority, and therefore tend to unfold at a generational pace rather than in sudden discontinuous bursts of radically innovative behavior, and to be independent of specific external threats.

The independent, causal variables emphasized by these two competing theories are civil-military and intraservice relations. Neither theory assigns causal significance to differing patterns

of interservice relations. One can both deduce and induce good theoretical and empirical reasons why interservice relations deserve more analytical attention as an independent, causal variable in its own right, especially in a multiservice environment like that characteristic of the United States.

If competition between separate branches within a service over roles and missions causes innovation, than it is a natural step to deduce that competition between separate services would have the same effect as well. In fact, the latter form of competition should be more fierce and less constrained than the former when it occurs, because the services are more independent of one another than the branches within a service normally are. Because interservice competition occurs between equally powerful and independent entities, one can also deduce that it would more likely result in the resort to external political (i.e. civilian) authority for resolution. In fact, one could argue that interservice as opposed to intraservice competition might force civilian executives to intervene in the details of military doctrine even if they are normally loathe to do so.

Likewise, there are good inductive reasons for exploring the causal significance of interservice relations. Periods of intense and overt interservice competition in the U.S. during the

cold war have covaried with periods of radical doctrinal innovation. Periods of relative interservice calm, or collusion, have covaried with periods of relative doctrinal stagnation.

The causal significance of interservice relations as a source of innovative or stagnant military doctrine might operate on one of several levels. Different patterns of interservice relations might serve as an intervening variable affecting the pace and scope of innovative behavior deriving from civil-military or intraservice sources. On the other hand, different patterns of interservice relations might play an independent causal role, causing doctrinal innovation or stagnation in the absence of civilian intervention or intraservice competition. Either role, whether as the throttle or the ignition, leads to a further set of questions concerning the sources of different patterns of interservice relations. Again, these varying patterns of competition or collusion could be hypothesized to have civil-military or intraservice sources.

Tests of the explanatory power of differing patterns of interservice relations thus need to show both the effects of interservice competition and collusion and their sources. In assessing the effects of interservice relations, reasonably objective standards of what constitutes innovative and stagnant

doctrine need to be applied to historical cases. If actual cases of covariance between competition and innovation and collusion and stagnation can be shown and explained, than an examination of the sources of interservice competition and collusion can be conducted. Explanations of the sources of interservice relations may serve to benefit one of our existing theories at the expense of the other, or serve instead to generate new theory.

Competing theories of innovative military doctrine point to different patterns of civil-military and intraservice relations as independent, explanatory variables. One can deduce for good theoretical reasons that different patterns of interservice relations might also be a source of innovative and stagnant military doctrine. Periods of intense interservice conflict have coincided with periods of intense doctrinal innovation, and so it also possible to use inductive logic to establish the same link, as well as its opposite. Hypotheses based on both the deductive and inductive logic outlined above need to be tested. These tests should explain both the effects and the sources of different patterns of interservice relations. Before proceeding with the construction of tests of the explanatory power of different independent variables, a more detailed understanding of the dependent variable in question is necessary.

Military Doctrine.

Military organizations are large, functionally specialized bureaucracies, and as such they share characteristics with all large bureaucratic organizations. They are excellent examples of Weber's classic concept of bureaucracy.[1] Military organizations also stand apart as unique in many respects from other bureaucratic organizations because of the special function they provide - the organized use of lethal force on a large scale against other, similar military organizations. In other words, military organizations fight wars against each other. A central activity of any military organization is the development and maintenance of doctrine for fighting wars. Doctrine combines technology and people into tactical formations on a large scale in preparation for conflict whose nature, timing, and locale are impossible to predict. These factors make doctrine, and the organizations which produce them, hard to change.

Technology. One important constraint on the flexibility of military doctrine is the sunk cost inherent in the existing

---

1. Max Weber, "Bureaucracy," H.H. Gerth and C. Wright Mills (eds) From Max Weber: Essays in Sociology (New York: Oxford University Press, 1978) pp. 196-244.

investment in a given set of technologies. These technologies generally take the form of preferred weapon systems. Certain types of weapon systems become the technological centerpiece of a military organization's doctrine. These weapon systems are difficult to engineer and expensive and time consuming to replace. It is always easier to imagine more effective replacements than it is to actually produce them and prove their efficacy. Large military organizations prefer to modify and improve an existing set of technologies, and postpone the day when these need to be replaced in toto. Military organizations are not the only bureaucracies charged with this type of technological conservatism.[2]

An example of the tyranny of technological sunk costs in military doctrine can be drawn from the development of naval carrier-based aviation before, during, and after World War II. Battleships continued to dominate the fleets of the major western

---

[2]. Computing and telecommunications have both been profoundly effected by advances in microelectronics. Before the breakup of AT&T, the computer industry was quicker to exploit these innovative opportunities than was the highly regulated and bureaucratized telecommunications industry. See Kenneth Flamm, "Technological Advance and Costs: Computers versus Communications," in Robert Crandall and Kenneth Flamm (eds) Changing the Rules: Technological Change, International Competition, and Regulation in Communications (Washington, D.C.: Brookings, 1989) pp. 13-61.

naval powers that emerged from World War I. U.S. Navy interwar doctrine continued to focus on surface battles between battleship gun lines, and carrier aviation was tolerated only as an adjunct to this dominant doctrinal paradigm. Only during WWII did the doctrinal emphasis begin to shift toward carrier aviation as the dominant offensive arm. By the end of the war and during the post war period, this doctrinal innovation was completed. This shift in the core weapon system or technology of U.S. Navy doctrine involved enormous change in the industrial base supporting naval ship construction and introduced entirely new scientific and engineering demands. During the latter part of this innovative process, the pace of technological change was spurred by a massive industrial mobilization. Nevertheless, many aviation advocates resented the lag between conception and execution of their new way of war.

People. Along with the sunk cost associated with technology is the sunk cost associated with the people who are trained to operate and support it. Military officers undergo professional apprenticeships of extraordinary length and complexity. They develop highly specialized forms of expertise linked tightly to the operation of particular weapon systems. These skills are not highly fungible even within the same military organization. Thus

naval aviators, submariners, and surface warfare officers can not substitute for one another at the tactical or operational level of naval warfare. Furthermore, wholly new technologies generally require the production of a whole new cadre of specialists to operate them.

Because military organizations depend on stable pools of highly skilled and highly differentiated personnel, they provide institutional mechanisms that create and preserve them. In return for acceptable performance, officers are normally guaranteed a career of at least twenty years. These professional commitments and organizational obligations produce a substantial sunk cost as well. For every battleship or aircraft carrier there are hundreds of naval officers. These officers have spent a substantial portion of their careers training to operate these weapons. Their professional expertise lies in that area and no other. Their future careers depend upon the continued demand for their unique form of expertise. As they rise in rank within the larger service of which they are a part, they tend to act in such a way as to preserve their professional usefulness.

Thus dominant weapon systems produce and empower clans or branches of military officers within an organization. These two elements of any military service's doctrine mutually support one

another. A radical change in one demands a radical change in the other. When new technologies and weapon systems arise they create the demand for new professional skills, but military organizations are dominated by people with an expertise in more traditional weapon systems who are usually loath to engineer the circumstances of their own professional decline or extinction. A generation can pass before the first operators of a new weapon system achieve the professional maturity and rank to institutionalize a place for themselves and their successors in a service's doctrine. In many cases, new weapon systems are suppressed at birth before this process can even begin.

Tactics. Though doctrines are often dominated by a single weapon system, they rarely comprise only one such system. Usually, doctrines contain a series of weapons that must be combined to maximize their individual strengths and weaknesses. Thus armies deploy armor, infantry, artillery, and now rotary wing aviation as separate branches to be combined on the battlefield according to an established set of tactical guidelines. Different armies produce different tactical solutions to the combined arms problem. The pre-1973 Israeli Army was notoriously "tank heavy" compared to the U.S. Army which has always given strong tactical emphasis to artillery and infantry as well. The same is

true of navies and air forces. The post war U.S. Navy was dominated by carrier aviation, but not to the exclusion of anti-submarine and anti-surface platforms. Doctrine simply called for tactical formations which tended to employ ASW and ASUW assets in support of carrier aviation assets. This was not an obvious or automatic doctrinal response, and the surface and submarine communities have resisted it with some success since the immediate post war period. Tactics are an important part of doctrine because they establish the organizational hierarchy among different combat branches within a service on the battlefield.

Tactics are also important in that they provide a window into the differences between services which may largely share the same technology. Tactics establish priorities and routines which are a military service's most intimate signature or personality. Tactics, to the degree that they establish priorities among different combat arms within a service, are also a perpetual bone of contention and evolution. The decisive combat arm seeks to retain its primacy, while the supporting arms are ever on the alert for opportunities to enhance the significance of their role on the battlefield.

Uncertainty. Tactics, technologies, and professional expertise develop hand in hand to form military doctrines under condi-

tions of great uncertainty. These fundamental uncertainties derive from at least three basic sources.

First, wars are rare so doctrines rarely get tested. Military organizations lack the feedback mechanism that most organizations use to test their capabilities.[3] Peacetime doctrinal debates either depend on data from the last war or they occur in a relative vacuum of data. Under such circumstances, they resemble religious feuds more than they do, say, corporate strategy making.

Second, the data itself, when available, is often ambiguous. Theories of strategic air bombardment have justified independent Air Forces since the end of WWI despite the lack of a single case of unambiguous, independently significant success on the battlefield.[4] Victory in battle, at least for the United States, often

---

[3]. Organizations that lack such feedback mechanisms are described by James Q. Wilson as "procedural organizations." James Q. Wilson, Bureaucracy: What Government Agencies Do and Why They Do It (New York: Basic Books, 1989) pp. 163-164.

[4]. Compare, for example, two essays written in the same format about strategic airpower in 1943 and 1986: Edward Warner, "Douhet, Mitchell, Seversky: Theories of Air Warfare," in Edward Mead Earle (ed) Makers of Modern Strategy: Miitary Thought fro Machiavelli to Hitler (Princeton, NJ.: Princeton University Press, 1943) pp. 485-503; and David MacIsaac, "Voices from the Central Blue: The Air Power Theorists," in Peter Paret (ed) Makers of Modern Strategy from Machiavelli to the Nuclear Age (Princeton, NJ.: Princeton University Press, 1986) pp. 624-647.

has many fathers and is somewhat overdetermined. Unfortunately, defeats or failures often also occur in ways that make blame difficult to assign with certainty.[5] During the Cold War, the United States engaged in a series of debates over nuclear deterrence doctrine which were never resolved. In some respects, the same essential debate outlasted the end of the cold war and the breakup of the former Soviet Union.[6]

The scarcity with which true doctrinal tests occur and their inherent ambiguities are compounded by the fact that technological and geopolitical change can often make them rapidly obsolete. Consider the plight of Bernard Brodie in his days as a naval historian on the eve of Pearl Harbor. In a book entitled A Layman's Guide To Naval Strategy, published in 1942, he mounted a passionate defense of the battleship in the face of an onslaught

---

The outcome of the 1991 air campaign against Iraq contiues this tradition of ambiguous outcomes. See Eliot Cohen and Thomas Keaney, *Summary Report*, Gulf War Airpower Survey (Washington D.C.: Office of the Secretary of the Air Force, 1993).

[5]. Compare, for example, the following accounts of the Iranian Hostage Rescue mission: Charlie Beckwith, Delta Force (San Diego: Harcourt Brace Jovanovich, 1983) and James Kyle, The Guts to Try: The Untold Story of the Iran Hostage Rescue Mission by the On-scene Desert Commander (N.Y.: Orion Books, 1990).

[6]. See, for example, Scott Sagan and Kenneth Waltz, *The Spread of Nuclear Weapons: A Debate* (New York: Norton, 1995).

of pro airpower zealotry that swept the country during the build-up towards WWII.[7] Succeeding editions of this similarly titled work in 1943 and 1944 scrambled to catch up with the carrier aviation revolution, accepting for all intents and purposes the terminal decline of the battleship. Two more editions of the same book, in 1958 and 1965, were largely devoted to defending the carrier, which in turn had been declared obsolete, much as the first volume had been devoted to defending the battleship.[8]

A true test, i.e. in real combat, of carrier aviation right up until WWII would have been conducted without radar. Under such conditions, carriers were extremely vulnerable and could not be concentrated into task forces, as Brodie pointed out in his 1942 defense of the battleship. The introduction of radar totally changed the nature of carrier aviation but this did not stop advocates of carrier aviation from making extreme claims for their chosen instrument of war before the advent of radar.[9]

---

[7]. Bernard Brodie, A Layman's Guide to Naval Strategy (Princeton, NJ.: Princeton University Press, 1942) See, in particular, Chapter VIII, "Must All Our Ships Have Wings?"

[8]. Strictly speaking, the battleship itself was a product of the twentieth century. For its origins in Britain in the early 1900s, see Jon Sumida, In Defense of Naval Supremacy: Finance, Technology, and British Naval Policy, 1889-1914 (Boston, MA.: Unwin Hyman, 1989).

Thus, the revolutionary claims of the innovative zealot need to be taken with the same grain of salt as the reactionary conservatism of the doctrinal traditionalist. Furthermore, the zealot may become the reactionary with alarming speed as alliances shift and technologies change. In the face of such uncertainty, organizations fear doctrinal chaos and often cling to the familiar tools at hand.

Interservice or Joint Military Doctrine.

In the United States, a particularly acute form of doctrinal uncertainty derived from its somewhat unique external security environment. From WWII onward, the U.S. was presented with a series of doctrinal choices of great breadth. The combination of continental size, maritime isolation, and advanced industrial developent gave the U.S. enormous flexibility. Far more than other countries, the U.S. was free to interevene in conflicts at times, in places, and with the means of its choosing. Presidents were reluctant to voluntarily constrain their options, thereby

---

[9]. Norman Friedman, U.S. Aircraft Carriers: An Illustrated Design History (Annapolis, MD.: U.S. Naval Institute Press, 1983) pp. 13-14.

creating demands for new doctrines while simultaneously excusing the maintenance of existing doctrines. As a result, the U.S. has been alternatively blessed and burdened with a heterogenous collection of military services and doctrines, overlapping in some dimensions and diverging in others.

The heterogenous organization of the U.S. military into multiple services introduces the complicated concept of joint doctrine. Doctrines are normally defined as belonging to a single organization, and indeed that is how they are developed and maintained. In most countries, this does not really create the problem of joint doctrine because one service is normally considered the preeminent, or "senior" service, just as one combat arm is usually considered the decisive arm within a single service's doctrine. Even great powers of the past have been primarily land or sea powers. During WWII and afterwards, the U.S., with some brief exceptions, has simultaneously pursued independent land, sea and air strategies, and has allowed the continued existence of four major services, the smallest of which approximates the size of the entire military establishment of many other major powers.[10] Each service had a complex set of

---

[10] Here I am roughly comparing the U.S. Marine Corps to the combat forces of the British military establishment.

intraservice doctrinal isssues to manage, and these intraservice issues were always complicated by an overlapping set of inter-service issues. Traditional definitions of military doctrine do well at explaining the intraservice aspects of doctrine, but not the interservice ones.

The process of forming doctrine for combining arms of separate, independent organizations lacks the centralized power and arbitration that exists within a single service. Thus, it creates tremendous uncertainties along the borders of individual organizations where such doctrine needs to be established. Armies distrust the level and quality of support provided by independent Air Forces. Marines distrust the level of support provided by naval carrier aviation. In the U.S. these two areas of joint doctrinal uncertainty were resolved in completely different fashion. The Air Force stripped the Army of its fixed wing aviation, while the Navy allowed the Marines to develop their own fixed wing aviation. In the first case, the doctrinal solution was to organize by platform while the second case defined boundaries on the basis of tasks, leaving the tools necessary to accomplishing the task to the organization with responsibility for it. The issue of platform versus task organizations as a means of setting boundaries in joint doctrinal issues is

only one of several areas which have festered unresolved since the need for joint doctrine was first developed. Good arguments abound on both sides of the debate and they are another major source of uncertainty facing those who form and maintain doctrine.

To summarize, modern military organizations manage tremendous technological enterprises. They train and nurture the careers of professionals to operate the weapon systems produced by technology. Different weapon systems demand different professional and technical skills. They also create the opportunity for different combinations of arms on the battlefield. Choices between these various combinations, and the tactics developed for their use need to be made under conditions of great uncertainty. This uncertainty simultaneously encourages debate and makes such debates difficult to resolve in objective fashion. Military services nevertheless must make choices, and these doctrines, once formed, become difficult to change. Doctrine is formed both within tightly integrated and hierarchical service chains of command, and between independent services that lack an equally strong central authority above them.

The process by which doctrine is formed indicates that it will normally be very hard to change (except, of course, in the

most incremental fashion). Doctrine constitutes a major commitment to a consensus by very large military organizations in favor of an existing set of military practices. Yet, a state's external security environment often evolves in ways that make existing doctrine obsolete. These changes in the external environent can occur at a pace that vastly exceeds the rate at which large organization can reach consensus through normal means that radical change is required. Such circumstances demand innovation where radical rather than incremental change is implemented in a very compressed timeframe.

Radical doctrinal innovation is to a military organization what a revolution is to a political community. In their most extreme forms, innovative military doctrines are as much about the destruction of an old order as they are about the creation of a new one. To use another analogy from the work of Joseph Schumpeter, periods of innovation temporarily introduce into military doctrine and, more importantly, into military organizations the creative destruction that constantly causes economic change under free market conditions.[11] Innovative military doctrines involve

---

11. Creative destruction, in Schumpeter's formulation, is a "process of industrial mutation...that incessantly revolutionalizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one." Joseph Schumpeter,

the erection of new means of fighting wars on the organizational wreckage of old ones. Thus, along with their benefits, these innovations also bear tremendous costs.

Intervention Versus Intraservice Evolution: The Debate Between Posen and Rosen.

Before introducing hypotheses concerning the causal effets of different patterns of interservice relations on military doctrine, it is important to understand the debate between Posen and Rosen over the causal effects of civil-military and intraservice relations. Both Posen and Rosen draw support for their theories by explaining the development of the world's first integrated air defense system by Great Britain in the years immediately preceding World War II and the Battle of Britain. This example of a radical military doctrinal innovation provides a vehicle for further highlighting the hypotheses of their two competing theories.

The Case of Fighter Command. Britain's Royal Air Force (RAF) was the first independent air force. It identified its

---

Capitalism, Socialism, and Democracy (New York: Harper and Row, 1976) p. 83.

independent existence with the legitimacy of the concept of strategic air bombardment. Other uses of airpower did not provide an equally compelling rationale for true independence, and these other uses - or doctrines - remained undeveloped within the interwar RAF. Support for naval, army, and, most importantly, air defense operations lagged significantly behind the doctrinal commitment to strategic bombing. This doctrinal commitment was reflected in the internal organizational structure of the RAF, which was dominated by Bomber Command.

Strategic bombing, and British foreign policy, depended for its credibility on beliefs that "the bomber would always get through," as well as on beliefs that once "through," the bomber could cause decisive, strategically significant damage to the opponent's will or capability. In the late 1930s, the prospect of German bombers "getting through" and causing decisive damage to Britain began to undermine the credibility of British foreign policy in the eyes of its civilian architects. Though strategic bombing remained an element of British military policy, British leaders increasingly came to fear German strategic bombing capabilities to which Bomber Command had no doctrinal counter. By the summer of 1940, such a doctrinal counter had been improvised in the guise of Fighter Command's integrated air defense system

which brought victory in the Battle of Britain.

Fighter Command and the integrated air defense capabilities which it wielded in the Battle of Britain provide a case where a radical doctrinal innovation solved a major grand strategic problem by creating new means of war at the expense of existing ones. Integrated air defenses involved a new technology in the form of radar, a shift in investment away from heavy bombers to new single engine, monoplane fighters, and a command and control system which used radar to guide the fighters to their prey. Posen and Rosen explain these developments quite differently.

Fighter Command and Civilian Intervention. In Posen's view, British civilian executives "knew what they wanted and set about getting it."[12] "Demand created supply, and it did so as a response to emerging threats, and in the hope of exploiting political opportunities."[13] In the case of radar, demand was expressed originally in the formation of the Committee for Scientific Study of Air Defense in 1934. This committee of civilian scientists soon learned of the possibility of determining the range and bearing of unseen objects by detecting and tracking the reflec-

---

[12]. Posen, Sources, p.175

[13]. Ibid., p.169.

tions of transmitted radio waves (RAdio Direction And Ranging = RADAR). On the basis of limited operational tests of a prototype chain of radars in 1937, the decision to build a complete operational system was made and resources were devoted to its rapid implementation. Here, support for the operational system was evident amongst both civilian executives and the RAF, but the former had been more instrumental in the early development of radar.

In the case of fighter planes, such as the Hurricane and the Spitfire, Posen shows that the civil-military battle lines were drawn more clearly. The RAF was devoted to the production of multi-engined bombers. Between 1937 and 1938, civilian executives forced the conversion of Britain's finite aircraft construction base away from bombers to single engine fighters. This shift in emphasis proved timely for Fighter Command in the Battle of Britain, but set back Bomber Command plans for expansion. It was adamantly opposed by the Air Staff and would never have been implemented in the absence of forceful civilian intervention. Posen notes the major contributions to implementing this innovative doctrine made by maverick officers within the RAF, with the most prominent such example being Air Marshal Hugh Dowding, but argues that alone, their efforts would have been suppressed by

the strategic bombardment advocates who dominated the Air Staff.

Fighter Command and the RAF. Rosen provides a very different explanation of these events, emphasizing internal RAF activities during the early 1930s which enabled and provided the doctrinal framework for the later activities emphasized by Posen. In particular, Rosen focusses on the command and control procedures linking sensors and weapons (radar and fighters) in Fighter Command's mature air defense system. He argues that this system derived from a "longstanding interest on the part of the RAF leadership in the problems of command, control, communications, and intelligence in support of defensive fighter operations."[14] "From the early 1920s on, the RAF had been interested in developing the doctrinal and technological infrastructure needed to acquire, process, and distribute information about enemy aircraft to friendly forces."[15]

In the case of radar, Rosen argues that the RAF was as active a supporter for the new technology as were civilian executives. Clearly, RAF officers did not invent radar, but they saw its value once scientists had proven the concept and embraced it

---

[14]. Rosen, The Next War, p. 15.

[15]. Ibid.

as quickly as the civilian executives emphasized in Posen's account. Radar, in Rosen's formulation, "was a round technological peg going into a round doctrinal hole."[16] Likewise, the early development of fast, low wing, single engine monoplane fighters like the Hurricane and the Spitfire also occurred without external prodding. Later, when their production competed with bomber production, Rosen acknowledges the opposition by the RAF to the shift to fighter production cited by Posen. On the other hand, Rosen argues, civilian executives forced this shift through for the wrong reasons. Given a certain fixed production plant, more fighters could be produced than bombers, and Rosen argues that British civilian executives were primarily interested in matching numbers of aircraft with their German rivals rather than in constructing an air defense system.

Rosen also disputes Posen's depiction of Air Marshal Dowding, as well as the general concept of a "maverick" innovater in a professional military context. True mavericks alienate their peers and superiors, and lose the ability to work within their own organizations. Mavericks are not institution builders and, in the end, all innovations must be institutionalized. Instead,

---

16. Ibid.

Rosen depicts Dowding as a mainstream, if somewhat eccentric, RAF officer whose rise to the pinnacle of the RAF high command serves as a reflection of that organization's willingness to entertain doctrinal alternatives to the theory of strategic bombing.

Intervention versus Evolution. According to Posen, the RAF underwent a sharp, discontinuous change in doctrinal emphasis after 1936. Resources were transferred within the organization in order to expand an innovative new branch that met British national security needs at the expense of further investment in a branch that did not. This change was imposed by external civilian forces operating in tandem with otherwise weak internal advocates of change. The change was a calculated response to the German threat, and the outcome was as intended.

According to Rosen, the RAF was an organization which, in the mid 1930s, was primed doctrinally to accept and exploit technological opportunities to develop an integrated air defense system. As these opportunities arose in admittedly random fashion, they were embraced. According to Rosen, the RAF might have been less inclined to believe in air defense in which case civilian intervention would have failed. Though the development of integrated air defenses caused conflict between competing branches of the RAF, the conflicts were generally resolved in a fashion

which allowed the innovative process to unfold. Civilian executives operated along the periphery of this internal evolution and were almost entirely absent from its beginnings. In some cases they supported initiatives which already had support within the RAF. In other cases, they intervened to cause change, but for reasons unrelated to air defense. Except in the most general sense, the internal process of developing integrated air defenses moved at a pace which was largely unrelated to Britain's changing security environment, and was well along the path to maturity before civilian executives became involved.

Deducing An Explanatory Role For Interservice Relations.

The case of the development of Fighter Command highlights the differences between the two competing theories because interservice relations in Britain between the RAF, the Royal Navy, and the Army did not effect debates over RAF doctrine. The Royal Navy, unlike the U.S. Navy, had no aviation lobby because naval aviation was in the RAF[17], while the Army remained unconcerned

[17] Thomas Hone and Mark Mandeles, "Interwar Innovation in Three Navies: U.S. Navy, Royal Navy, and Imperial Japanese Navy," *Naval War College Review*, Vol. 40, No. 2 (Spring 1987) pp. 63-83.

about the total lack of tactical aviation as long as it avoided a continental commitment[18]. Thus, either civil-military or intraservice relations were decisive. With the later development of naval aviation and the establishment of a continental commitment and a mass Army, interservice conflict became more common. Because of the interwar development of naval aviation in the U.S. Navy, interservice conflicts had been prevalent throughout the 1930s, even in the absence of a continental commitment.

It is possible to deduce circumstances in which interservice relations would play a role in causing or suppressing doctrinal innovation independently or along with the roles hypothesized by Posen and Rosen for civil-military and intraservice relations. The structure of interservice relationships shares some similarities with the internal structure of an individual military service. At the same time, there are some profound differences in the way power is distributed between and within military services. The similarities and differences combine to produce a potentially different source of both innovative and stagnant military

---

[18] Once a continental commitment was made, this issue provoked intense interservice conflict in the early years of the war. For Churchill's attempt to adjudicate these disputes during the Battle of France see David Fisher, Race on the Edge of Time (N.Y.: McGraw-Hill, 1988) pp. 148-152.

doctrine. This alternative source can be deduced from the competing hypotheses already marshalled to show the explanatory power of civil-military and intraservice relations.

The Structure of Interservice Relationships. An individual military service is usually a collection or coalition of discrete technologies and concentrations of specialized professional military expertise. Individual technologies or weapons and experts in their use form combat arms which are combined with other such groups according to an organizationally prescribed division of labor and hierarchy. The nature of these combinations, and the tasks which those combinations of arms are designed to fulfill constitute the essence of a military service's doctrine. Rosen has argued that the complexity of these internal structures provides the seeds for an internally motivated process of gradual doctrinal innovation. Changing technologies create opportunities for new missions and new professional hierarchies and therefore cause political struggles for control over doctrine between traditionally dominant members of the service community and innovative advocates of new combat arms and/or new missions. These struggles resolve themselves gradually because they occur in a closed, hierarchical organizational environment where the resort to external political authority is discouraged, and the

intrusion or intervention by such authority is normally rebuffed.

Doctrine often needs to be developed for combining arms across service boundaries. Just as the infantry, armor, and artillery arms of a modern army need to agree on doctrines for their combination on the battlefield, they also need to develop doctrine along with independent air forces for combining ground and air combat arms on the battlefield. Amphibious operations produce the need for developing doctrine to combine naval, air, and ground operations. During the Cold War, U.S. nuclear deterrent policies demanded the development of doctrine for combining and coordinating the capabilities of land based missiles, sea based missiles, and manned aircraft. In all these cases, as well as others, the interservice doctrinal challenge resembles the intraservice one. Combat arms need to be developed, combined, and continually recombined in a highly bureaucratized setting as technology evolves and creates both new opportunities and new constraints.

Thus, in principal, the process of forming and changing interservice military doctrine should resemble the intraservice process described above. In practice the two processes are radically different because of the basic structural differences between intraservice and interservice relations. The combat arms

within a service share the same centralized, hierarchical organization. Though individual services vary in their degree of centralization and hierarchy, they all succeed to varying degrees at socializing their members to place their first loyalties with the parent service rather than with their professional military specialization which defines their place within that service. Thus, even in the U.S. Navy where hierarchies are most diffuse, great efforts are expended, and with some success, to make aviation, submarine, and surface warfare officers loyal first to the Navy and then to their branch. These efforts are even more pronounced in the Air Force and the Army where senior officers lose (or never gain) their affiliation with a particular branch, and become "general" officers. The process of forming doctrine for combining arms across service boundaries confronts this socialization head on. It is perhaps not to strong an analogy to conceive of the differences between intraservice and interservice relations in the same way that differences between domestic and international politics are conceived. Two factors underly this distinction.

First, the branches within a service usually occupy a hierarchy which establishes at any particular point in time the distribution of power between them. These distributions of power

are often unequal, reflecting as they do the perceived dominance of one or several combat arms over the others on the battlefield. Thus, aviators and submariners rose within the U.S. Navy after World War II at the expense of surface warfare officers. Strategic Bombardment aviation rose at the expense of tactical aviation in the U.S. Air Force during the same period. On the other hand, the very concept of maintaining a collection of individual services has, in the U.S., implied a lack of such a hierarchy defining the distribution of power between them. Instead, it implies that they stand alone as independent and reasonably autonomous entities, capable of achieving strategically significant objectives on the battlefield by themselves, or with collateral assistance from other services.

The classic example of this distinction lies in the evolution of airpower doctrine in the U.S. Army before, during, and immediately after World War II. When doctrine focussed on the tactical close support of Army operations, organization reflected this doctrinal consensus by leaving aviation within the army and subordinate within its internal hierarchy to the dominant infantry, and later armor branches. When aviation advocates made the case for independent strategic bombardment capabilities, they were simultaneously making the case for an independent Air Force

alongside rather than within the Army.[19] Tactical support remained an Air Force mission, but it remained collateral to its main, now independent and autonomous responsibilities.

Thus, in the United States, when the combat arms of several services need to be combined, debate over the particular form of the combination takes place horizontally between equals rather than between unequally endowed members of a more vertical chain of organizational command and power. In other states, it is more likely that at least a tacit hierarchy among individual services will exist reflecting either a continental or a maritime security focus. In these cases, interservice relations will more closely resemble intraservice ones.

Second, these interservice debates occur just below a significant dividing line in the vertical chain of organizational command and power within the modern state. The branches within a service argue and negotiate the location of boundaries separating them and the distribution of power and resources among them, and these arguments and negotiations are adjudicated to varying degrees by a central authority. In all cases, the participants are professional military officers expert in various forms of

---

[19] Perry McCoy Smith, The Air Force Plans for Peace, 1943-1945 (Baltimore: Johns Hopkins Press, 1970).

organized violence. The central authority responsible for the adjudication of interservice arguments and negotiations over doctrine is ultimately a civilian one. In the U.S., this authority resides within the Office of the Secretary of Defense (OSD). Civilians executives are not often perceived as experts in the use of organized violence, and their ability to influence the process of forming interservice doctrine will be less than the power of the central staff of a military service to form and influence intraservice doctrine.

Thus, the structure of interservice relations differs from the structure of intraservice relations for two basic reasons. First, power is distributed more evenly between independent services than it is between the individual combat arms branches within a service. Second, power is distributed more evenly between independent services and their civilian masters than it is between individual branches within a service and their military masters. For both reasons, interservice relations should be characterized by different internal dynamics than either civil-military or intraservice ones. One can deduce the means by which intense and overt interservice competition should accelerate or cause by itself doctrinal innovations whose number, rate, or scope would be dramatically less in the absence of such competi-

tion.

Interservice Conflict and Intraservice Evolution. In the theory of gradual intraservice evolution presented by Rosen, two dominant structural factors influence the process. Innovative groups within a service are normally low in the hierarchy of power within their organization, and the tactics available to them to reverse or improve their position are limited to those measures which do not involve the resort to external political authority. They must normally struggle to gain resources and autonomy at the expense of other branches within their service while keeping the ensuing doctrinal debates and negotiations "in house" and out of the public eye. In the absence of civilian intervention, whose efficacy Rosen disputes, it is natural that innovation will normally occur gradually. Interservice competition can upset this formulation in two ways when an innovative group within a service suggests doctrinal innovations with interservice ramifications.

The full development of a new combat arm, and new doctrine for employing it, normally involves the destruction, reorientation, or suppression of an existing combat arm and its doctrine. The advocates of such a process normally must destroy another branch of their own organization. Under some circumstances,

innovative groups within one service can portray their proposals as doctrinal initiatives which come at the expense of another service rather than their own. In other words, they can seek to "export" some of the costs of implementing their new doctrines. For a time during the interwar period, Army aviation sought to portray the long range bomber as an alternative means of performing the Navy's coastal defense mission, rather than as an instrument for conducting independent strategic bombardment campaigns. The latter mission threatened the traditional doctrine of the parent organization of these airpower advocates, while the former mission threatened the Navy - a presumably more amenable prospect for traditional Army leaders.

The same interservice competition can produce the opposite reaction where a service becomes interested in developing a new combat arm even when it comes at the expense of existing ones, in order to fend off the claims of a branch of a rival service seeking a monopoly on the new instrument of war. This is the effect that Army aviation's efforts to export the costs of long range bombers to the Navy had on the Navy's attitudes towards its on internal aviation branch. Though naval leaders were not wont to follow their own internal aviation advocates to the extremes of their doctrinal imaginations, these same leaders were also

unwilling to risk losing all naval aviation to the Army. Out of this conundrum grew a greater commitment to aviation in general, and a more specific commitment to carrier aviation in particular on the part of the traditional Naval hierarchy than would have existed in the absence of Army aviation's doctrinal challenge.

It is interesting to note how in the British case during the same period, none of these interservice dynamics were present because the RAF controlled all aviation - whether it flew from land or from ships, and whether its targets lay on land or at sea. This lack of interservice competition crippled British carrier aviation, while the presence of such competition boosted U.S. carrier aviation. In Britain, the lack of interservice competition contributed to stagnation, while in the U.S. it contributed to innovation. In both of the U.S. examples described above, interservice competition accelerated intraservice processes of innovation which were already underway.

Interservice Conflict and Civilian Intervention. Posen's theory of doctrinal innovation argues that civilian executives are the primary force behind such radical shifts in service doctrine. Civilian executives respond to emerging threats in the external security environment by "auditing" available military doctrine and intervening to change it when necessary. This

theory places a heavy burden on these civilian executives in that they must accomplish two difficult tasks. First, they must detect both the need for new doctrine and the existence of latent alternatives within existing organizations which better serve the state's security needs. Second, once past this conceptual or decisionmaking stage, these same executives must marshal and wield sufficient political power to intervene and actually implement the needed changes. At both stages, Posen's theory acknowledges the important role that professional military mavericks can play in assisting civilian executives. Officers like Marshal Dowding, in Posen's argument, help both to alert civilian executives to doctrinal alternatives and assist them in the political process of implementing them. In the case of Fighter Command, Posen argues that civilian executives succeeded at both tasks.

Interservice competition should improve the prospects of an innovative process based on civilian intervention because it should reduce the burden placed on civilian executives and increase the stature of professional military mavericks or internal advocates for radical doctrinal innovation.

Normally, as both Posen and Rosen argue, internal advocates for radical doctrinal change are suppressed by their parent service if they press their claims for change too vigorously. As

noted above, when these advocates for change pose their proposals in ways that the costs are exported to another service, the receptivity of their parent service is often improved. More importantly, when the claims of a rival service threaten a service with the loss of a mission or of the right to deploy certain classes of weapon, advocates for exploiting the doctrinal potential of these new missions or weapons gain stature they would have lacked in the absence of such an interservice challenge. In either case, the existence of doctrinal ferment and debate is more likely to come to the attention of civilian executives when there is intense interservice competition than when there is not. Here, interservice competition contributes to the alerting function referred to above by emboldening and empowering innovative branches within an organization that might be suppressed without a trace under other circumstances.

Interservice competition thus alerts civilian executives to the existence of doctrinal alternatives they might otherwise overlook or miss. At the same time, such competition should assist civilians in overcoming the political obstacles in the path of using intervention as a means of implementing doctrinal change. Unlike Rosen, Posen argues that such intervention is possible but he also acknowledges that it is difficult. When

civilians intervene in the details of a service's military doctrine they are leaving that region of the civil-military division of labor where the distribution of power, authority, and expertise is clear and to their benefit, and are venturing into a region where they are often perceived not to belong. Military mavericks have some expertise, but they lack the power and authority wielded by their professional military superiors. Interservice conflicts over doctrine change this balance of power in ways that can increase the leverage of civilian executives.

When two service clash over the details of military doctrine, power is distributed evenly amongst the contestants. Unlike in the case of intraservice conflicts over doctrine, the advocates for change tend to have their entire service behind them. The most senior officers in both services will be engaged on either side in a reasonably equal struggle. Paradoxically, it should be easier for civilians to determine the outcome of such a battle than it is for them to come to the assistance of an internal doctrinal insurgency waged by low and mid-ranking officers within a service. In the former case, civilian executives can play the role of a powerful but neutral country whose assistance is desparately pursued by two equal powers because its active assistance could easily tip the balance of power between them.

Furthermore, interventions which take the form of choosing between competing services do not create the perception of civilian meddling in professional military business. Rather, interservice conflicts tend to shatter the walls of professional autonomy that the services normally erect and defend. Finally, interventions that involve choices between existing or emerging interservice alternatives can also result in greater than normal control over the implementation of the chosen alternative because civilian executives can always threaten to retract their support in the absence of cooperation.

So far, the hypotheses provided have focussed on the potential role that different patterns of interservice relations might play as an intervening variable. It is also possible, for the same reasons, to deduce a role for interservice politics as an independent variable. This would be especially credible in cases where the other two theories both predicted the opposite outcome. Interservice competition and innovation in military doctrine might covary in certain cases along with an absence of civilian intervention or intraservice support for the innovative doctrine. It is important to distinguish between an independent and an intervening role for the variable of interservice politics because of the theoretical consequences of the two outcomes. As an

intervening variable, interservice politics remains an inextricable part of the theoretical inheritance from Posen and Rosen, acting to support or repair one or both of these existing theories. As an independent variable, interservice politics would require the introduction of new theory.

Interservice Conflict as an Independent Variable. In a true multiservice environment, as in the United States, each service is concerned to protect its doctrinal vision of itself as an independent, strategically significant actor. To some extent, each service also has a theory as to how the other services fit into this doctrinal scheme, usually in a supporting fashion. This built in tension makes the services acutely sensitive to perceived shifts in the balance of power between them. One major indicator of doctrinal status used by the services is budget share. In the competition for defense dollars, budget shares and trends in budget shares are taken to reflect status on the battlefield, in the same way that established tactical routines do the same for the combat arms within a service.

Another matter of great concern to the services concerns the doctrinal integration of new weapon technologies. Some technologies have only intraservice consequences, as in ASW. Others have the potential to change doctrine in several services. One can

deduce that these technologies, if they are not suppressed, can spur service efforts to exploit them in ways that protect or expand their position vis a vis the other services. Of particular relevance to the argument here, one can deduce that a service might engage in the competitive development of a new technology without the spur of an intraservice lobby or of civilian intervention. Instead the prospect of a monopoly in the new technology by another service might be a sufficient cause.

Summary. Neither of our two competing theories of the sources of doctrinal innovation address the potential explanatory power of different patterns of interservice relations as an independent or intervening variable. Yet both theories provide the basis to deduce both roles. If intraservice conflicts produce innovation, than interservice ones should as well. Furthermore, intraservice conflicts, when they become bones of interservice contention, may be resolved more quickly and more in favor of innovative groups when those groups suggest changes which other organizations would pay for or which defend their own service against the claims of a rival service. Likewise, if civil-military conflict causes innovation, than interservice competition should enhance the innovative process by alerting civilians to doctrinal alternatives and providing them improved

leverage in the civil-military struggles which occur when civilians intervene to actually implement new doctrine.

When interservice competition alone ignites doctrinal innovation, then it should cause radical doctrinal innovations in the absence of an intraservice lobby or direct civilian intervention. One can deduce a process where one service begins to exploit a new technology for which it has an internal lobby or as a result of civilian intervention, and where this initiative provokes an innovative response by a competing service in the absence of either intraservice or civil-military conflict.

Inducing An Explanatory Role For Interservice Relations.

Just as the potential explanatory power of different patterns of interservice relations can de deduced from existing theories, such a role can also be induced empirically from the historical record. Individual services in a multiservice environment resolve doctrinal disputes of common interest to them in different ways. In some cases, these disputes are bitter and open and spill out into the larger political arena. In other cases, they remain behind closed doors and are resolved in a negotiated, consensual fashion. Both patterns of interservice relations

occupied center stage in the United States during different periods of the Cold War.

The strategic modernization program begun in the mid-1950s by the Eisenhower administration raised a whole slew of doctrinal issues with interservice implications. Debate over and resolution of these issues occurred in an environment of intense and overt interservice competition. The strategic modernization program begun in the mid-1970s after the SALT I treaty also raised a similar set of doctrinal issues with interservice consequences. Here, these issues were resolved in an environment of interservice cooperation or collusion. In the first case, highly innovative doctrinal solutions were pursued and quickly implemented. In the second case, more traditional solutions were pursued, and their execution lagged significantly behind the problems they were meant to address. This seeming covariance between different patterns of interservice relations and different patterns of innovative behavior provides another basis for a deeper examination of the possible causal relationships between the former and the latter.

Defining Interservice Competition and Cooperation. It is a commonplace to describe the U.S. Cold War defense establishment as having been beset with interservice rivalries. Indeed, all

defense establishments seem to produce rivalries among their constituent parts. This depiction fails to capture the political process by which these rivalries resolve themselves over particular issues. Broadly speaking, the Cold War witnessed two distinct patterns of peacetime interservice relations. From the immediate aftermath of World War II through to the end of the 1950s, these rivalries expressed themselves in loud, often bitter, and public disputes over resources, roles and missions. Since the early 1960s, these rivalries have remained focussed on the same set of issues, but have been adjudicated between the services in a closed, negotiated fashion. These two patterns of rivalry are, respectively, interservice competition and cooperation. Leaving aside for the time being any questions of why these different patterns of interservice relations obtained at any particular time, it is important to establish the extent and nature of the differences between them.

During both the late 1940s and the 1950s, the American defense establishment witnessed a series of major interservice fights over a variety of important issues, prominent among them being disputes over the responsibility for nuclear weapons, their delivery systems, and doctrines for the use of these instruments. In the late 1940s, there was the debate over whether to procure a

new generation of nuclear capable large deck aircraft carriers to supplement the Air Force's strategic bombers, prime among them the new B-36. When the former was cancelled and the latter continued, there ensued the Admiral's Revolt, in which the Navy orchestrated a public campaign in Congress and in the national media designed to save the "supercarrier" and kill the B-36. Later, during the mid and late 1950s, an equally bitter, more protracted, and far more diverse set of battles occurred among all three services over the development of ballistic missiles.

These and other interservice battles of the time followed patterns quite different from the pattern of intraservice relations described by Rosen and others. They provide empirical support for the deductive hypothesis provided above concerning the differences between how power is distributed within and between individual services. In the latter case, doctrinal disputes between services occur in a relative vacuum of central power compared to the authority service leaders wield when they adjudicate internal intraservice disputes. In the absence of such a central and potentially coercive authority, the individual services can be less concerned about resorting to external political allies in order gain favorable outcomes in interservice disputes.

To use an analogy drawn from both Posen's and Rosen's discussions of intraservice disputes, interservice "mavericks" such as Captain Arleigh Burke during the Admiral's Revolt incur a different set of risks than do intraservice mavericks such as Captain Rickover. In the former case, the rebel officer incurs the ire of civilian executives but the respect and support of his professional peers. In the latter case, the equation is reversed. Though neither path is smooth, clearly the former involves less career risk. In general, because of the different structures of power defining intraservice and interservice relationships, interservice conflicts, when they occur, will be more intense and more openly politicized. They will spill out into decision making arenas where intraservice disputes rarely if ever appear.

Cooperative patterns of interservice relations are more familiar for two reasons. They were the dominant pattern of the post 1960 era. Since the early 1960s, interservice disputes have been resolved in private, behind the closed doors of the meeting room of the Joint Chiefs of Staff (JCS) in the Pentagon. This process has been described by close observers as an elaborate, drawn out negotiation where log rolling replaces confrontation, and outcomes resemble lowest common denominator compromise rather

than victory or defeat. Potentially competing programs and doctrines rarely confront each other in this mode. Rather, great efforts are expended to make such programs and doctrines complementary. Most importantly, rather then resorting to external political authority for the advancement of their own agenda, the individual services go to great lengths to present a united and common front in the face of external politcal authority, and moderate their individual claims in order to preserve this unity.

Cooperative patterns of interservice relations are also more familiar because they more closely resemble the typical patterns of intraservice behavior. These similarities are especially apparent with respect to civil-military relations where interservice cooperation seeks to produce the same autonomy from civilian intervention over interservice issues that the individual services normally enjoy in realms where they enjoy operational and doctrinal monopolies. The difference is that in the latter case this autonomy is, to a large extent, structurally determined. In the former case, the services must choose to cooperate - no coercive central authority structurally determines that outcome.

Explaining the Sources of Interservice Competition and Cooperation. Assuming the explanatory power of different patterns of interservice relations, either as an intervening or an

independent variable, the sources of these different patterns of behavior themselves become important and require explanation. Rosen argues that intraservice relations are a reflection of the degree of political consensus among its branches, while Posen argues that the behavior of civilian executives regarding military doctrine is a function of the systemic pressures of the international state system. Both are structural arguments, but they reflect opposing views of how power is distributed in the modern state. Rosen, in the tradition of bureaucratic politics and organizational theories, argues that the internal organs of state power are autonomous. Posen, in the tradition of balance of power theory, argues that state leaders dominate the domestic tools of state power when the international state system demands that they do so.

Even as an independent source of innovative or stagnant military doctrine, interservice politics are likely to remain a captive to the fundamental theoretical divide described above. They may reflect the same internal structural factors that determine intraservice politics, or they may ebb and flow in response to external, systemic pressures. Usually, interservice conflicts are provoked by one service's development of a new doctrine, often for the use or integration of a new technology. These

catalytic doctrinal developments, whether they are innovative or not, may themselves be caused according to the dynamics described by either Posen or Rosen. Thus, a final theoretical task is to determine the sources of competitive and cooperative patterns of interservice relations and integrate that finding into the larger debate between balance of power and organizational theories of state behavior. In short, are different patterns of interservice relations caused by external systemic pressures or are they the result of internal, organizational dynamics?

CHAPTER 3: Fleet Ballistic Missiles in Two National Security Crises.

The United States experienced two serious nuclear vulnerability crises during the Cold War. Popularly known as the Missile Gap and the Window of Vunerability, these crises began in the late 1950s and the late 1970s. During both periods, U.S. leaders feared that the nuclear balance between the superpowers had become unstable because the bulk of U.S. forces were becoming vulnerable while Soviet forces were becoming survivable. Throughout the Cold War, U.S. decision makers sought the opposite circumstance in which U.S. forces were survivable while Soviet forces were not.[1] The first crisis ended abruptly in 1961 with the rapid deployment of a new generation of radically innovative weapon systems and new doctrine for their use, while the second crisis lingered without resolution until it was simply defined away in the 1980s in such a way as to

---

[1]. Few would argue about survivability, but some might argue that the U.S. had not always had a counterforce doctrine. Harold Brown stated otherwise when as Secretary of Defense he said "we have always considered it important, in the event of war, to be able to attack the forces which could do damage to the U.S. and its Allies," as quoted in Scott Sagan, Moving Targets: Nuclear Strategy and National Security (Princeton, N.J.: Princeton University Press, 1989) p. 11.

preserve existing forces and doctrine. This chapter describes the technical and policy basis of each crisis and compares the means developed to resolve them. It shows that relevant decision makers took both crises seriously and sought resolutions to them, and that the technical challenges in the path of a successful resolution were greater for the first crisis than the second one. This discussion establishes that neither policy choice nor technological constraint can stand alone or in concert as explanations for the very different outcomes in the two cases.

Rather, both crises were initially caused by the doctrinal conservatism of the Air Force and the Navy in the face of changes in Soviet nuclear force structure. In the first case, this conservatism was rapidly replaced by innovative behavior, first by the Navy and then by the Air Force. In the second case, neither service behaved in innovative fashion. The primary manifestation of this contrast in behavior lies in the respective development histories of the Navy's Polaris and Trident II Fleet Ballistic Missiles (FBMs). Polaris' aggressive development by the Navy both caused and was caused by a radical innovation in Navy nuclear doctrine which, in turn, caused radical change in Air Force nuclear doctrine. Trident II was developed much less aggressively by the Navy in a way that sought to preserve rather than change existing

Navy and Air Force nuclear doctrines.

Polaris was caused neither by civilian intervention nor by intraservice competition. It resulted instead from a fear felt at the highest level of the service that existing budget shares might change and budget dollars flow from general purpose Navy programs to missile and bomber programs in the other services, especially the Air Force. The Navy was not particularly interested in missiles but felt that its own missile program would grant it influence in how budget dollars were allocated in this new field. In addition, the Navy felt that their own missile program would give them a doctrinal say in the consequences of the missile revolution for the general purpose forces that they really cared about. Thus, Polaris was from the start a weapon used in an intense and very public interservice battle over resources and over nuclear doctrine.

These interservice battles ended in the early 1960s. On the other hand, Polaris' successors enjoyed a high degree of civilian and intraservice support. Civilians sought the survivability of the now familiar submarine basing mode, while within the Navy, the Strategic Projects Office (SPO) sought to sustain itself with follow on programs. These follow on programs were explicitly designed not as weapons to be used in interservice battles with Air Force nuclear programs, but as a complement to those programs. It

is during these years, with the development of Polaris A-3, Poseidon and Trident I, that SPO chose to optimize FBMs for soft area target coverage, ceding coverage of hardened targets to Air Force ICBMs. During these same years the support for new SLBMs had waned among top Navy leaders. Spending on Air Force nuclear programs had dropped precipitously and did not constitute a threat to Navy programs, largely because of the success of Polaris. These Navy leaders continued their focus on general purpose forces which, in the absence of interservice conflict over budget shares, came out of a relatively fixed Navy budget that was determined more by civil-military conflicts over the size of the overall defense budget and individual programs within that budget. These intraservice attitudes constituted a return to the position taken by the Navy in the early to mid-1950s, when they had also sought to bury the hatchet with the Air Force after an earlier set of bruising interservice battles in the late 1940s.

It is hard to explain why, after this interregnum of interservice peace, the Navy chose not to imitate their experience with Polaris when the development of Trident II first became an issue in the late 1970s. Many parallels existed between the two periods. The overall nuclear budget was growing once again as a percentage of defense spending, and the bulk of this growth

involved Air Force programs.[2] At the same time, general purpose naval programs were under attack both because of their cost and due to questions concerning their relevancy to a war between NATO and the Warsaw Pact. With Trident II, the Navy once again had an opportunity to attack the Air Force on both a budgetary and a doctrinal front in order to protect general purpose forces from budget cuts.

Trident II could have been used by the Navy to kill the case for modernizing the entire triad. The case for modernizing the triad depended on two arguments: that land based forces provided unique capabilities and that they provided a hedge against unanticipated submarine vulnerabilities. Trident II eliminated the allegedly unique capabilities of land based forces while existing land based forces already provided a hedge, albeit a less capable one, against any compromise of the submarine leg. Using Trident II to kill the case for modernizing the triad would have saved considerably more money in cancelled Air Force programs than it

---

2. Beginning in the late 1970s, both the Air Force's share of the service budget and the nuclear force's share of the program budget began rising for the first time since the Eisenhower years. See Kevin Lewis, "Historical U.S. Force Structure Trends: A Primer," *P-7582 The Rand Corporation*, July 1989, pp. 13, 16.

cost to develop Trident II.[3] Some or all of the remainder could then have been shifted elsewhere in the defense budget - i.e. toward general purpose Navy programs.

At the same time, the Navy could have attacked the Air Force on the doctrinal front by exposing and promising to eliminate both the growing dependence of U.S forces and war plans on the exploitation of tactical warning and the continued embrace of targeting schemes calling for massive prompt counterforce operations. Instead the Navy could have promulgated a new doctrine of enduring withholdability that met the more recently perceived threats of accidental or inadvertent war.

The top Navy leadership did neither of these things. Instead, interservice collusion continued through the late 1970s and into the 1980s. Trident II was justified and developed, like its immediate predecessors and unlike Polaris, in a way that protected rather than threatened Air Force nuclear programs like the B-1 and MX, and later the B-2 and SICBM. The United States wasted vast amounts of money on land based modernization programs that ended up

---

[3]. For a list of twenty year life cycle costs for the major land and sea based modernization programs, see Michael Brown, "The U.S. Manned Bomber and Strategic Deterrence in the 1990s," International Security, Vol. 14, No. 2, Fall 1989, pp. 34-35. Even more useful are the tables showing comparative costs per delivered warhead in a retaliatory scenario. See pp. 38-40.

reinforcing rather than eliminating the doctrinally based vulnerability of the U.S. nuclear posture to accidental or inadvertent nuclear escalation.

These two cases, at least as they have been summarized here, present a puzzle. We have one case of technical and doctrinal innovation and one of stagnation by the same organization involving the same weapon system. Yet, superficially, our existing theories of doctrinal innovation and stagnation would both predict the opposite outcome in both cases. Barry Posen's theory of civilian intervention would have predicted that Polaris would not have been developed in the face of civilian opposition, while it would have predicted a much more aggressive development profile for Trident II given the support this system always enjoyed in OSD. Likewise, Steve Rosen's theory of intraservice conflict would have predicted no progress on Polaris in the absence of a powerful internal naval lobby in favor of guided missiles, while again it would have predicted much greater progress for Trident II given the power of the now 20 year old Strategic Systems Program Office (SSPO, formerly Strategic Programs Office or SPO).

This chapter shows that this is indeed a puzzle worth solving. It shows that there are no compelling reasons not to compare these two cases. In particular, it shows that Polaris and Trident II,

unlike their intervening relatives - Poseidon and Trident I, were developed during and designed to address the needs of national security crises that civilian leaders took seriously. Thus, one can not argue that Trident II came along at a time when national leaders had few concerns about the condition of U.S. nuclear forces. One can argue that these fears were groundless, just as one can argue the same point about the fears of an earlier generation of leaders during the years when Polaris was developed. Even if one were to accept these arguments, one is still left with a puzzle if one seeks to explain the undeniably different behavior by the Navy in the two cases.

This chapter also shows that Trident II faced, if anything, smaller technological challenges than did Polaris and that technical risk is not a good explanation of why Polaris was developed expeditiously and Trident II was not. Polaris required exotic and revolutionary technologies, especially in the realm of space based navigation in which it pioneered. Trident II faced primarily perceptions of technological constraint based on the traditions established by several earlier generations of FBM systems in which Navy program managers intentionally sought to eschew certain capabilities in order to keep SLBMs out of conflict with ICBMs.

The next two sections elaborate on the political and technological comparability of these two cases. This discussion sets the stage for the third and fourth chapters, which describe each case in detail, comparing the civilian, intraservice, and interservice sources of behavior. In each case, the interservice sources of behavior dominate the other two. Finally, in the fifth chapter, I discuss the sources of different patterns of interservice behavior.

I. Gaps and Windows.

During the Missile Gap years of the late 1950s, U.S. leaders had visions of a future in which the Soviet Union led the United States in the development and deployment of a revolutionary new nuclear delivery technology - the intercontinental ballistic missile (ICBM). Sputnick symbolized this new potential. During the late 1970s, another set of leaders had a vision of the future in which the Soviet Union possessed a monopoly of accurate, heavy ICBMs carrying multiple warheads (MIRVs), thus creating a "Window of Vulnerability". Here, the prime symbol was the Soviet SS-18 ICBM. During both periods, the anticipated offensive power of these new weapons produced fears in the United States concerning the

consequences of not deploying new forces with equivalent offensive capabilities. These anticipated asymmetries initially provoked matching responses. Both the Eisenhower and Carter administrations began ambitious ICBM development programs designed to close gaps and shut windows.[4]

These initial programs foundered when their operational constraints became apparent. For alongside the drive to match the offensive capabilities of these new Soviet weapons lay an operational imperative that these new U.S. forces also be immune to attack. Forces that were vulnerable to attack could be destroyed and their offensive or deterrent power eliminated. In both cases, U.S. ICBM development programs designed to match or mimic the offensive capabilities of new Soviet ICBMs were unsuited for this second more demanding operational imperative. In the late 1950s, the first generation liquid fuel ICBM programs begun by the Eisenhower administration were criticized for the vulnerability of their soft, above ground launch facilities, and for the hours of

---

[4]. On the origins of the Eisenhower program, see Edmund Beard, Developing the ICBM: A Study in Bureaucratic Politics (New York: Columbia university Press, 1976). On the origins of the ICBM modernization program of the mid-1970s, see Lauren H. Holland and Robert A. Hoover, The MX Decision: A New Direction in U.S. Weapons Procurement Policy? (Boulder, CO.: Westview Press, 1985).

preparations necessary to make them ready for launch.[5] In the late 1970s, the MX ICBM program begun by the Carter administration was criticized for the expense, complexity, and technical uncertainty associated with the design and construction of a deceptive or mobile basing mode for such a large, relatively immobile missile.[6] Alternatives to both of these ICBM programs existed, but there were radical differences in how they were assessed and implemented.

Polaris and the Missile Gap

The main alternative to the first generation liquid fuel missile programs of the Eisenhower administration lay in the exploitation of solid fuels. Solid fuels produced more thrust per unit of volume than liquids and could be stored indefinitely in the

---

[5]. This was a central theme of Albert Wohlstetter, "The Delicate Balance of Terror," *Foreign Affairs*, Vol. 37, No. 2, January 1959. I have found it convenient to use a reprint of the original RAND report upon which this article was based as found in Marc Trachtenberg (ed), The Development of American Strategic Thought: Writings on Strategy 1952-1960 Volume III (N.Y., N.Y.: Garland Publishing Co., 1988) pp. 3-47.

[6]. These criticisms led to an endless series of special reports and commissions on MX basing. The major basing options, with all of their strengths and weaknesses, are described and compared in Office of Technology Assessment, MX Missile Basing (Washington D.C.: U.S. Government Printing Office, September 1981).

missile. These two characteristics allowed much smaller missiles that could be kept in a state of immediate readiness to launch. Small size made mobility and hardening easier to accomplish, and these operational factors made solid fuel missiles optimal for systems designed to maximize survivability. The first such system was the Navy's Polaris fleet ballistic missile (FBM) system which combined the submerged stealth and endurance of a nuclear powered submarine (SSBN) with a small, intermediate range submarine launched ballistic missile (SLBM). Polaris entered full scale development at the beginning of 1957. As Polaris gained momentum, and in the aftermath of Sputnick, the Air Force followed suit in 1958 by beginning the full scale development of the solid fuel Minuteman ICBM program. Minuteman was designed either for hardened and dispersed silo or mobile rail basing. Both missile programs promised great improvements in survivability over their liquid fuel predecessors. Doubts about their feasibility focussed on two areas of technical concern.

The first area of technical concern lay with the lack of experience with solid fuels for large missiles.[7] For example,

---

[7]. Until Polaris, liquid fuels were used for all large ballistic missiles. The state of solid rocket fuel development in the mid-1950s is described in Graham Spinardi, <u>From Polaris to Trident: The Development of U.S. Fleet Ballistic Missile</u>

initial laboratory breakthroughs in achieving requisite thrust-to-weight ratios remained to be proven in the field, and new control problems emerged since solid fuel motors could not be throttled like their liquid counterparts. The second area of technical concern concerned the possibility that small solid fuel missiles would trade off offensive capabilities in exchange for their increased survivability. Here, it was believed that the very attributes which made them survivable would limit their lethality and make them harder to control.[8] Severe weight and volume constraints on warhead and guidance components made accuracy and high yield hard to provide, while the need to communicate with many small, dispersed, or mobile platforms created the need for more reliable long distance radio circuits than traditional high frequency (HF) ones. These concerns were expressed with particular vigor in the case of Polaris.

Despite these technical obstacles, first Polaris in 1960 and then Minuteman in 1962 emerged as the definitive responses to the first nuclear vulnerability crisis of the Cold War. By utilizing

---

<u>Technology</u> (Cambridge: Cambridge University Press, 1994) pp. 50-53.

[8]. Here again, Wohlstetter was among the critics. See "Delicate Balance of Terror," p. 16.

innovative basing schemes which exploited solid fuels, they provided a high degree of survivability. In addition, innovations in warhead, guidance, and, in the case of Polaris, navigation and communication technologies allowed these systems to enjoy extremely high levels of lethality against the full range of existing Soviet targets and reliable peacetime communications. Finally, the success of these two systems allowed for the wholesale replacement of outmoded and expensive alternatives such as the Air Force's huge fleet of intermediate range bombers and its growing arsenal of liquid fuelled missiles. Thus, by the early 1960s, the first vulnerability crisis was over almost as soon as it had been declared. A triad of nuclear forces emerged, each element of which was both survivable and highly lethal against the full range of Soviet targets.

Trident II and the Window of Vulnerability

Many MX basing modes were studied beginning in the late 1970s. These all had in common the challenge of providing survivability to a large ballistic missile without compromising its lethality or effectiveness. By the late 1970s, lethality and survivability were considered to be a function of both the traditional need to

maximize the yield and accuracy of platforms capable of surviving a surprise nuclear attack, and a newer need to maximize the means of effectively commanding and controlling survivable systems not only before but during and after both conventional and nuclear attack.[9] MX had been designed from the outset to maximize lethality and most of its possible basing modes were centrally located in the continental United States which reduced the need for long range communication links with a highly dispersed force. Arrayed against these perceived advantages was the major problem of making the missile itself survivable. A multiple protective shelter (MPS) basing mode was chosen as the best means of providing survivability, but it faced not insignificant technical risks and substantial domestic political opposition.

One seemingly obvious alternative to MX was a combination of the planned Trident SSBN force with new more survivable and covert

---

[9]. A particularly influential argument for greater lethality through ICBM modernization was Paul Nitze, "Assuring Strategic Stability in an Era of Detente," *Foreign Affairs*, Vol. 54, No. 2, January 1976. An explicit analysis linking command system and force modernization efforts in ways favorable to ICBMs was John Steinbrunner, "National Security and the Concept of Strategic Stability," *Journal of Conflict Resolution*, Vol. 22, No. 3, September 1978, pp. 411-428.

two way communication links and a new more lethal Trident II SLBM.[10] Extremely high frequency satellite communication (EHF SATCOM) systems might provide the first set of capabilities for both MX and Trident II, while the Navy's ongoing improved accuracy program (IAP) might make Trident II as lethal as MX. Combined with the uncontested survivability of the deployed SSBN force, these programs might provide at sea what was proving increasingly difficult to obtain on land. Between 1976 and 1983, the technical risks associated with improved SSBN communications and SLBM accuracy were cited as a reason to focus political and budgetary capital on the search for a survivable MX basing mode instead.[11] That search came to a halt in 1983 with the decision to deploy MX

---

[10]. This option must be distinguished from the much more common argument in favor of SLBMs and against ICBMs because the former were survivable and the latter's allegedly unique counterforce capabilities were unnecessary or destabilizing.

[11]. Thus, in January 1979, Harold Brown wrote "I have considerable doubt that SLBM command, communications and control (C3), responsiveness and accuracy can ever be made as reliable as a CONUS-based ICBM force, especially while maintaining the requirement for enduring survivability of the SLBMs." By contrast, he argued that an ICBM basing mode which replicated the enduring survivability and independence from tactical warning of existing SLBMs was quite feasible. See *Report of Secretary of Defense Harold Brown to the Congress on the FY80 Defense Budget* (Washington D.C.: U.S. Government Printing Office, January 1979) p. 118.

in vulnerable Minuteman silos. After 1983, Trident II and an EHF SATCOM program entered full scale development. In 1989, the first Trident SSBN was deployed with Trident II SLBMs that equalled the lethality of the silo based MX force. In addition, Trident SSBNs were supported by new communication systems, including newly deployed EHF SATCOM systems, whose characteristics rendered moot previous distinctions between the command system capabilities of land and sea based forces.[12] Once again, survivable fleet ballistic missiles had succeeded in resolving technical tradeoffs between survivabiity, control, and lethality in superior fashion to their land based contemporaries. Yet, unlike Polaris, the history of the Trident II program provides an example of doctrinal stagnation rather than innovation for three reasons.

First, Trident II was developed in slow, deliberate fashion.

---

[12]. Thus, in the same section of the FY92 DOD annual report as was cited above from the FY80 report, Dick Cheney wrote, "The sea-based leg of the triad...is considered the most survivable and enduring element of the U.S. strategic offensive force structure. In addition, extensive supporting communications allow SSBNs on alert to be highly responsive." With particular reference to the D-5, he wrote, "(The D-5's) demonstrated reliability and accuracy have surpassed expectations. The new missile combines the survivability and endurance qualities traditionally associated with SLBMs with a capability to retaliate quickly and effectively against Soviet hard targets." See *Report of the Secretary of Defense to the President and Congress* (Washington D.C.: U.S. Government Printing Office, January 1991) pp. 53-54.

Where Polaris moved ahead simultaneously and rapidly on many fronts, the Trident II program was characterized by highly sequential development process. Accuracy and communication capabilities necessary to its ultimate performance were completely proven before Trident II even entered full scale development.[13] In the case of Polaris, full scale development began before some navigation and communication technologies necessary to its ultimate performance even existed.[14] Second, because of this deliberate, hghly conservative development schedule, Trident II was never perceived as sufficiently advanced to serve as an alternative to

---

[13]. Communications probably constituted the biggest challenge in giving Trident II capabilities normally considered unique to ICBMs. EHF SATCOM was a major part of the solution. Lincoln Experimental Satellites (LES) 8 and 9 proved the feasibility of EHF SATCOM soon after their launch in 1976. See W.W. Ward and F.W. Floyd, "Thirty Years of Research and Development in Space Communication at Lincoln Laboratory," *The Lincoln Laboratory Journal*, Vol. 2, No. 1, Spring 1989, pp. 20-31.

[14]. This was particularly true in the area of navigation technology. Polaris required a survivable, all weather means of updating Ship Inertial Navigation Systems (SINS) over many thousands of square miles of patrol area. The principles underlying Transit, the ultimate solution, had not even been conceived never mind developed and proven when Polaris entered full scale development in 1957. For a description of the original system and its capabilities on the eve of its initial deployment, see Capt. Robert Freitag, USN, "Project Transit: A Navigation Satellite," *Navigation: The Journal of the Institute of Navigation*, Vol. 7, Nos. 2&3, Summer-Autumn 1960, pp. 106-116.

the MX. Where Polaris served as a spur to the Air Force's small solid fuel missile program in the late 1950s, Trident II did not create pressure on the Air Force to seek alternatives to the MX that might better address the challenge of developing a survivable ICBM force.[15] Finally, because Trident II remained a relatively distant option even in 1983, the decision to place MX in vulnerable silos was made for lack of a near term alternative. This decision reinforced rather than reduced the growing operational commitment to hasty and massive responses to warning of a Soviet attack.[16]

It also justified major new investments in systems that depended upon such a commitment.[17] Even when Trident II was

---

15. Minuteman entered full scale development only at the end of 1958, after it became clear that the aggressive Polaris development program begun in 1957 was likely to be a success. In the late 1970s, the order of priority was reversed. Trident II did not enter full scale development until the decision was made in 1983 to place MX in existing Minuteman silos.

16. The MX silo basing decision flowed from the conclusions of the Scowcroft Commission. This report argued that silo based ICBMs could be made survivable by being launched en masse in the ten to fifteen minute period prior to attack upon themselves but after earlier arriving attacks on U.S. bomber bases. The logic is explained more fully in "Report of the President's Commission on Strategic Forces," Brent Scowcroft, Chairman, The White House, April 6, 1983, pp. 7-8.

17. Thus, once the utter dependence of ICBMs on tactical warning was admitted, basing modes that were dependent upon strategic warning, like MX Rail Garrison, also became more acceptable. See Russell Dougherty, "The Value of ICBM

eventually deployed, its capabilities were not used to replace new but outmoded systems like MX, nor were operational plans optimized to be responsive to the constraints of these vulnerable systems changed in recognition of the new flexibility offered by the survivable Trident II. Where the aggressive development of Polaris served as a spur to the elimination of intermediate range bombers and still new liquid fuel missiles, the low key approach to Trident II development left it out of consideration when major decisions were made to preserve and modernize vulnerable ICBMs like MX and unwithholdable bombers such as the B-1 and the B-2.[18]

Severing the Link Between Warning and Survivability

The land based force structure vulnerabilities that were rapidly and decisively eliminated by Polaris and allowed to linger in the

---

Modernization," *International Security*, Vol. 12, No. 2, Fall 1987, pp. 170-171.

[18]. Thus, even strong advocates for truly survivable and withholdable MX basing in the 1970s settled for the Scowcroft Commission's artful arguments in favor of "survivable" silo basing in the 1980s. For a particularly stunning example of such a shift, see Colin Gray, The MX ICBM and National Security (New York: Praeger, 1981) p. 86 and Gray, "ICBMs and Deterrence: The Controversy Over Prompt Launch," *Journal of Strategic Studies*, Vol. 10, No. 3, September 1987, p. 287.

case of Trident II can also be described in less explicitly technological fashion. From the 1950s onward, decision makers sought survivable, controllable, and lethal nuclear delivery systems in order to project credible threats of attack against the full range of nuclear, leadership, military, and industrial targets in the Soviet Union.[19] Credibility was consistently defined in ways that required coverage of thousands of targets of all types with very high probabilities of destruction, or damage expectancies. These targeting demands in turn placed a premium on access to all alert nuclear delivery systems. When those systems were themselves vulnerable to Soviet attack, the credibility of the U.S. deterrent, defined in the way described above, came into question because damage expectancies dropped. Of particular concern were damage expectancies against Soviet nuclear forces, or counterforce targets. Contrary to declaratory policies at certain points during the Cold War, U.S. nuclear war planning never lost its focus on counterforce targeting. Soviet counterforce targets occupied a particularly important place in Air Force nuclear doctrine.

U.S. forces first came under the threat of major nuclear

---

[19]. For the essential continuity in U.S. nuclear targeting throughout the cold war, see Scott Sagan, Moving Targets: Nuclear Strategy and National Security (Princeton, N.J.: Princeton University Press, 1989) pp. 54-57.

attack during the 1950s with the first deployments of intercontinental range Soviet nuclear delivery systems.[20] The most direct means of dealing with this threat was to preempt it before it could be launched, and this was the both the natural doctrinal inclination of the Air Force and the policy inclination of the Eisenhower administration.[21] A preemptive doctrine depended upon the exploitation of strategic warning of an imminent Soviet attack, and upon the ability of U.S. forces to mobilize and strike before that attack could be launched. In the age of intermediate range bombers, the two opposing forces would mobilize by deploying to overseas bases from which they could strike their targets deep in the opponents heartland.[22] SAC operations during the 1950s focussed on winning such a mobilization race in order to maximize the

---

[20]. The first alarms on this score led to the "Bomber Gap." See Lawrence Freedman, U.S. Intelligence and the Soviet Strategic Threat (Princeton, N.J.: Princeton University Press, 1986) pp. 65-67.

[21]. On the coincidence between Air Force doctrine and administration policy during the Eisenhower years, see Sagan, Moving Targets, pp. 18-24 and David Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy," *International Security*, Vol. 7, No. 4, Spring 1983, pp. 34-35, 40-44.

[22]. Major SAC staging bases were in Canada, Iceland, Greenland, England, Spain, Morocco, Libya, Saudi Arabia, and Guam. For a reference to Soviet staging bases in the Arctic, see Sagan, Moving Targets, p. 31 and fn. 68.

exploitation of strategic warning. Several problems with this strategy began to emerge during the 1950s. First, and most obviously, a failure to gain or exploit strategic warning might occur.[23] Second, and more importantly, as Soviet forces grew in number and destructive power, the United States could expect an increasing weight of retaliation in response to a preemptive attack.

In the late 1950s, U.S. decision makers awoke to a third fear: that their nuclear forces might be destroyed on the ground in a surprise attack.[24] Such vulnerability, if exploited, would allow Soviet nuclear forces to threaten attacks against U.S. cities with impunity. Survivable forces would eliminate this threat and make

---

[23]. For a general discussion of the problem of surprise attack, see Richard Betts, Surprise Attack (Washington D.C.: Brookings, 1982) pp. 87-149. For the problems associated with gaining and exploiting strategic warning during the 1950s, see Albert Wohlstetter and Fred Hoffman, "Protecting U.S. Power to Strike Back in the 1950s and 1960s," *Rand Report R-290*, September 1956, in Trachtenerg, The Development of U.S. Strategic Thought, pp. 150-152.

[24]. For a fascinating account of one decision maker's awakening, see Fred Kaplan's description of Robert Sprague's trip to SAC in The Wizards of Armageddon (Stanford, CA.: Stanford University Press, 1991) pp. 132-134. Sprague was a member of the steering committee for the Gaither Commission. During his visit, General Lemay confirmed that essentially all of SAC was vulnerable to an attack that came with less than six hours warning.

the nuclear balance more stable. Two countries with highly vulnerable forces in the midst of a serious crisis would be under enormous pressure to use their forces in preemptive fashion in order to avoid losing them. Two countries with survivable forces would, in theory, feel less incentive to preempt and feel less fear regarding the consequence's of the opponents preemption. Air Force doctrine did not acknowledge the all important distinction between preemption and retaliation. Indeed, such a distinction is difficult to draw for forces dependent upon strategic warning for their survival. The Air Force strenuously resisted external efforts to guide it towards a force posture that was less dependent upon warning for survival.

By the late 1970s, survivability had become a more complicated concept and decision makers became concerned with a different set of instabilities. Forces which gained their survivability by exploiting tactical warning had to be used or lost within the time span of an ICBM or SLBM trajectory. Command systems which lost their ability to control forces after an attack put pressure on decision makers to order an immediate response to an attack even by forces which themselves could partially or totally survive such an attack. In both cases, the delivery or communication systems in question were survivable, but only in a contingent fashion. Since

they survived by being used without prospect of recall, they presented decision makers with the choice, in the space of a few short minutes, of using or losing control over the bulk of their forces.

When both sides suffered from this constraint, any use or even suspected use of nuclear weapons could easily provoke a rapid, massive, and preplanned response by the opponent which could in turn, provoke a massive response by the real or suspected attacker. Thus, very limited, unauthorized, accidental, or even imaginary uses of nuclear weapons by either side might provoke a massive spasm response by both sides which would result in the mutual devastation of both the United States and the Soviet Union.[25] Furthermore, forces dependent upon tactical warning for survival were therefore dependent upon the survival of tactical warning sensors which, in many cases, were even more vulnerable than the forces themselves. Again, Air Force doctrine both embraced the value of tactical warning and refused to acknowledge its dangers. Using tactical warning as a trigger maximized damage expectancies against Soviet targets and simplified planning by continuing to mask the distinction between preemptive and retaliatory operations.

---

[25] Steinbruner, "Strategic Stability," p. 424.

In both the late 1950s and the late 1970s, the vulnerability crises spawned debates over the feasibility of different operational uses of warning for making forces survive. During the missile gap years, the debate was between those who believed in the continued feasibility of exploiting strategic warning of an attack in advance of its actual launch, and those who believed that at most only tactical warning of an attack already in progress would be available.[26] The catalyst for this debate was the arrival of the ballistic missile. With bomber based forces, the distinction between strategic and tactical warning was important for preemptive purposes, but less important for retaliatory purposes. Both types of warning provided hours of indicators that an attack was imminent. First generation ballistic missiles which required hours of major launch preparations but only thirty minutes of flight to the target made this distinction extremely relevant. Forces optimized to depend on hours of warning would be completely vulnerable to attacks which came with only minutes of warning.

---

[26]. This was the debate between Rand and SAC that grew out of Wohlstetter and others' work on bomber basing in the mid 1950s. For General Curtis Lemay's belief in the availability and uses of strategic warning, see Kaplan, Wizards of Armageddon, pp. 132-134. For Eisenhower's belief in the liklihood of gaining and exploiting strategic warning, see Ibid., pp. 150-152.

Polaris and, for a time, Minuteman made this argument moot by eliminating the link between survivability and warning altogether.[27] Each was capable of riding out an attack that came with complete surprise and being used in its aftermath.

At the policy level, Polaris and Minuteman provoked a major shift away from forces which depended upon strategic warning for survival. By the early 1960s, the bulk of U.S. forces could survive an attack that came with no warning at all, and residual U.S. intercontinental bomber force operations were radically reoriented towards a posture which depended on tactical not strategic warning, and aerial rather than ground-based refueling.[28] These survivable forces remained highly effective for preemptive operations but were not dependent on that style of operation for their survival. Thus, the United States rapidly created a

---

[27]. Polaris gained its independence from warning purely through stealth. Deployed SSBNs could not be attacked because they could not be found. Minuteman's independence from warning was more contingent, and flowed from the prohibitive cost of attacking its hardened silos using inaccurate, single warhead missiles.

[28]. The shift to tactical warning led to the implementation of fifteen minute strip alert postures and the predelegation of fail-safe positive control launch authority to a select group of Air Force officers. The shift away from ground-based refueling on the way to the target led to the accelerated retirement of the medium bomber force and a concentration on the B-52/KC-135 combination from the early 1960s onwards.

deterrent that was quite robust.

During the window of vulnerability years, the debate was over whether to allow a growing portion of U.S. forces, now including both bombers and silo based ICBMs, to depend on tactical warning for survival and effective operation, or whether to reverse this trend by emphasizing only the modernization of those forces, like MX/MPS or Trident II, which survived and functioned effectively without any warning. Such withholdable forces would eliminate the need to launch forces or lose them, and would allow decision makers the time and provide them the information necessary to identify and respond to an attack in kind rather than with a massive, immediate, and preplanned spasm. This ability to withhold became important as the utility of an immediate response declined. Through much of the 1960s, such an immediate response was likely to prevent some Soviet weapons from being launched and to destroy any weapons that were withheld from the initial attack.[29] Thus, it was conceivable that it might limit damage to the United States even if the initiative was ceded to the Soviet Union. Increasingly during the 1970s and onwards, civilian decision makers were concerned that under many

---

[29]. Sagan, Moving Targets, p. 31. See also Thomas Schelling, "Controlled Response and Strategic Warfare," *Adelphi Paper # 19*, June 1965, p. 7.

conceivable circumstances such a response would increase rather than limit damage to the United States.[30] This concern applied especially to cases where a hasty decision to respond to tactical warning of a large nuclear attack in a crisis or in the midst of a conventional war might be based on erroneous warning indicators, thereby provoking the very attack which it was mistakenly intended as a response to.[31] Thus, the late 1970s and 1980s saw growing fears of the link between dependence upon tactical warning and inadvertent paths to the failure of deterrence.

The decision in 1983 to place MX in vulnerable Minuteman silos signalled a deepening and an institutionalization rather than a reduction of the reliance by U.S. forces on tactical warning for survival.[32] Because a withholdable basing mode for MX was

---

[30]. By the late 1960s, and certainly by the late 1970s, forces withheld by the Soviets from an initial strike could be launched upon warning of a large U.S. counterforce response. For a rare reference to this Soviet option, see Albert Carnesale and Charles Glaser, "ICBM Vulnerability: The Cures Are Worse Than the Disease," *International Security*, Vol. 7, No. 1, Summer 1982, pp. 79-80.

[31]. See Bruce Blair and John Steinbruner, The Effects of Warning on Strategic Stability (Washington D.C.: Brookings, 1991) pp. 3-5.

[32]. The Scowcroft Commission artfully dodged this conclusion with the concept of "launch under attack" (LUA) where prior attacks against the bombers provided warning sufficient to launch ICBMs without fear of accident. The Commission did not

abandoned, and because the lethality and controllability of modern SLBMs remained in doubt, it proved impossible to cause a major shift away from forces and plans for their use which were unwithholdable. What in the late 1970s had been considered a vulnerability in land based forces - the dependence upon tactical warning for survival - was transformed in 1983 into a virtue. When in 1989 a withholdable, lethal, and controllable Trident II SLBM was finally deployed, its unique capabilities were not used to replace outmoded systems which depended on tactical warning, but were instead described as a complement to those systems.

II. Real Gaps and Phony Windows?

Two possible explanations for this outcome need to be rejected at the outset. One explanation would argue that the two vulnerability crises were so different that they are incomparable. The first crisis is generally considered to have been more important to solve than the second one, and the political consensus in favor of pursuing such solutions to have been more robust. This argument

---

claim that LUA provided an option to safely withhold ICBMs, only that it allowed them to barely survive. Over the longer term, they advocated the development of the SICBM for the former purpose.

does not carry enough weight to eliminate the utility of the two cases as a test of the two competing theories of doctrinal innovation and stagnation.

On some level, the popularly perceived vulnerabilities of the late 1950s were potentially more serious than those that characterized public debate in the late 1970s. Some participants in the first vulnerability crisis did fear that the United States might become vulnerable to a completely disarming first strike by the Soviet Union. Few if any participants in the second crisis could claim that U.S. forces were similarly vulnerable. Certainly, deployed SSBNs remained survivable during the latter period. Rather it was the consequences of ICBM vulnerability which exercised those most concerned with shutting the window of vulnerability, and these consequences, though dire in some minds, might seem to pale a little in comparison to the first set of fears. Thus, one might simply argue that the Missile Gap and the fears of total force vulnerability which accompanied it provoked more strenuous modernization efforts than did the Window of Vulnerability which was really only about the vulnerability of a portion of U.S. nuclear forces.

Such an argument misses one point and overstates another. First, the crucial issue in these two cases involves the question

of what vulnerabilities real decision makers perceived at the time and how much political capital they were willing to expend to eliminate or ease those vulnerabilities. Even if the two crises were of a completely different order of magnitude by some objective standard, a comparison between them would still be a fair test of, for example, the role of civilian intervention as a source of innovation, if both cases contained examples of such intervention by similar actors with similar perceptions of the need for change. To cite specific examples, there is no evidence to support the conclusion that President Eisenhower was more concerned about the success of his missile program than President Carter was about his ICBM modernization program. If anything, there is evidence to support the opposite conclusion. The MX program and its basing mode woes consumed the attention of Carter and his administration's defense policy executives.[33] Enormous amounts of political and budgetary capital were spent during this period on a basing scheme that hopefully would provide the survivability for MX that an SSBN at sea could take for granted. For some in the administration, this capital was well spent as an investment in SALT II. Without

---

[33]. For the growth of support within the Carter Administration NSC to near unanimity, see Fen Hampson, Unguided Missiles: How America Buys Its Weapons (New York: W.W. Norton, 1989) pp. 121 -125.

MX, SALT II was unlikely to be ratified. For others, especially within Harold Brown's OSD, the commitment to MX derived from beliefs in the need to close the Window of Vulnerability.

The struggle to deploy MX was also part of a larger effort at across the board modernization and expansion of U.S. military capability. Overall levels of peacetime defense spending began rising in real terms in 1976 for the first time since the early 1960s and continued rising every year for a decade. More important, the percentage of the defense budget consumed by defense spending also rose every year between 1979 and 1984.[34] Defense spending fell in the midst of the Missile Gap years between 1957 and 1960. These gross indicators do not support an argument that leaders did not perceive serious vulnerabilities in the U.S. nuclear posture in the late 1970s or act aggressively to eliminate them.

Second, though the force vulnerabilities feared by some in the late 1950s were severe, there seems to have been somewhat of an inverse relationship at the time between how strongly these fears were held and how familiar the bearer of these fears was with the

[34] Les Aspin, *Annual Report of the Secretary of Defense to the President and Congress* (Washington, D.C.: U.S. Government Printing Office, 1994) p. 151

actual state of U.S. and Soviet programs. For instance, it was possible with then current intelligence to argue that operational Soviet ICBMs might be introduced in large numbers either by 1958 or by 1962.[35] At the same time, the United States had secret plans to install a Ballistic Missile Early Warning System (BMEWS) by 1960. If Soviet ICBMs were deployed after 1960, the resulting vulnerabilities would be greatly reduced because a warning net would exist to support the operational transition from strategic to tactical warning as a means of survival. For reasons like these, high officials within the Eisenhower administration, including especially the President himself, never believed they faced an imminent threat of total vulnerability to surprise attack.[36]

Nor would such a threat have actually materialized in full even if the worst fears about Soviet missile programs were true, and even if Polaris and Minuteman were never developed. Large

---

[35]. These differing interpretations had an institutional basis described in Lawrence Freedman, U.S. Intelligence and the Soviet Strategic Threat (N.Y.: Macmillan, 1982).

[36]. For Eisenhower's views on ballistic missiles at the time, see "Memorandum of Discussion at the 268th Meeting of the National Security Council, Camp David, Maryland, December 1, 1955," in Foreign Relations of the United States, 1955-1957, Volume XIX, National Military Policy (Washington D.C.: U.S. Government Printing Office, 1990) pp. 268-269. These early views never changed in the face of events like the Gaither Report and Sputnick.

parts of SAC's force structure would have been vulnerable but not all of it. Existing programs to establish tactical warning nets, increase alert levels, and reduce the dependence on the use of overseas bases for prestrike refueling were already making B-52s and KC-135s more survivable. Thirty years later they were still unanimously considered highly survivable in the face of Soviet SLBMs that could strike with even less warning than early Soviet ICBMs.[37] What was of great concern, and what Polaris and Minuteman did eventually eliminate, was the delicacy of schemes for surviving surprise attack which were highly dependent on the size, capabilities, and timing of Soviet attacks, and upon rapid political decision making by national command authorities in response to often ambiguous tactical warning.[38]

Just as the vulnerabilities accompanying the missile gap were

---

[37]. For the consensus that alert B-52s remained survivable in the late 1980s, see Michael Brown, "The U.S. Manned Bomber and Strategic Deterrence in the 1990s," *International Security*, Vol. 14, No. 2, Fall 1989, p. 6, fn. 4. After the deployment of BMEWS in 1960s, strip alert B-52s were likely to get equal or greater warning of a smaller threat than was the case in later years.

[38]. Polaris survived independently of the size, composition, or capability of opposing nuclear forces. Thus, its survivability was not dependent upon accurate forecasts of enemy capabilities. Because these so often exagerrated future threats, Polaris innoculated debates over nuclear sufficiency against the "gapitis" that characterized the 1950s.

highly exagerrated in the late 1950s, those accompanying the Window of Vulnerability may have been, in a perverse way, understated by those who focussed solely on the question of ICBM vulnerability. Beginning in 1976, and gaining considerable momentum in the 1980s, concerns were increasingly expressed over the vulnerabilities in nuclear command, control, communications, and intelligence (C3I) systems and procedures.[39] These vulnerabilities, along with force vulnerabilities and doctrinal proclivities towards high assurances of damage against enormous numbers of targets, contributed, so the argument went, to planning on both sides for massive and immediate release of most alert forces immediately upon the outbreak (or

---

[39]. Concerns about the survivability and performance of the command system for the strategic forces had always existed, but they became increasingly acute in the late 1970s when planners began to focus on retaliatory operations that withheld a larger component of the forces from an initial prompt response to a Soviet attack. Steinbruner's "National Security and the Concept of Strategic Stability" inaugurated a more public and intense debate over the vulnerability of nuclear command systems. Other contributions included: Desmond Ball, "Can Nuclear War be Controlled?" *Adelphi Papers* 169 (London: International Institute for Strategic Studies, 1981); Office of Technology Assessment, MX Missile Basing (Washington D.C.: U.S. Government Printing Office, 1981) pp. 277-299; Paul Bracken, The Command and Control of Nuclear Forces (New Haven: Yale University Press, 1983); Bruce Blair, Strategic Command and Control: Redefining the Nuclear Threat (Washington D.C.: Brookings, 1985); and Ashton Carter, John Steinbruner, and Charles Zraket (eds), Managing Nuclear Operations (Washington D.C.: Brookings, 1987).

suspected outbreak) of war.[40] Here, taken to its extreme, was an argument which stated that the problem was not that forces would be destroyed on the ground, it was that they might all need to be used immediately in order to ensure the full target coverage called for in U.S. nuclear doctrine. Thus, perversely, an exchange once begun might rapidly spiral out of control, and even more importantly, such an exchange might be provoked by accidental, unauthorized, or intentionally limited use of weapons in a crisis or during a war.[41] Here, the eventual outcome resembles that feared by many in the late 1950s - it is only the path to that outcome that differs. Interestingly, these types of concerns seemed to grow with proximity to real knowledge of how nuclear command systems actually worked. In this way, much of the public debate about the window of

---

[40]. Kurt Gottfried and Bruce Blair (eds), Crisis Stability and Nuclear War (New York: Oxford University Press, 1988) pp. 85-87.

[41]. The best short summary of the dynamics of such an unintended escalatory process is in Blair and Steinbruner, The Effects of Warning on Strategic Stability. Their argument emphasizes the degree to which decision makers will increasingly "see" incoming attacks on tactical warning sensors during a crisis. Another route to the same unintended outcome is provided by Barry Posen, Inadvertent Escalation: Conventional War and Nuclear Risks (Ithaca, N.Y.: Cornell University Press, 1991). Posen's argument is concerned with the effects on nuclear deterrence of intended or unintended conventional attacks on nuclear forces, their warning and communications nets, or the conventional forces assigned to protect them. See pp. 1-4.

vulnerability may have masked the more serious concerns described above which were much less accessible.[42]

Third, the degree of societal vulnerabiity in the two cases needs to be factored in to the comparison. Soviet forces during the 1950s were overwhelmingly focussed on Europe. Their intercontinental capabilities resided in a small bomber force that was relatively easy to preempt and against which the U.S had deployed massive air defenses, albeit of uncertain capability. Even in the early 1960s, Secretary McNamara testified that the maximal Soviet attack against the U.S. would consist of no more than 200 weapons. During the second Berlin Crisis in 1961, Deputy Secretary of Defense Roswell Gilpatric publicly stated for Soviet consumption that U.S. forces could retaliate in numbers which far exceeded the ability of Soviet forces even when the latter were used first.[43] Thus, the missile gap years were partly about U.S. reactions to the initial and gradual loss of its almost complete societal invulnerability.

---

[42]. Ashton Carter, "Assessing Command System Vulnerability," in Carter, Steinbruner, and Zracket (eds), Managing Nuclear Operations, p. 556.

[43] On this episode, see Marc Trachtenberg, *History and Strategy* (Princeton, N.J.: Princeton University Press, 1991) p. 221

By the late 1970s, this societal invulnerabiity was a distant memory. Soviet intercontinental forces deployed weapons which numbered not in the thousands but in the tens of thousands. Even after a preemptive U.S. attack, these forces could retaliate massively. Of course, the Soviets faced the same threat in reverse. Thus, the consequences of an accidental or inadvertent escalation in the second case might have been vastly worse for the U.S. than the consequences of intentional escalation due to force vulnerabilities would have been in the first case. In fact, Soviet forces were so limited in the first case that they had to choose between very small target sets. They faced a choice between attacking a small number of SAC airbases and a small number of U.S. cities. In the first case, they might hope to limit damage to themselves while causing little damage to U.S. value targets. In the second case, they might maximize damage against U.S. value targets while inviting a truly withering retaliation by the U.S. against the same set of targets in their own country. By the late 1970s, both sides, protestations by military planners to the contrary, were "warhead rich" and could afford to cover multiple target sets with generally high damage expectancies.

III. FBM Technology Constraints in the Late 70s?

Even if the political will to address the nuclear vulnerabilities of the two periods was comparable, the technical challenges in the path of solutions might have been different. Thus, a second way of arguing that the cases do not provide a fair test of the competing theories would show that the technical challenges in the second case were more daunting than in the first. Here, the evidence flows even more strongly and clearly in the opposite direction than in the inherently subjective area of comparative political will. Polaris was far more challenging in the late 1950s than was Trident II in the late 1970s, yet Polaris was deployed in 1960 while Trident II was delayed until 1989.

A useful means of comparing the technical challenges in the two cases is provided by an analysis of the tradeoffs that designers had to grapple with in order to reconcile conflicting mission requirements and the solutions that eased or eliminated these tradeoffs. Mission requirements in both cases were functionally similar but detailed requirements changed with the growth in the size and quality of Soviet forces. The functional requirements in both cases are best imagined as a series of six hurdles all of which needed to be cleared. Any system needed (1) a peacetime deployment mode that was not too expensive or accident prone and (2) that allowed the launcher to survive attack; (3) a

command system and supporting communication links that could also survive attack, make the decision to retaliate, and communicate it; (4) the range sufficient to reach its assigned target or targets; (5) the ability to penetrate active defenses protecting those targets; and (6) the lethality to destroy those targets with reasonable efficiency.[44] Any mission of retaliation required the clearance of all six hurdles but most systems had serious problems getting over all six under all circumstances. Tradeoffs between capabilities at different hurdles either forced compromises that limited mission effectiveness under certain circumstances, or led to innovations which eliminated or eased the tradeoffs.

In both the late 1950s and the late 1970s decision makers were confronted with vulnerabilities in existing forces which derived from tradeoffs between survivability and other mission requirements. In both cases, substantial pressures existed to preserve existing forces by using different degrees of warning as a means of resolving these tradeoffs. In the late 1950s, strategic warning was cited as a way of preserving the effectiveness of intermediate range bombers and liquid fuel missiles. In the latter period, tactical warning was cited as a means of preserving the

[44]. Wohlstetter, "The Delicate Balance of Terror," p. 9.

effectiveness of land based legs of the triad, intercontinental bombers and silo based ICBMs. These arguments in favor of preserving existing forces grew not only out of institutional inertia, but also out of policy demands calling for capabilities at other hurdles which systems that survived without warning appeared ill equipped to provide. The classic case of such a policy demand involved lethality, which loomed large in both periods as a seemingly unique capability that could not be provided by survivable sea based systems. Also present in both periods was the assumption that sea based systems would be harder to communicate with and therefore to control.

The key accomplishment by Polaris was to provide survivability while eliminating the perceived tradeoff between that hurdle and the desire for continuous communications and high lethality. Polaris' accomplishments in the latter areas prevented it from being marginalized by the Air Force as a weapon of limited usefulness.[45] In order to undermine the case for modernizing the land based legs of the triad, the Navy needed to ensure that Trident II also combined survivability with the lethality and

---

[45]. For an example of how the Air Force might have marginalized Polaris, see Fred Kaplan's description of William Kaufmann's attempt to do so in Wizards of Armageddon, pp. 237-239.

communications capabilities claimed as unique by bombers and ICBMs. The key characteristic of Trident II's development lay in the absence of ambitious claims for its lethality and communications. Advances in these areas were described as possible but risky, and not of sufficient confidence to warrant abandoning land based modernization programs. Indeed, these advances were eventually achieved after the troubled land based modernization program had finally entered full scale development and deployment. Despite the delay and reticence in the second case, I will show below that Polaris faced the more daunting technical challenges.

Controlling and Communicating With Polaris

Polaris communication procedures derived from two different demands. Great value was placed on the provision of a continuous peacetime communication link that allowed for covert submerged operation. The prime purpose of such a link was to allow the rapid launch of the alert Polaris force along with the other land based forces in anticipation of or upon warning of a Soviet attack without compromising the stealthiness of peacetime alert patrols. The timing of such operations placed a premium on continuity and speed rather than survivability for such communications. Less

emphasis was placed on developing a dedicated communications link that emphasised survivability for two reasons.

First, the emphasis upon a rapid response in anticipation or upon warning of an attack was a necessity for those forces that depended upon warning for survival of an attack. U.S. war plans during the 1950s were designed to serve the needs of such forces because they dominated the Air Force's nuclear force structure and the Air Force dominated nuclear war planning. What appeared as a liability in a retaliatory scenario could also become a virtue in a preemptive scenario and Massive Retaliation was somewhat misnamed in that respect since it was, at its heart, based on a strategy of preemption.

Second, the absence of a dedicated communications link optimized for survivability was a function of how easy it was to provide survivable communications to SSBNs compared to other forces. Since SSBNs could survive essentially indefinitely, effective retaliation depended only upon the eventual receipt of valid launch orders. In the case of the bomber force, tight fuel constraints generated relatively narrow timing windows during which launch orders had to be recieved if the bombers were to retain sufficient fuel to reach their targets. Since SSBNs were likely to suffer virtually no attrition and since they were extremely

autonomous, valid launch orders could be very simple. Even silo based ICBMs placed significantly greater demands on post attack communication links in a true retaliatory scenario. Though highly survivable, they would suffer some attrition which created pressures to optimize the effectiveness of surviving forces by allocating them against the most important targets. Unlike SSBNs, individual ICBM launch control centers could not retarget the missiles under their command. In the ICBM force, such retargeting could only be performed on large centrally located computers in major command centers unlikely to survive the first minutes of an attack. Thus, from the beginning, ICBM operations in the United States focussed on scenarios in which there would be no need for true post attack communication on a large scale because of the difficulties involved, and such communication links were therefore not developed. In the case of SSBNs, such links were not emphasized for exactly the opposite reason. Since post attack SSBN communication needs were relatively simple, they could be met by reconstituting over time residual assets from existing Navy HF communication nets.

The dedicated SSBN communication link that was developed for peacetime operations was revolutionary in that it involved the first operational use of the Very Low Frequency (VLF) band of the

radio spectrum. VLF radio had several unique attributes that made it useful for SSBN communications. VLF radio propagated over long distances without dependence upon multiple relays (as with microwave radio) so that it was ideal for over water communication at great distance. High powered VLF transmitters on each coast provided coverage of all Polaris patrol areas. Compared to traditional High Frequency (HF) naval communication nets, VLF traded greater reliability at some loss in data rate which was irrelevant to SSBN operations. Thus, VLF broadcasts were not prone to HF skywave propagation interruptions due to sunspot activity and to variations in night and day time ionospheric conditions. Finally, and most importantly, VLF radio could penetrate water coherently to greater depths than any other frequency than in use. This allowed for the maintenance of a continuous link even with submerged SSBNs. At the time that full scale development of Polaris began, only the most basic experiments in VLF propagation had been conducted, and no prototype or operational communication systems were in existence for military purposes. In the space of three short years, such an operational system was developed and deployed in support of the first operational Polaris patrols.

Making Polaris Lethal

More surprising and challenging was the record of performance achieved by Polaris in the area of lethality. Here, the technical risks were greater and the consensus that SLBMs were fundamentally disadvantaged compared to land based forces more widely held.[46] Lethality is traditionally described as a function of yield and accuracy. In cases where the target can respond, it is also a function of the speed with which an attack can be mounted, or more precisely, of the degree of warning that a system provides of its launch. According to traditional measures of lethality, Polaris was the equal of any other ballistic missile of its day.[47] Taking

---

[46]. Ibid., pp. 232-247. One can only conclude that much of this consensus was "motivated." In the Air Force case, confirmation of Polaris' utility for counterforce as well as countervalue operations came as early as 1958. See the description of E.P. Oliver's classified rejoinder to Kaufmann's "Puzzle of Polaris" in David Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1960," *International Security*, Spring 1983, Vol. 7, No. 4., pp. 57-58. Partly because of this "factual and unbiased" report, the official Air Force shifted from a strategy of technically discrediting Polaris to one that both criticized the Navy's minimum deterrence doctrine for Polaris and that sought operational control over Polaris so as to integrate it into Air Force operations. See Graham Spinardi, From Polaris to Trident: The Development of U.S. Fleet Ballistic Missile Technology (Cambridge: Cambridge University Press, 1994) pp. 60-61.

[47]. It is crucial to keep in mind that throughout the early 1960s, the Soviets deployed their strategic forces in soft, above ground configurations, as had the United States before Polaris and later, Minuteman. Not until the mid to late 1960s did Soviet strategic forces become hardened to any significant degree. See,

into account those cases where timing mattered as well, Polaris was more lethal than both contemporary bombers and land based missiles.[48] In particular, the accuracy of Polaris equalled or exceeded contemporary land based missiles despite the fact that

---

Robert Berman and John Baker, Soviet Strategic Forces: Requirements and Responses (Washington D.C.: Brookings, 1982) pp. 90-91. Prior to this point, any megaton range weapon of reasonable accuracy was sufficiently lethal to destroy any single Soviet target, whether industrial or military. When the U.S. ICBM program was begun in the mid 1950s, reasonable accuracy was defined as "less than five miles CEP." Herbert York, Race to Oblivion: A Participant's View of the Arms Race (New York: Simon and Schuster, 1970) p. 89. By 1960, the most accurate Air Force ICBM was presumed to have a 2 mile CEP, a standard that Polaris A-1 also met when first deployed at the end of that year. By 1964, Polaris A-3 was deployed with a CEP of .5 miles. Until the deployment of Minuteman II in 1966, the A-3 was the most accurate ballistic missile in the world. All these systems had the necessary throwweight to deploy warheads that approached or exceeded a megaton. For missile CEPs, see Donald Mackenzie, Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance (Cambridge, MA.: M.I.T. University Press, 1990) pp. 428-429. For warhead yields, see Chuck Hansen, U.S. Nuclear Weapons: The Secret History (New York: Orion Books, 1988) pp. 189-206.

[48]. Because of their shorter range, SLBMs arrived at their targets minutes before ICBMs and many hours before Bombers. Thus, against soft targets that depended upon warning for survival, SLBMs were more lethal than any other system. Because of their all azimuth deployment patterns around the Soviet Union, warning of SLBM attack was also more difficult to provide. Though U.S. planners have traditionally ignored these SLBM characteristics, at least in their public statements, they have consistently, if tacitly, confirmed them through expressions of concern about Soviet SLBM counterfroce capabilities. For an early example of such unintended or motivated bias, see Wohlstetter, "The Delicate Balance of Terror," p. 15.

Polaris was launched by a constantly moving submerged platform. This required the development of a truly revolutionary SSBN navigation, fire control, and missile guidance system. For Pclaris, the major challenge lay in the demands on SSBN navigation.

Until the late 1950s, navigation at sea involved dead reckoning between known landmarks using speed logs, accurate clocks, compasses, and intermittent celestial sightings. While at sea, ships might know their position with sufficient precision to keep errors from growing to values which exceeded tens of miles. Errors of this magnitude in the navigation system of an SSBN would propagate directly into miss distances at the target of at least that magnitude no matter how precise the missile fire control and guidance systems were. Thus, Polaris needed a navigation system that dramatically reduced the magnitude of the navigation error if its accuracy were to compare favorably with land based systems which could rely on very precise terrestrial surveilling systems to provide initial location information to ICBM fire control and guidance systems. At the same time, this navigation system needed to function in such a way as to preserve the covertness of SSBN patrols, and it needed to be survivable if SLBM accuracy were to be preserved after an attack. Two complementary systems were developed by the Navy for Polaris which met these different

criteria.[49] Both were radio aids to navigation that submarines could use to periodically update the errors in ships inertial navigation systems (SINS) that accumulated over time, in the same way that celestial sightings were used to update more primitive dead reckoning methods.

The first system, called Loran C, built on some of the technical principles underlying VLF radio comunications. Using multiple transmitters of Low Frequency (LF) signals, Loran C was a radio aid to navigation that allowed submerged reception at shallow depths. Using the same towed antenna used for reception of the VLF fleet broadcast, an SSBN could also receive Loran C signals. Within the areas covered by the Loran C signals, SSBNs had a continuous, all weather means of updating SINS that did not require significant departures from stealthy SSBN patrol procedures. Like VLF radio, Loran C was not designed to be a survivable system, rather it was optimized to serve the need of preserving peacetime stealth for patrolling SSBNs in specific deployment areas.[50]

---

[49]. These and other SSBN navigation systems are discussed in Owen Wilkes and Nils Petter Gleditsch, *LORAN C and OMEGA: A Study of the Military Importance of Radio Navigation Aids* (Oslo: Norwegian University Press, 1987).

[50]. LORAN C also provided an alternative, covert communication link to deployed SSBNs under the Clarinet Pilgrim program.

The second system, called Transit, was a radical departure from all previous navigation systems. It was (and is) a satellite based radio aid to navigation operating at two frequencies in the very high (VHF) to ultra high (UHF) frequency band of the radio spectrum. It provides position information to terrestrial platforms using the inverse of a method developed to track the first orbiting satellites.[51] This method exploits the information provided by precise measurement of the doppler shift in radio frequency generated at a receiver by a moving transmitter. Space tracking systems use fixed terrestrial receivers of known location to measure doppler shifts in telemetry signals caused by orbiting satellites. Transit involved the measurement by a terrestrial platform of unknown location of doppler shifts in transmissions by satellites in known orbits. Doppler based space tracking was first developed as a means of tracking Sputnick in 1958. Its application as a radio aid to navigation for Polaris began in 1960 and achieved full operational capability by 1964. Unlike Loran C, Transit was a survivable system which provided global coverage. These characteristics made Transit ideal for post attack operations since

[51]. The challenge of tracking Sputnick is what led engineers at the Applied Physics Laboratory (APL) at Johns Hopkins to conceive of what later became Transit.

its accompanying drawbacks - intermittent coverage and the need to surface an antenna - did not matter in that environment. Thus Loran C and Transit provided complementary and highly innovative solutions to the challenge of providing precise, survivable navigation capabilities to widely dispersed, covert platforms.

At the time Polaris entered full scale development in the beginning of 1957, the basic concept of a solid fuel ballistic missile remained unproven. The marriage of this new technology with submarine basing and the need for submerged launching added serious additional technical challenges. By themselves, these obstacles were perceived to be serious enough to cast doubt on the entire FBM concept. The additional challenges of providing Polaris with continuous communications and accurate navigation were sufficient to cause doubts about the viability of the FBM concept even after the original challenges were met. FBM communication and navigation systems ended up exploiting revolutionary technologies that did not exist in operational form when Polaris entered full scale development, but which were developed and deployed in the space of several years in time to support initial Polaris patrols in late 1960. These initial patrols, combined with the later deployment of Minuteman ICBMs in hardened silos in 1962, enabled the United States to engage in a wholesale redirection in its

modernization programs and in its war planning away from systems and plans for their use which depended on strategic warning. This shift towards systems which survived in the absence of strategic warning in no way compromised the ability of U.S. forces to meet other important operational demands. Instead, Polaris improved not only the survivability but the lethality of U.S. forces, eliminating what had been perceived as an inexorable tradeoff between those important operational demands without resort to risky strategies which depended upon the exploitation of strategic warning.

Making Trident II A Hard Target Killer

The question of the comparative accuracy and lethality of ICBMs and SLBMs has an interesting history. Soon after the first generation Polaris A-1 SLBM first went on patrol in November 1960 through to the late 1970s, SLBMs came to be perceived as weapons whose intrinsic inaccuracy compared to land based forces limited them to retaliatory missions against soft urban-industrial targets. Thus, when SLBMs were considered as an alternative to ICBMs in the late 1970s, they were burdened with the perception that substantial technological hurdles blocked the path leading to SLBM accuracies

equal to those expected of the most modern ICBMs. These popular perceptions were misguided on two counts.

First, SLBM accuracies have always been the equal of contemporary ICBMs in the United States. I have already noted that this was true of the first SLBM. Polaris A-1 had a cep of 2 miles when it was deployed in 1960, as did the only operational ICBM of the time - the Atlas D. Polaris A-3 improved on this accuracy fourfold when it was deployed in 1964 with a cep of .5 miles. Polaris A-3 was actually the most accurate ballistic missile in the world until Minuteman II was deployed in 1966 with a cep of .25 miles. In 1970, Minuteman III and Poseidon C-3 were deployed. Minuteman III provided only a marginal improvement in accuracy over Minuteman II, while Poseidon provided a further twofold improvement over Polaris A-3 with a cep of .25 miles, which brought SLBM accuracies back into rough equivalence with contemporary ICBMs. An improved accuracy program reduced Minuteman III ceps to .12 miles in 1979. At the same time, Trident C-4 was deployed with an accuracy goal equivalent to Poseidon's .25 mile cep. By 1983, a navy improved accuracy program confirmed that Trident C-4 ceps were actually equivalent to the .12 mile performance of the improved Minuteman III. MX ceps were projected in the late 1970s to be in the .06 mile range, and this performance projection was apparently

achieved in 1986. In 1989, Trident D-5 deployed with a cep of .06 miles as well. Contrary to the popular belief that this constituted a major shift in the comparative capabilities of ICBMs and SLBMs it was in fact a continuation of a trend that had applied throughout the ballistic missile era.[52]

Second, these mistaken popular beliefs concerning accuracy masked the true source of differences in lethality between ICBMs and SLBMs. Polaris and Trident II were the only SLBMs which equalled the lethality of their land based counterparts because they were deployed with heavy warheads. Though they were perfectly accurate, Poseidon and Trident I had small warheads designed to maximize effectiveness against soft area targets. This had nothing to do with any fundamental technical constraints, but resulted simply from doctrinal decisions by the FBM program to optimize SLBMs for soft targets while the Air Force focussed ICBM development efforts on the hard target mission.[53] Thus, the improved lethality of the Trident II was the result of evolutionary improvements in accuracy and a substantial, more than fourfold

---

[52]. These CEPs are drawn from the table cited earlier in Mackenzie, Inventing Accuracy, pp. 428-429.

[53]. See Ted Greenwood, Making the MIRV: A Study of Defense Decision Making (New York: University Press of America, 1988) pp. 54-57.

increase in the yield of its warheads compared to the Trident I.[54] Technically, the development of the heavy W-88 Trident D-5 warhead was a trivial challenge and the basic design was "tested at full yield in 1976 just prior to the implementation of the Threshhold Test Ban Treaty."[55] The improvement in accuracy from the C-4's .12 mile cep to the D-5's .06 mile cep was not significantly more challenging.

Despite the fact that SLBMs always achieved accuracies equal to contemporary ICBMs, this performance was not initially the result of any attempts to maximize SLBM accuracy. A program to make such an attempt possible was begun in 1974.[56] The improved accuracy program (IAP) ran from 1974 to 1982. It was largely focussed on the development of advanced instrumentation on SLBM test ranges designed to construct and verify mathematical models explaining the sources of error in existing submarine navigation

---

54. The C-4's W-76 warhead yields 100 kilotons. The D-5's W-88 warhead yields 475 kilotons. See Hansen, U.S. Nuclear Weapons, p. 206.

55. Don Kerr, former director of Los Alamos, as cited in Graham Spinardi, From Polaris to Trident: The Development of U.S. Fleet Ballistic Missile Technology (Cambridge, UK: Cambridge University Press, 1994) p. 152, n. 50.

56. On the origins of the IAP, see Mackenzie, Inventing Accuracy, pp. 284-285; and Spinardi, From Polaris to Trident, pp. 141-143.

and SLBM guidance systems.[57] Once developed, these models could be used to identify and correct these errors. Largely through the construction of these models, the Navy was able to double the accuracy of Trident C-4 between 1979 and 1983, and to further double the accuracy of Trident II compared to Trident I. These improvements did not involve substantial changes in the hardware of existing navigation and guidance systems, new components that were needed were well developed (if often hard to produce), and required nothing even remotely as challenging as the initial development of the Transit navigation system.[58] Furthermore, their high probability of success was apparent to technically informed observers well before the completion of the IAP.[59] Thus, the

---

[57]. See Capt. Robert Topping, "Submarine Launched Ballistic Missile Improved Accuracy," American Institute of Aeronautics Paper AIAA-81-0935, May 1981.

[58]. See *A Review of Major Strategic Weapons Programs*, House Armed Services Committee (Washington D.C.: U.S. Government Printing Office, June 1988) pp. 95-114. Elsewhere in this report are vivid descriptions of performance and reliability problems associated with the MX's guidance subsystem. See pp. 35-50.

[59]. Thus, the director of Strategic Systems Program Office (SSPO) could testify in 1978 that the only technical risk associated with the Trident II lay in the area of accuracy improvement, and that a decision to pursue accuracy improvement by building on the existing Trident I guidance subsystem would allow those risks to be eliminated with high confidence by 1981. SSPO was more reluctant to guarantee success using other forms of mid-course or terminal guidance. See SASC FY79, pp. 6682-6690.

challenge in the late 1970s of making Trident II as lethal as MX was far less daunting than the challenge in the late 1950s of making Polaris A-1 as accurate as Atlas D and of making Polaris A-3 more accurate than any other ballistic missile only four years later.

Controlling and Communicating With Trident II

Misperceptions also characterized comparisons between SSBN and ICBM communications. These comparisons were less long lived than comparisons of lethality, but by the late 1970s such comparisons had become perhaps even more influential in leading decision makers to choose an ICBM modernization program as the solution to the ICBM vulnerability crisis. Because of their central location in the United States, ICBMs enjoyed access to many peacetime communications media unavailable to deployed submarines, including land lines and line-of-sight radio relay. This obvious fact led many to presume that ICBMs also enjoyed intrinsic advantages in terms of their access to post attack communications. Even in theory, this presumption had little real basis in fact, while in practice, ICBM command systems, like their SSBN counterparts, emphasized the demands of peacetime and crisis operations. Since

the operational proclivities of the managing organization leaned so heavily in the direction of launching land based forces on tactical warning, little investment was made in dedicated systems designed for true second strike operations. Thus, by the late 1970s, it was more accurate to note that neither ICBMs nor SSBNs were supported by extensive dedicated command systems designed for enduring post attack operations. In fact, given an equally small investment in post attack comunications, the consequences in terms of command and control constraints were more severe for the partially survivable ICBM force than for the totally survivable SSBN force.[60] Thus, the

---

[60]. This realization only gradually emerged even amongst those most intimately familiar with the state of the command system. In 1978, John Steinbruner described the SSBN force as the least controllable of the three legs of the triad. Steinbruner, "Strategic Stability," p. 422. Bruce Blair made a similar argument in 1985. See Blair, Strategic Command and Control, pp. 198-201. Blair argued that there existed an "inverse relationship between the vulnerability of a given force component and the strength of its supporting command system." (p. 209) Steinbruner described "a mean twist of fate (in the existence of) a fundamental trade-off between the vulnerability of individual force elements and the ability of authoritative command channels to exercise precise, centralized control." (p. 421) William Perry made a somewhat different argument in 1979, stating that "in terms of (surviving) for a month or a week or even an hour after attack, we become essentially dependent on our airborne (command) systems, those that survive an attack. That problem is really common to the three legs of the triad." See *DOD Appropriations for FY80, House Appropriations Committee*, pt. 3, p. 26. Writing in 1987, Ashton Carter argued in opposite fashion to Steinbruner and Blair. "Despite some technical basis for the unfavorable comparison so commonly made between ICBM and

predilection to believe in the intrinsic superiority of ICBM command systems over SSBN command systems could only be based on a comparative assessment of future developments rather than current capabilities. Paradoxically, it was in the late 1970s that technical innovations in satellite communications promised to render distinctions between ICBM and SSBN command systems all but moot.[61]

Dedicated command systems for true second strike retaliatory operations did not receive much attention before the late 1970s for several reasons. First, since land based forces were oriented towards exploiting tactical warning for technical and doctrinal reasons, their command systems had traditionally not been optimized for true second strike operations. Likewise, since SSBNs were expected to enjoy perfect survivability and since they were highly autonomous, their post attack command system needs were minimal as long as they only had to perform pre-planned operations and

---

SLBM command and control, as a general proposition it is much too strong, and by important standards simply incorrect." Carter, Managing Nuclear Operations, pp. 574-575.

[61]. Again, as in the assessments of current capabilities described above, few analysts noted how future communications assets would serve all force elements equally well. One exception is the discussion of command and control by Ashton Carter and Ted Postol in the 1981 OTA MX Basing Study, pp. 276-299.

therefore post attack command system requirements did not receive the emphasis that peacetime command system requirements did. Left to their own devices, the Air Force would have continued to focus on one way communication links designed to rapidly disseminate execution orders on tactical warning and the Navy would have continued to focus on their very different one way communication links designed to maximize the stealthiness of deployed SSBNs.[62] By the late 1970s, new satellite communication technologies promised to provide a highly effective means of post attack communication to all forces, both on land and at sea.

Post attack strategic communications required circuits which could survive direct nuclear attack, could survive and function in

---

62. Thus, for different reasons, both services were highly ambivalent concerning the need for truly robust two way communications. The Air Force was reluctant to provide its airborne command aircraft with two way links to missile silos for post attack monitoring and retargeting of surviving forces. It placed primary emphasis on a prompt retaliatory launch in which all the ICBMs survived and communication circuits were needed simply for the transmission of one of several pre-existing plans. Likewise, the Navy was lukewarm towards covert two way satellite communication links with deployed SSBNs because they were concerned that their availability would lead to demands for their frequent use during peacetime patrols. Such a change in existing (and highly successful) patrol procedures, over time, might create vulnerabilities that would not exist if such links were only used briefly and intermittently in the midst of a war. Thus, the Navy focussed instead on the development of a one way, ELF fleet broadcast for peacetime operations that allowed SSBNs to patrol more deeply and without an antenna near the surface.

the presence of a variety of indirect nuclear effects, were resistant to enemy jamming, were capable of deployment on small mobile platforms, were global in reach, and were covert when used for two way communication with stealthy platforms. No existing communication system met these demands in the late 1970s and they contributed to the initial development of extremely high frequency (EHF) satellite communications (SATCOM). EHF SATCOM eliminated many if not all of the tradeoffs which plagued earlier communication systems.[63]

EHF radio occupies one extreme of the radio spectrum useful for communication. At the other extreme are the very low (VLF) and extremely low (ELF) frequencies used for the one way peacetime links to submerged SSBNs. At the EHF end of the spectrum, even highly directional transmitters and receivers can be made very small because the efficiency of an antenna of a given size varies directly with the frequency (or inversely with the wavelength). Thus, even small antennas useful for mobile platforms could transmit and receive highly directional beams which were hard to

---

[63]. On the development of EHF SATCOM, see William Ward and Franklin Ford, "Thirty Years of Research and Development in Space Communications at Lincoln Laboratory," *The Lincoln Lab Journal*, Vol. 2, No. 1 (Spring 1989) pp. 5-34.

detect and jam.[64] At lower SATCOM frequencies, highly directional SHF antennas are too large for mobile or stealthy deployment, while omnidirectional UHF antennas are easy to detect when transmitting and to jam when in receive mode.

Another characteristic which varies directly with frequency is bandwidth. Bandwidth normally determines the quantity of data that a given circuit can pass simultaneously. Thus, high bandwidth circuits can have very high data rates. Bandwidth can also be exploited to create highly jam resistant and covert communications using one or both of two techniques which spread or hop signals across frequencies.[65] The wider the bandwidth, the more frequencies are available for spreading and hopping. The very wide bandwidth available at EHF makes that part of the spectrum uniquely adaptable to the exploitation of these low probability of intercept (LPI) and antijam techniques, further improving on the already intrinsic covertness and jam resistance provided by highly directional EHF circuits. Finally, EHF circuits are also least effected by the

---

[64]. For an example of such a terminal, see David Hughes, "MILSTAR Terminals Enter Production as MIT Develops Briefcase-Size Unit," *Aviation Week and Space Technology*, June 4, 1990, pp. 45-48.

[65]. See, David Nicholson, Spread Spectrum Signal Design: LPE and AJ Systems (Rockville, MD.: Computer Sciences Press, 1988)

ionospheric effects of nuclear blasts, like blackout and scintillation. These can interrupt SATCOM circuits at SHF or UHF for minutes or hours.[66]

These potential advantages led to the development and deployment in 1976 of a pair of experimental EHF satellites by MIT's Lincoln Laboratory. Lincoln Experimental Satellite (LES) 8 and 9 proved the basic feasibility of EHF SATCOM.[67] They also provided an example of how SATCOM constellations operating at EHF could address the issue of the survivabiity of the satellites themselves, since the possibility of attack against these vital circuit nodes could not be ruled out. LES 8 and 9 were given internal nuclear power sources that eliminated the need for solar panels with large radar cross sections. In addition, they were controllable from survivable airborne command posts which allowed basic housekeeping duties and emergency redeployments to continue during or after an attack. Finally, LES 8 and 9 deployed

---

66. See Carter, Managing Nuclear Operations, p. 246.

67. On LES 8&9, see F.J. Solman, C.D. Berglund, R.W. Chick, and B.J. Clifton, "The Ka Systems of the Lincoln Experimental Satellites LES-8 and LES-9," *AIAA Paper 78-562*, April 1978; L.J. Collins, L.R. Jones, D.R. McElroy, D.A. Siegel, W.W. Ward, and D.K. Willim, "LES-8/9 Communications System Test Results," *AIAA Paper 78-599*, April 1978; and D.M. Snider and D.B. Coomber, "Satellite-to-Satellite Data Transfer and Control," *AIAA Paper 78-596*, April 1978.

crosslinks linking them to each other as well as the normal uplinks and downlinks linking them to surface terminals. Crosslinks allowed the relay between satellites of a message from one hemisphere to another without an intervening relay by a ground based (and potentially vulnerable) terminal.[68]

EHF SATCOM served as the centerpiece of the strategic communications modernization program that was part of the general strategic nuclear modernization program begun in the late 1970s. Two aspects of the EHF SATCOM program limited its contribution to solving the second nuclear vulnerability crisis. First, after LES 8 and 9, the architecture for an operational EHF SATCOM system remained the subject of a rancorous debate until the early 1980s.[69] Advocates of the early exploitation of EHF SATCOM argued that EHF transponders could be quickly developed and deployed on host satellites already in advanced development or production. The opposing argument called for the development of a dedicated

---

[68]. These spacecraft survivability measures grew out of the Air Force's interest in a survivable satellite system, or SURVSAT, designed to defeat exotic Soviet anti-satellite (ASAT) systems. See Anon., "USAF Studies Spacecraft Survivability," *Aviation Week and Space Technology*, August 4, 1975, pp. 41-42.

[69]. See Strategic Command, Control, and Communications: Alternative Approaches For Modernization (Washington D.C.: Congressional Budget Office, October 1981) pp. 26-29.

satellite system using deep space orbits that would be more survivable in the face of exotic anti-satellite systems yet to be developed or deployed. The architectual compromise that eventually emerged from this debate led to the MILSTAR program.

MILSTAR was a highly ambitious system which in the best case would not be available until the late 1980s. (The first MILSTAR satellite was not deployed until 1994.) It was also a technical compromise between the two opposing architectures described above since it was an entirely new, multi-purpose satellite program designed to operate from a traditional orbit. MILSTAR was also a joint program designed to meet the demands of all services in a variety of scenarios. After MILSTAR was approved in 1983 for full scale development, a supplementary Navy EHF SATCOM Program (NESP) was begun to develop transponder packages for existing UHF Fleet Satellite Communication (FLTSATCOM) platforms that could be used to test terminals for the MILSTAR system prior to its deployment.[70] These NESP packages would also provide an interim operational EHF SATCOM capability. Two of these packages were deployed in 1986 and 1989. Thus, like Trident II, EHF SATCOM develcpment lagged considerably behind the pace that technology would have allowed.

---

[70]. See D.R. McElroy, "The FEP Communications System," *AIAA Paper 88-0824*, March 1988.

Interim transponder packages which could have been deployed in the early 1980s were instead deployed in the late 1980s, while a dedicated system begun in 1983 on the assumption that there would be no such interim deployment became so complicated and expensive that it remained undeployed as late as 1993.

Second, and more importantly, the unique utility of EHF SATCOM for SSBN operations played no role in the architecture or timing of EHF SATCOM development. Dedicated SSBN command systems had always emphasized the value of preserving the stealth that was the centerpiece of SSBN survivability. In peacetime, this emphasis on stealth led to command system procedures that eschewed two way communications as much as possible. Beginning in the late 1970s, decision makers desired command systems optimized for true second strike operations that would allow report back from surviving forces to ensure that they had recieved the proper orders. EHF SATCOM provided such a means of covert report back to deployed SSBNs.[71] EHF antennas were so small that their intermittent deployment in a receive mode posed no more of a threat of detection than did the routine deployment of Transit navigation receivers.

---

[71] See *DOD Authorization For Appropriations For FY 82, Senate Armed Services Committee*, p. 4095 for one of the earliest references to an EHF report back program for SSBNs.

Likewise, frequency hopped and spread EHF transmissions from such an antenna were immune to existing and planned radio interception and position fixing technologies even in peacetime.[72] In a post attack environment which existing types of SIGINT systems were extremely unlikely to survive, EHF SATCOM transmissions were even less likely to compromise the stealth of deployed SSBNs.[73]

As early as the late 1970s, no technical reasons existed that prevented the design of a true second strike command system for SSBN operations that was identical in capability to those that would support second strike MX operations. Since debate over EHF SATCOM architecture lasted through 1983, no planned (or unclassified) system with these capabilities existed for decision makers to consider in any prospective comparison of future ICBM and SSBN command systems. Instead, airborne and terrestrial command systems served as the baseline for comparison between land and sea based C2 capabilities. These artificially constrained comparisons did show sea based forces in a somewhat unfavorable light in certain scenarios. Once the MILSTAR program was actually begun,

---

[72]. See <u>MX Missile Basing</u>, pp. 290-291.

[73]. In fact, in a true post attack environment, SSBNs could in all liklihood use HF radio. Soviet SIGINT capabilities are unlikely to survive a nuclear exchange.

the commitment to silo basing MX had already been made. This rendered all debate over post attack command systems moot, since silo based ICBMs would retain the counterforce mission and had to be launched on warning if they were to survive. Thus, when operational EHF SATCOM systems were finally deployed along with Trident II, the unique capabilities of this combination for true second strike operations remained unexploited.

IV. Innovative and Stagnant FBM Doctrine.

From a purely technological perspective, the Polaris and Trident II programs were both extremely successful. Once deployed, decision makers in both the late 1950s and late 1980s realized that each system provided them unique and highly prized capabilities that were difficult if not impossible to obtain by other means. In the latter case, this realization came a decade too late. This was a doubly ironic outcome. Years of study and comparison between MX and Trident II produced a consensus that MX would more effectively eliminate the vulnerabilities in U.S. nuclear posture that so exercised the modernization program begun in the late 1970s. In the end, a survivable MX proved more difficult to obtain than a lethal and controllable Trident II. The irony deepens because, in

the meantime, delays in the Trident II development process led to a decision to deploy MX in silos and essentially abandon the drive to escape the constraints and dangers associated with complete dependence upon tactical warning for survival and effective control over the bulk of U.S. forces. Thus, at the time of Trident II's eventual deployment, U.S. war plans remained as focussed on exploiting tactical warning as earlier war plans of the 1950s were focussed on exploiting strategic warning. Given this overwhelming and continuing focus on tactical warning, the capabilities provided by Trident II remained underutilized and the return on the money invested in its development was not maximized. The Trident II program was used as a complement rather than a replacement for other outmoded and more expensive systems systems.

Polaris saved decision makers of an earlier era from their prior emphasis on programs which, like MX, were likely to increase rather than reduce vulnerabilities. In so doing, it more than payed for itself by provoking the elimination of those same programs. Here, decision makers were not forced to compromise their policy goals because of perceived technical tradeoffs between valued capabilities - these tradeoffs were eliminated by innovative systems which provided the full range of desired capabilities. Furthermore, the rapid and aggressive development of these

capabilities provided decision makers the option of changing war plans to exploit them in timely fashion.

Polaris and Trident II were developed by the same organization. Both systems were developed in the midst of one of the two major strategic nuclear modernization programs of the Cold War. Both modernization programs grew out of substantial and wide ranging concerns over the vulnerability and effectiveness of the U.S. nuclear posture. Finally, Polaris and Trident II faced similar kinds of technological challenges, even if these challenges were somewhat greater in the first case. None of these factors explains the substantial differences between the innovative uses to which Polaris was put compared to the relatively stagnant role of Trident II. Since these potential causal factors do not exert powerful effets, it is fair to consider the causal effects of different patterns of intraservice and civil-military politics. The next two chapters show that theories of doctrinal innovation which use these independent variables to explain innovation are also not well suited to explaining Polaris and Trident II.

CHAPTER 4: Polaris and the Missile Gap.

In both senses of the term, the Navy's FBM program was a radical doctrinal innovation. It involved the establishment of a completely new combat arm, and caused a major internal reorientation of Navy investment and personnel patterns. It also involved the Navy in the development of a weapon system that was a threat to its existing organizational and doctrinal proclivities. At the same time, the FBM program had radically positive effects on U.S. security. More than any other system, the FBM program both made the balance of terror indelicate, and made national leaders realize that the balance was indelicate, and it accomplished these results rapidly and in timely fashion. In the space of five years, secure second strike capabilities ceased to be a daunting challenge and became instead a basic and immutable part of the grand strategic landscape.

An excellent example of both the speed and decisiveness of this shift in both capability and perception is provided by Bernard Brodie. Writing in 1959, he noted the degree to which beliefs in the security of the U.S. nuclear force and in the automaticity of its retaliatory capacities were taken for granted by policy makers

in an environment where such capabilities were in fact far from being assured.[1] By 1965, Brodie was writing of the "revolution in the degree of security" obtained by U.S strategic forces, and of the degree to which its extent "has considerably outrun my (earlier) expecations."[2]

Polaris was one of many strategic nuclear programs initiated during the second term of the Eisenhower administration. Some of these programs, such as the Air Force's B-52/KC-135 combination were innovative in a limited, evolutionary sense, being a somewhat natural product of mainstream Air Force organizational and doctrinal proclivities. Others, like the Air Force's Atlas ICBM program, were fairly radical departures from such existing organizational and doctrinal proclivities but depended on a high degree of civilian intervention in order to get started. Still others, like the Army's Jupiter IRBM were the result of internal intraservice

---

1. The discussion I am paraphrasing here can be found in Bernard Brodie, Strategy in the Missile Age (Princeton, N.J.: Princeton University Press, 1959) p. 282. It is accompanied by an approving reference to Wohlstetter's contemporary piece on the delicate balance of terror.

2. Bernard Brodie, Strategy in the Missile Age (Princeton, N.J.: Princeton University Press, 1965) p. vii. Brodie goes on to note the source of this revolution in the Polaris and Minuteman missile programs. I am indebted to Steven E. Miller for alerting me to the contents of Brodie's preface to the 1965 paperback edition.

struggles between fairly autonomous and competitive factions or communities in which the resulting program constituted a natural product only for a small part of the service and faced varying degrees of opposition from the rest of the service. The Navy's FBM program did not derive from any of these three organizational and political dynamics.

Certainly, Polaris was not the natural evolution of established Navy organizational and doctrinal proclivities as was the Air Force's manned bomber program. Likewise, Polaris did not derive from the lobbying of an established sub group of the Navy in the way that Jupiter derived from the intraservice lobbying of the Army's Ballistic Missile Agency. Finally, unlike the Air Force's ICBM program, Polaris did not derive from powerful and sustained pressure by civilian executives. More than any of the other programs mentioned so far, Polaris derived from a Navy desire to not lose what it perceived to be an interservice competition over the resources and the roles and missions of the coming thermonuclear missile age. These concerns motivated the other services as well, but their behavior had other powerful sources as well, sources corresponding to the predictions of existing theories of the sources of innovative military doctrine. These theories do not explain Polaris very well because they do not treat interservice

competition as an independent variable. This chapter will show how interservice competition helped to "cause" Polaris.

My argument unfolds in five sections. First, I provide a brief history of U.S. grand strategy, the nuclear doctrines of the services, and the weapon systems which represented those doctrines for the period from the immediate post WWII period through to the late 1950s. This discussion establishes for the reader the link between the doctrinal innovation in need of explanation and the Polaris weapon system. In the following section, I discuss the origins of the Polaris program or, more accurately of the Fleet Ballistic Missile (FBM) program. This section will illuminate the organizational and doctrinal behavior in need of explanation. In the next two sections, I compare this behavior to that of the other services involved in developing ballistic missiles. In particular, I compare the intraservice and civil-military politics of the Navy's FBM program and the other service's ballistic missile programs. Here, I show that the Navy lacked an internal organizational and doctrinal lobby for ballistic missiles on anything approaching the scale of the Army, and that the Navy never experienced the intense and sustained civilian intervention that led to the Air Force's ballistic missile program. In the last section, I show that the Navy's rapid establishment of its own ballistic

missile program, in the face of intraservice and civilian opposition, was caused or greatly felicitated by fears of the consequences of not doing so when the other services were. As I will show, these fears could have easily led to the opposite course - they did not force the Navy into an FBM program, and they certainly did not force the Navy into the particular FBM program which in the end produced the Polaris weapon system. On the other hand, given the intraservice and civil-military politics of a Navy FBM program, this section will show that in the absence of such fears, and in the absence of the particular pattern of interservice relations which produced them, it is exceedingly unlikely that the decision to pursue an FBM capability would have been made when it was and executed with the depth of commitment that it was. Interservice competition is a necessary, if not sufficient independent variable in the explanation of the Navy's FBM program.

Aircraft Carriers, the Air Force, and Massive Retaliation: A Marriage of Convenience.

The Navy was essentially barred as an organization from participa-

tion in the Manhatten Project during World War II.[3] After the war, several naval officers who had been individually assigned to the project decided to pool their knowledge of atomic weapons and work to give Navy carriers an atomic delivery capability.[4] As the Navy thereby developed a nascent nuclear delivery capability from its existing carrier force, the question arose as to how best to justify new carrier construction. Such construction was threatened both by the fiscal scarcity caused by the Truman administration's low budget ceilings, and by a doctrinal challenge from the newly independent Air Force which opposed new carrier construction as a violation of the Key West roles and missions agreement.[5] In response to these threats, the Navy sought to develop doctrine to justify future carrier construction, and in particular, to justify CVA-58, the new flush-deck carrier the USS United States. Three

---

[3]. For the story on the Navy's lack of involvement in the wartime Manhatten Project, see Harvey Sapolsky, Science and the Navy: The History of the Office of Naval Research (Princeton, N.J.: Princeton University Press, 1990) pp. 15-19.

[4]. Vincent Davis, The Politics of Innovation: Patterns in Navy Cases, *The Social Science Foundation and Graduate School of International Studies Monograph Series in World Affairs*, Vol. 4, No. 3, 1966-67 Series, University of Denver, pp. 4-17.

[5]. John Greenwood, "The Emergence of the Postwar Strategic Air Force, 1945-1953," Air Power and Warfare, *Proceedings of the Eighth Military History Symposium*, U.S. Air Force Academy, 1978, p. 233.

schools of thought emerged.

A "traditionalist" school argued that carriers would continue to play their classic roles of sea control and power projection because atomic weapons were unlikely to be used in any future war. A "radical" school argued that carriers should focus solely on developing their capacity for lang range atomic attack because future wars would be dominated by these new weapons. Finally, a "compromise" school argued that carriers provided tremendous flexibility to accomplish the full range of missions - conventional or nuclear - and that the Navy should not focus on one mission for its carrier force to the exclusion of the others.[6] This doctrinal ferment within the Navy contrasted with the unanimity of the Air Force whose doctrine saw massive nuclear offensive capabilities against Soviet cities as both a necessary and sufficient response to Soviet conventional superiority in Eurasia.[7]

The Truman administration refused to be drawn in by these

---

[6] David Rosenberg, "American Postwar Air Doctrine and Organization: The Navy Experience," in Alfred Hurley and Robert Ehrhart (eds) *Air Power and Warfare: The Proceedings of the 8th Military History Symposium*, United States Air Force Academy (Washington, D.C.: U.S. Government Printing Office, 1979) pp. 252-255.

[7] John Greenwood, "The Emergence of the Postwar Strategic Air Force, 1945-1953," in Hurley and Ehrhart, *Air Power and Warfare*, pp. 219-224.

doctrinal arguments, which really impinged directly on basic grand strategic decisions that the administration had yet to make. Throughout the period between WWII and Korea, Truman refused to provide guidance to the military services regarding the circumstances under which he would authorize the use of atomic weapons. This grand strategic uncertainty allowed and, in some senses, provoked the doctrinal debates described above, which, in turn, reflected efforts by the Navy and the Air Force to justify continued investment in their main weapon platforms.

The uncertain policy guidance provided the services by the Truman administration was accompanied by quite explicit and draconian budget policies. Strict ceilings were imposed on defense budgets in these years.[8] As a result of those ceilings, and because of perceptions that several of the Navy's various carrier doctrines were redundant compared to the Air Force, the Secretary of Defense cancelled CVA-58 in 1949. This decision led to an intense and unsuccessful effort by the Navy to discredit the Air

---

[8]. To give an idea of how strict, the FY48 defense budget in FY90 dollars amounted to 77.8 $billion. To give some perspective, this is roughly the amount that each service is spent in FY95, half a decade after the end of the cold war. For a list of late 1940s defense budgets in FY90 dollars, see William Kaufmann, *Glasnost, Perestroika, and U.S. Defense Spending* (Washington, D.C.: Brookings, 1990) p. 55 (Table 1).

Force's nuclear doctrine and the chosen instrument of that doctrine. The Navy argued that an atomic air offensive would not be sufficient by itself to win a war, and that the Air Force's new strategic bomber, the B-36, was too vulnerable to wage such an offensive. Instead, the Navy argued that atomic weapons could assist general purpose forces waging traditional campaigns for control of the air, land, and sea, and that carrier based atomic strike aircraft escorted by carrier based fighters would be more likely to penetrate modern air defenses.[9] This effort to resurrect CVA-58 by discrediting Air Force strategic bombing doctrine and the B-36 failed.

Korea saved the Army and the Navy from further cuts in budget and in responsibility to the benefit of the Air Force. Korea's

---

[9]. A corollary to the Navy's operational critique of the B-36 was that long range bombers operating alone against Soviet air defenses would be driven to night attacks, as they were in WWII under similar circumstances. Such night attacks would not provide the accuracy necessary to attack hardened military targets such as submarine pens even with atomic weapons. Rather, the Navy argued, such military targets required daylight attacks which, in turn, produced the need for escorts. This was not a superficial debate designed merely to justify competing weapon systems. In keeping with the positions described above, the two services clashed on the issue of atomic weapon design. The Air Force sought efficient implosion type weapons that maximized the number of weapons in the stockpile and their yields. The Navy sought less efficient gun-type weapons which used huge quantities of fissile material per unit of yield, but which could be used in an earth penetration mode against hardened or buried targets.

limited nature mandated a return to more traditional general purpose forces, even while the U.S. continued to rely primarily on Air Force nuclear striking power to deter war in Europe. In FY52 the Navy was authorized to begin construction on the USS Forrestal, the first postwar big deck carrier and the second coming of CV-58. On the other hand, 1952 also saw Eisenhower's election on a plank that called for no more Koreas and a more explicit reliance on the deterrent power of nuclear weapons.

During the early Massive Retaliation years of Eisenhower's first term, the politics of defense spending changed from the rancorous interservice bloodletting that had characterized the last years of peace before Korea. Eisenhower's explicit emphasis upon nuclear weapons was counterbalanced to some degree by the dramatic growth in peacetime defense spending caused by Korea. Truman budgets averaged about 100 billion in FY90 dollars. After Korea, peacetime spending under Eisenhower averaged 250 billion.[10] This particular combination of policy guidance and spending greatly benefited the Air Force, hurt the Army, and presented a dilemma to the Navy.

Like the Army and unlike the Air Force, the Navy did not

---

[10]. Kaufmann, Glasnost, Perestroika, and U.S. Defense Spending, p. 55.

embrace Eisenhower's Massive Retaliation policies which elevated Air Force doctrine to the level of U.S. grand strategy. On the other hand, there was now more room in the defense budget for a compromise between the Air Force and the Navy in which each would support the other's primary weapon platforms. In the case of Navy carriers, such a compromise could be fashioned by emphasizing their nuclear delivery role in a way that complemented rather than competed with Air Force bombers.[11] Here, the Navy returned to the "compromise" doctrine which had been eschewed in favor of the more extreme (and contradictory) "traditional" and "radical" doctrines adopted during the B-36 controversy with the Air Force. As nuclear platforms, carriers gained the support of the Eisenhower administration, while Navy doctrine for limited, tactical use of those nuclear capabilities appeased the Air Force. Between FY52 and FY58, the Navy received a big deck carrier in every budget and managed to hold on to its one third share of the defense budget while the Air Force's share approached 50% and the Army's shrank to

---

[11]. One can see how such a tactic remained much less relevant to the Army which, despite its desperate efforts - both organizational and technological - to appear relevant to a thermonuclear war with the Soviet Union, remained self evidently a tool for conventional war. Thus, the Army Chiefs of Staff of the period, Mathew Ridgway and Maxwell Taylor, remained more publicly antagonistic toward Massive Retaliation than their Navy counterparts, Robert Carney and Arleigh Burke.

20%. These were years of relative interservice peace, at least between the Air Force and the Navy, and the architects of this peace in the Navy drew the understandable conclusion that a renewed bout of interservice competition would threaten their successful carrier construction program. Navy ballistic missile development challenged the architects of the Navy's compromise both with the Air Force and with the Eisenhower administration because it threatened to reignite interservice conflict.

As the reader will see below, the Navy's compromise with the Air Force and the Eisenhower administration did come undone. Even more surprising, the Navy was the agent of its demise and Fleet Ballistic Missile development the instrument. The Navy used its FBM program as the centerpiece of a new nuclear doctrine more suited to a world of thermonuclear plenty. This doctrine, often described as minimum or finite deterrence, was a direct challenge to both Air Force strategic bombing doctrine and to Eisenhower's massive retaliation policies. Finite deterrence was to the emerging era of thermonuclear plenty what the existing "compromise" carrier doctrine had been to the era of atomic scarcity. In both cases, navy nuclear doctrine sought to preserve a decisive role for general purpose forces: during the first period, because atomic weapons were too small and scarce by themselves to decisively

destroy the Soviet Union, and during the second period, because thermonuclear weapons would soon be so powerful and plentiful on both sides that the mutual destruction of both superpowers once an exchange began would be assured.

The Navy's finite deterrence doctrine was never adopted as policy by either the Eisenhower or Kennedy administrations, but it was instrumental in causing the abandonment of massive retaliation and in causing the development of flexible response as an alternative. Likewise, Polaris was not the only new nuclear delivery system to be developed and deployed on a large scale at the end of the Eisenhower years and the beginning of the Kennedy years. The Air Force responded to the challenge of matching Polaris with their Minuteman solid fuel ICBM program which was developed and deployed several years later. On the other hand, the performance and capabilities of these new systems made it difficult to argue for continuing other modernization programs with less capability and, in many cases, greater cost. These arguments in favor of existing modernization programs became particularly difficult when measured against the demands of the new Flexible Response policies of the Kennedy administration. Thus, the late 1950s and early 1960s witnessed a major cutback in Air Force nuclear programs, including all liquid fuel IRBMs and ICBMs, all cruise missiles, the B-58, B-

70, and B-47 bombers, and the Skybolt air launched missile. Thus, the development of Polaris and, later, Minuteman saved money by making other more expensive programs obsolete.

At least as important were the operational consequences of these solid fuel missiles. The key factor here was the rapid elimination of the thousand strong force of recently deployed intermediate range B-47 bombers in the early 1960s. This step, against Air Force opposition, eliminated the rationale for dependence upon strategic warning for survival. Thus, contrary to normal practice, the doctrinal shift by SAC from dependence on strategic warning to tactical warning occurred quite rapidly. Against Albert Wohlstetter's advice, SAC became an all B-52 force which did not require the use of overseas bases before striking targets in the Soviet Union in the way that a B-47 force did. With a large B-47 force, SAC planning would have been dominated by the capabilities and constraints of that force, rather than the more capable B-52s. Without B-47s, SAC had no excuse but to realign its doctrine for bomber operations so as to render irrelevant the new capabilities for surviving attack provided by Polaris and Minuteman.

Obstacles in the Path of a Navy FBM.

There are two important aspects to the story of the origins of the Navy's FBM program. In a technical sense, the FBM program underwent a rapid and complex evolution which, at the outset, differed dramatically from the Polaris program which eventually emerged. The speed and extent of this technological odyssey sharply distinguishes the Navy's FBM program from the ballistic missile programs of the other services. Below, I note the milestones of this odyssey. The FBM program also underwent a political or doctrinal evolution. The intraservice, civil-military, and interservice politics of this program were not constant, nor have existing accounts focussed on disentangling these different arenas of political behavior and describing their interrelationships. I address these questions after the discussion of the technological development of the FBM program.

The Technology of the Pre 1957 FBM Program.

The FBM program came to life in a kind of technological vacuum. Within the Navy, there were a small group of individuals commited to the idea of a sea based ballistic missile, but their plans and aspirations were not based on any existing hardware. Like the Air

Force, the Navy had a cruise missile program - the Regulus.[12] The Navy, like the other services, had also done experimental work with German V-2 missiles after World War II. These tests included a successful launch of a V-2 from the deck of the carrier Midway.[13] As the supply of war surplus V-2s was exhausted, the Naval Research Laboratory (NRL) contracted with the Martin Company to develop a family of larger sounding rockets, including the Viking. NRL engineers and scientists unsuccessfully promoted a weapons version of the Viking with a notional 500 mile range in 1952.[14] Viking later served as the basis for NRL's successful bid in 1955 to be assigned the task of launching a satellite during the IGY of 1958. Both the human and material resources contained in NRL's small ballistic missile program found their primary use in space rather than in weapons development, and its contributions to the FBM program were minimal.[15]

---

12. Kenneth Werrell, The Evolution of the Cruise Missile (Maxwell AFB, AL.: Air University Press, September 1985) pp. 113-119.

13. Vincent Davis, The Politics of innovation: Patterns in Navy Cases (Denver, CO., University of Denver, 1967) p. 21.

14. Ibid., p. 22.

15. Later, in 1955, one of the reasons why OSD civilians forced the Navy into a joint project with the Army on Jupiter was their belief that the Navy's already small body of ballistic missile expertise was competely tied up in NRL's Viking project to

All ballistic missiles are a combination of propulsion, guidance and control, a payload, and a launching system. In the 1952-54 timeframe, established technology could only barely combine particular forms of these subsystems into a usable system. Existing motors were very large and depended exclusively on non-storable, cryogenic liquid fuels.[16] Guidance and control, especially for longer range missiles, depended on radio guidance and the ability to throttle and swivel the engine thrust vector during the guided boost phase.[17] Thermonuclear weapons had recently created the possibility - still unproven - of marrying the previous two technologies in acceptable fashion by increasing the yield/weight ratio of the missile payload. Finally, the combination of preceding technical constraints produced launching systems comprised of large, soft, easily identifiable, above ground

---

launch the IGY satellite. On the Viking's consumption of Navy ballistic missile talent, see Ronald Kurth, The Politics of Technological Innovation in the Navy (PhD Dissertation, Harvard University, 1970) p. 225.

16. Cryogenic fuels need to be kept refrigerated and missiles designed to use them can only be fuelled shortly before launch.

17. Radio guidance used a radar to track the missile during its boost phase and a radio data link to the missile for sending course corrections. On radio guidance for early ballistic missiles, see M.D. Fagen (ed), A History of Engineering & Science in the Bell System: National Service in War and Peace (1925-1975) (Bell Telephone Laboratories, Inc., 1978) pp. 505-524.

complexes.

This technological format was quite ill-suited to sea basing. Experiments conducted in 1949 on a mockup warship designed to reproduce the effects of a shipboard leak of cryogenic fuel provided a glimpse of some of the potential problems. The sudden thermal shock of the release inside a ship's hull twisted girders, cracked open thick steel plating, and to quote one officer involved in the experiment, "(sent) a shudder through every ship in the Navy."[18] Not only would existing ballistic missile designs be dangerous, their size would rapidly consume all the available space on existing warship design, driving out other weapon systems. Submarine basing of large, liquid fuel missiles therefore seemed particularly unwieldy despite the theoretical advantages of such a basing mode. To make matters worse, sea based ballistic missiles would have to meet additional, unique technical challenges beyond those of their land based cousins. They would have to be launched from moving platforms whose location, using existing methods, was often known only with an accuracy measured in miles.[19]

---

[18]. Michael Armacost, The Politics of Weapons Innovation: The Thor-Jupiter Controversy (New York: Columbia University Press, 1969) p. 67.

[19]. Absent modern radio aids to navigation and when clouds obscure the stars, ships still depend on centuries old "dead

It was against this technical backdrop that ballistic missile proponents within the Navy were forced to operate. Paraphrasing the later words of Admiral Burke:

> "...the components needed to provide a viable FBM system did not yet exist, and there was no guarantee that any amount of research and money could bring them into existence."[20]

Thus, the first step in the technical development of the FBM involved an attempt to adapt existing or imminent land based ballistic missile technology to the maritime environment. This technical "marriage of convenience" paralleled an associated political liason that I discuss in the next section. From a technical standpoint, the Navy's FBM program evolved from a state of sporadic and somewhat disconnected experimental work into a real program only when the Navy "came ashore" and joined the Army's land based Jupiter IRBM program.

The joint Army-Navy IRBM program focussed initially on providing a launching mechanism for a liquid fueled Jupiter that would be compatible with a relatively large merchant hull. This

---

reckoning" methods of navigation using the compass, the marine chrongraph (i.e. a watch), and a speed log (a marine speedometer).

[20]. Davis, The Politics of Innovation, p. 25.

stage lasted from the program's initial establishment in November 1955 until March 1956.[21] At that point, the Navy received permission to pursue a solid fuel missile - the Jupiter S. Jupiter S consisted of a cluster of solid fuel engines and remained a very large missile.[22] It obviously addressed the major problem of shipboard use of liquid fuels but mandated a continuing emphasis on surface rather than submarine basing.[23] During the summer of 1956, two events combined to allow a radical redirection and focussing of FBM technical development. Advances in solid fuels dramatically raised the specific impulse or power of solid rocket motors, allowing a great reduction in size, and promised advances in thermonuclear weapons design dramatically increased yield/weight ratios, thereby reducing demands for rocket motor thrust for a given range performance.[24]

These changes in the design parameters for propulsion and

---

[21]. R.A. Fuhrman, "Fleet Ballistic Missile System: Polaris to Trident," *AIAA Paper 78-355*, February 1978, p. 3.

[22]. In fact, it was projected to be as long as the current Trident D-5 SLBM (44') and 1.5 times its width (120").

[23]. A Jupiter S submarine was estimated to displace 8500 tons and carry only four missiles. Ibid., p. 3.

[24]. On solid fuel developments in the 1955-1956 timeframe, see Spinardi, From Polaris to Trident, pp. 51-52. On warhead developments, see Sapolsky, The Polaris System, pp. 28-32.

payload allowed the FBM program to take seriously the challenge of submarine basing. Thus, only in December 1956 did the FBM program begin the actual technical development of what actually became the Polaris. Leaving the unwieldy Jupiter S behind, the FBM program began focussing on means to squeeze a 1500 mile range megaton yield solid fuel missile within the hull diameter of an existing class of nuclear attack submarine. The last important step in the design process involved the decision to use a true two stage missile. The "envelop" of the various Polaris FBM components was finally established in March 1957.[25] These included decisions concerning the design, configuration, size, and performance goals for the missile itself, the submarine platform, the launching mechanism, the warhead, the navigation system, the fire control system, missile guidance and control, and the communication system.

The Intraservice Politics of Fleet Ballistic Missiles.

During the early 1950s, Navy FBM proponents - both officers and civilian scientists - were few and spread roughly among the Navy Research Lab (NRL), the Bureau of Aeronautics (BuAer), and the

---

[25]. Fuhrman, "Fleet Ballistic Missile," p. 4.

Bureau of Ordnance (BuOrd). The first group had the most practical experience with rocketry, but had no line responsibility for weapons development and was focussed primarily on research, particularly in the area of rocketry for atmospheric sounding and orbiting scientific payloads. BuAer had the responsibility for the Navy's Regulus cruise missile program, and a small group of officers within that branch were lobbying its senior echelon to establish and pursue an operational requirement for a ship launched ballistic missile. BuOrd had no current development responsibilities for either cruise or ballistic missiles, but resisted efforts by BuAer to claim sole developmental responsisbility in these areas. On the other hand, BuOrd did have responsibility for research and development of certain relevant materials and components, such as solid rocket fuels. Finally, there was a small office (Op-51) for coordinating the Navy's work on guided missiles in the office of the CNO.

In 1952, members of this "tacit, low level alliance" sought authorization and funding for the development of a weapons version of NRL's Viking missile and were rebuffed by the Admiral in charge of Op-51.[26] In 1954, an opportunity presented itself to revisit the

---

[26]. The phrase is Vincent Davis' and the description of the Navy's dispersed guided missile organization is from Sapolsky, The

question. That year, President Eisenhower's Killian commission had been convened to study measures to meet the threat of surprise attack posed by Soviet ballistic missiles. Not surprisingly, it became clear at the outset of this study that one of its main recommendations would be for a greatly expanded and accelerated ballistic missile program. Two members of BuAer - Commander Freitag and Abraham Hyatt - managed to pass preliminary and unofficial FBM feasibility studies to members of the commission via a naval officer on the White House staff who had been assigned to support the commission's efforts. As early drafts of the commission's report began circulating within the executive branch in the spring of 1955, they contained a requirement for both a sea and land based IRBM.[27]

This external blessing for a Navy FBM then proved useful to Freitag, Hyatt, and others within BuAer as they sought to build

---

Polaris System, p. 16.

[27]. The origins of the Killian Committee's endorsement of a sea based IRBM are described in Davis, The Politics of Innovation, pp. 23-24 and Sapolsky, The Polaris System, pp. 18-19. It is important to note that this endorsement was for a surface ship-launched rather than a submarine-launched missile. The latter was considered impossible in the near term, thus justifying the continued development of the supersonic, submarine-launched Triton cruise missile. See "Report on the Department of Defense Intercontinental Ballistic Missile and Intermediate Range Ballistic Missile Programs," FRUS, 1955-1957, Vol. XIX, pp. 164-165.

support within that office for an expanded Navy FBM program. Such support was forthcoming and gradually rose to the top within BuAer when its director, Admiral Russell, embraced the concept of an FBM program with a liquid fuel missile and an IOC six to seven years hence.[28] Informal discussions between BuAer and other branches of the Navy during this period made clear that considerable opposition to this concept existed. BuOrd, jealous of BuAer's efforts to monopolize guided missile developments, couched its opposition in technical terms, though the jurisdictional issues were just beneath the surface. BuOrd suggested that near term developments should focus on a more advanced cruise missile, while ballistic missile development should wait upon further progress in the area of solid fuels. NRL, with the only actual ballistic missile program, was in the midst of an effort to win support for the development of a satellite launch capability. NRL harbored concerns over the prospects for that program if the Navy pursued an FBM, and sought to dampen enthusiasm for such a program by emphasizing the daunting navigational and guidance problems yet to be solved in such a concept.[29]

---

[28]. Davis, The Politics of Innovation, p. 24.

[29]. Sapolsky, The Polaris System, p. 20.

This opposition within the guided missile "family" of the Navy was mirrored by opposition from those branches for whom all guided missiles were a waste of time. Not surprisingly, non-technical aviators - the newly dominant faction within the Navy - were within this group. Thus, BuAer itself was not united behind the FBM, and opposition to such a project amongst fleet operators was high in that guided missiles of all types were perceived as being competitive with manned aircraft for dollars, roles and missions.[30] Aviators as a branch had done very well during Eisenhower's "New Look" years, and part of this success had stemmed from the aircraft carrier's identification with the nuclear strike mission.[31] A new missile system for that purpose could only threaten that comfortable arrangement.

At the same time, the submarine community also opposed the idea of an FBM. In 1955, the Navy was just coming to the conclusion that all submarines should be provided with nuclear power - a

---

[30] Ibid., p. 17.

[31]. Eisenhower continued the practice, begun in FY 52 & 53 by the Truman administration, of authorizing a big deck carrier in every budget. This lasted through from FY 54 through FY 58. After a two year hiatus, he authorized one more in the FY 61 budget making a total of six. This is two more carriers than were authorized during President Reagan's administration. Harvey Sapolsky and Owen Cote, "A Baker's Dozen (Of Aircraft Carriers)," *Breakthroughs*, Vol. 1, No. 1 (Fall 1990) p. 2.

conclusion that did not come easily and which would prove tremendously expensive.[32] An FBM submarine program would compete for funds and building spaces with nuclear attack submarines.[33] In addition, proposals for a submarine FBM raised technical questions that the submarine community was not comfortable with. Then Captain Rickover himself expressed serious concern about the prospect of a nuclear power plant and liquid fuel rocket motors in the same submarine hull. Finally, a submarine FBM raised role and mission concerns as well. The submarine community had only in the early 1950s begun seriously the radical reorientation of its doctrine and technology away from anti-surface warfare and towards ASW by marrying the roughly coincidental revolutions in propulsion and sensors caused by nuclear power and low frequency passive acoustics. Nuclear powered submarines had come to be perceived as the prime counter to the Soviet submarine threat to western sea lanes, and submariners had little desire to dilute their efforts in

---

[32]. The decision was made by Arleigh Burke during the construction of the FY 56 budget. Richard Hewlett and Francis Duncan, Nuclear Navy: 1946-1962 (Chicago, IL.: University of Chicago Press, 1974) pp. 265-266.

[33]. The first Polaris submarine was actually begun as an attack submarine, as were the next two as well. Ibid. pp. 314, 320.

the pursuit of other missions.[34]

The surface community had initially been neutral about guided missiles. Earlier, supporters of Regulus in BuAer had bought their support for that system by pointing out how Regulus would generate demands for new ships as launching platforms. Already in 1955 it was becoming clear that Regulus would be largely a submarine and carrier launched weapon. Now BuAer used the same argument in support of an FBM and met with considerable skepticism from the unrestricted line.[35]

Thus the intraservice politics of an FBM did not appear promising to those within BuAer advocating its establishment as a high priority Navy program. In July 1955, Admiral Russell took two steps which belied BuAer's concerns about internal Navy opposition to an FBM. Exercising his authority as a bureau chief to its maximum, Admiral Russell "informed" the CNO's office that under the authority provided by the Regulus program BuAer was proceeding with a liquid fueled FBM development program and initiating contact with industry and government labs for that purpose. Admiral Russell

---

[34]. Sapolsky, Polaris System Development, pp. 18, 35, 52-53.

[35]. Capt. Dominic Paolucci USN (RET), "The Development of Navy Strategic Offensive and Defensive Systems," *U.S. Naval Institute Proceedings*, Vol. 96, No. 5/807 (May 1970) p. 211.

also took the step of lobbying the civilian secretariat of the Navy, starting with the Assistant Secretary for Air James Smith, who in turn gained the support of the Secretary of the Navy Charles Thomas.[36]

This act of independence did not produce decisive results. In response to BuAer's letter of interest in an FBM program, industry and lab groups responded with preliminary and somewhat contradictary assessments of feasibility, cost, and schedule. Generally those groups who already had missile work were skeptical, while those who did not were more optimistic.[37] Likewise, support in the civilian secretariat of the Navy did not translate by any means into Navy wide support. In fact, something approaching the opposite outcome quickly transpired.

BuAer's activities had not gone unnoticed by other bureaus and by Opnav. Admiral Russell's initiatives produced a rapid response in the summer 1955. Chief of Naval Operations (CNO) Admiral Robert Carney specifically informed Admiral Russell by letter that BuAer was under no circumstances to enter into contractual relationships

---

36. Davis, The Politics of Innovation, p. 26.

37. Sapolsky, The Polaris System, p.19.

with industry on the basis of BuAer's FBM "program".[38] More generally, Admiral Sides, director of Op-51 and Admiral Carney's chief advisor, opposed the FBM program and marshalled the support of the senior Admirals in Opnav with cognizance over this issue in support of his position. By the end of the summer 1955, Admiral Carney decided formally not to pursue an FBM program and was supported by Admiral Sides, Admiral Combs (Deputy CNO for Air), and Admiral Roscoe (Deputy CNO for Fleet Operations and Readiness).[39] They argued that an FBM program would jeopardize existing Navy guided cruise missile programs, that these programs were sufficient to meet the Killian commission's unspecific proposal for a sea based missile capability, and that the technical risks and financial costs associated with ballistic missile development would be better borne by the other services until such time as ballistic missiles were better suited for naval use.[40]

The Civil-Military Politics of Fleet Ballistic Missiles.

---

[38]. Davis, The Politics of Innovation, p.25.

[39]. Robert Love, Jr., The Chiefs of Naval Operacions (Annapolis, MD.: Naval Institute Press, 1980) p. 277.

[40]. Ibid., p. 278.

This internal and high level Navy opposition to an FBM was amplified, and in some ways, caused by clear indications from the top of the civilian secretariat of the defense department that a Navy FBM program would encounter tough going at that level. Since before even the initial commissioning of the Killian commission study, DOD civilians had been grappling with the organizational, budgetary, and jurisdictional issues raised by ballistic missiles. The sources of these pressures will be the subject of succeeding sections of this chapter. From the point of view of the Navy and the FBM, the important point concerns the relative lateness of its entrance into the ballistic missile sweepstakes. By the time that Navy FBM advocates had finally succeeded in amassing a critical mass of support for the exploration of that concept within BuAer, DOD had already come to the conclusion that a maximum of four separate military ballistic weapon programs would be supported.[41] There were already four such programs before the subject of an FBM arose, and powerful elements within DOD actually supported limiting the ballistic missile program to a maximum of three.[42] Paradoxically,

---

[41]. Saposky, Polaris System Development, p. 21.

[42]. Deputy Secretary of Defense Ruben Robertson sought to give sole control of all missiles to the Air Force, which would have led to development of only the Atlas, Thor, and Titan systems. Davis, The Politics of Innovation, p. 26.

the issue of a satellite launch capability was also coming to a head at the same time. Here, the Navy had significant DOD support for a complicated set of reasons, but the nature of this support actually constituted another formidable obstacle in the path of an FBM. The civil-military politics of an FBM program were in many ways less encouraging to its advocates than were its intraservice politics. Below is a brief summary of the civil-military politics of an FBM through the summer 1955.

Momentum behind an expanded ballistic missile program had been growing in certain quarters since late 1953. The Killian commission was less a cause than a reflection of this growing pressure. By early 1955, when Navy FBM advocates began lobbying for such a capability, civilian executives within DOD already feared that the United States was overcommited to ballistic missiles. What had begun as a single ICBM program was rapidly evolving into a potentially massive four or five missile program.[43] From a managerial perspective, DOD was concerned about the dispersion and duplication of effort contained in such a wide scope of programs. The fear was that such duplication would waste money and slow progress.

These fears were quite manifest in the office of the Under-

[43]. York, Race to Oblivion, pp. 94-103.

secretary of Defense Reuben Robertson, who was charged with providing DOD oversight for ballistic missile programs. Robertson's primary concern was with the brewing Air Force-Army fight over development and jurisdiction of IRBMs. His clear preference was to give the Air Force sole control over the development and operation of all but the shortest range land based missiles.[44] Robertson's other problem at this point involved the new commitment by the administration to launch a satellite during the IGY. Concommitant with this decision was an additional constraint - the capability exhibited by this program had to be "non-military" or, in practical terms, its booster could not derive from one of the military ballistic missile programs.[45] This program was taken quite seriously by the Administration exactly because of its ambitious plans for the military use of space. The legal principle had to be established that sovereign airspace did not extend into orbit, and the safest political way to establish this precedent was with a non-military civilian scientific program.[46]

Two factors were relatively constant in this complicated set

---

[44]. Armacost, The Politics of Weapon Innovation, pp. 69-70, n. 132.

[45]. McDougall, The Heavens and the Earth, p. 130.

[46]. Ibid., pp. 120-124.

of equations. The Air Force was in DOD's eyes the main developer and operator of military ballistic missiles. From a military point of view, the only question was whether they would be the sole developer and operator. Of the three services, the Navy was clearly least involved in ongoing ballistic missile work. Robertson was well aware of the nascent state of FBM development, and of the internal jurisdictional disputes that even such a low level program was generating within the Navy.[47] In principal, the Navy might have a better case for a "duplicative" ballistic missile than did the Army, but in practice Robertson doubted both the will and the capability of the Navy to actually pursue that goal anytime soon. On the other hand, given its very backwardness, the Navy was actually the best solution to the problem of the IGY satellite. Exactly because ballistic missile work was so limited within that service, most of it remained under the auspices of NRL and outside the mainstream line agencies with the responsibility for weapons development. NRL was quite enthusiastic in its lobbying to be given the IGY assignment, Viking was not related in any way to any military programs, and NRL, though part of the Navy, was overseen by the Office of Naval Research (ONR) whose charter included the

---

[47]. Sapolsky, Polaris System Development, p. 20.

support of basic scientific (i.e. civilian) research and was populated by a gratifying number of civilian scientists (without German accents).[48]

In the summer 1955, Robertson came to his initial position on the ballistic missile program. The Air Force would have sole control of land based ICBMs and IRBMs and neither the Army nor the Navy would be allowed to initiate their own IRBM programs. NRL would be given the responsibility for the IGY satellite which would be more than enough to keep the Navy's limited internal ballistic missile expertise busy for some time to come, while technical and jurisdictional problems with an FBM could be given time to work themselves out. Thus, the top leadership of the Navy and of DOD were of essentially one mind about an FBM, and both recommended that it be delayed well into the future. The intraservice and civil-military politics of ballistic missile programs in the Army and the Air Force were quite different at this important juncture.

Ballistic Missile Programs in the Army and the Air Force.

---

[48]. For the antipathy felt by civilian executives towards Von Braun's Army team at Redstone Arsenal, see York, Race to Oblivion, p. 105.

At the same point during the summer of 1955 when the Navy seemed willing to postpone any serious pursuit of a fleet ballistic missile, the Army and the Air Force were becoming deeply engaged in ballistic missile development. These programs derived from dramatically different sources. The Army's program derived from intraservice pressures, while the Air Force's was the result of a vigorous civilian intervention. By comparison, these internal and external pressures encouraging ballistic missile development were substantially greater than those marshalled in support of a fleet ballistic missile.

Jupiter and the Army Ballistic Missile Agency.

As part of the vast immediate postwar effort to exploit captured German technology, the Army was assigned the task of studying the V weapon project which had produced the first operational cruise missiles and ballistic missiles. When the Army Air Corps gained its independence from the Army in 1947, the Army retained by mutual consent the organizational infrastructure set up to further exploit German missile technology. This infrastructure was centered at the Redstone arsenal in Huntsville, Alabama, which later became the

Army Ballistic Missile Agency (ABMA).[49] The issue of developmental control and operational responsibility over future ballistic missile systems remained an open issue between the newly independent Air Force and the Army, but this particular role and mission dispute remained somewhat in the background during the late 1940s and early 1950s due to the nascent state of ballistic missile development in the Army and the overwhelming emphasis in the Air Force on manned strategic bombers.

ABMA was a classic example of the type of emerging intra-service force for doctrinal change that plays the central role in Rosen's theory of the sources of innovative military doctrine. Despite the opposition or indifference of much of the mainstream of the Army, ABMA was able to gradually carve out a reasonably established place for itself within the Army's hierarchy of investment priorities.[50] In 1950, ABMA began the development of the first militarily significant ballistic missile - the Redstone medium range ballistic missile (MRBM). Redstone was designed to be a mobile tactical missile of several hundred mile range that could serve as a nuclear armed extension of traditional indirect fire

---

[49]. McDougall, <u>The Heavans and the Earth</u>, p. 99.

[50]. On the gradual accretion of higher level Army support by ABMA, see Armacost, <u>The Politics of Weapon Innovation</u>, pp. 34-36.

artillery forces. Its relatively limited range made it appear to both the Army and the Air Force as an evolutionary step and it did not provoke controversy.[51]

ABMA aspired to considerably greater heights than those achievable with Redstone. In particular, engineers at the Redstone arsenal were captivated with visions of missiles returning to the Army many of the long range strike capabilities previously provided by the airpower now resident in the independent Air Force. Even more compelling were visions of the military and other uses of satellites to be boosted into orbit by more advanced missiles than Redstone. These visions demanded resources and role and mission responsibilities that were not easily forthcoming, and ABMA acted aggressively to gain the necessary resources and responsibilities by seeking political allies, both within the Army and in the larger political setting occupied by the Defense Department and industry.

A major source of support for ABMA lay with another new but much more powerful and prestigious branch of the Army - the Airborne forces. Well known and charismatic officers from this branch like James Gavin supported a large ballistic missile program

---

[51]. Wernher Von Braun, "The Redstone, Jupiter, and Juno," in Eugene Emme (ed) <u>The History of Rocket Technology</u> (Detroit, MI.: Wayne State University Press, 1964) pp. 107-121.

in the Army as part of a larger strategy designed to recover role and mission autonomy from the Air Force, and to counteract the effects of the Eisenhower administration's emphasis upon nuclear airpower.[52] These two problems mutually reinforced each other. With its newfound independence, the Air Force was more free to allocate investments towards those forms of airpower most conducive to supporting its independent mission of strategic bombardment. With the Eisenhower administration's post Korean War emphasis on nuclear weapons, preexisting Air Force doctrinal proclivities were reinforced. Overall defense spending shifted substantially towards the Air Force, and that spending was focussed on missions with no relevance to Army support. Officers like Gavin, saw an Army ballistic missile program as one of several means of associating the Army with the nuclear mission than in favor, and as an organic substitute for those forms of airpower no longer provided by the independent Air Force.

This alliance of interests between different elements of the Army was sufficient to sustain support for ABMA and to provide an established organizational and technical basis for the follow on to Redstone, the 1500 mile range Jupiter intermediate range ballistic

---

[52]. On Gavin's support for ABMA, see James Gavin, *War and Peace in the Space Age* (New York: Harper & Bros., 1959) p. 153-154.

missile (IRBM). From the outset, Jupiter faced the opposition of the Air Force and of many civilians in OSD because it appeared to duplicate an Air Force mission. Likewise, the expense of such an ambitious IRBM program did not escape the notice of other branches of the Army already suffering from severe budget scarcity.[53] Similar factors were suppressing internal pressures within the Navy in favor of a ballistic missile program during the summer of 1955. The difference in the Army's case was dramatic. A substantial core of technical expertise had already been concentrated and organized at the Army's Redstone arsenal. This group already had responsibility for missile development in the Army, and had already developed such a missile by the summer of 1955. Finally, the preexisting organization that became ABMA with the commencement of the Jupiter program could benefit from the fruits of at least five years of alliance building within the Army in support of their ongoing development efforts. During the summer of 1955, none of these factors operated in support of a Navy ballistic missile program. There was no organizational core of missile expertise in

---

[53]. It is important to note here just how much worse the Army's budget situation was than the Navy's at this point. Army budget share plunged dramatically after Korea to a low of 23% in FY 57. Navy budget shares held constant at about 30%, while Air Force shares lept upwards to close to 50%. Kantor, Defense Politics, p. 31.

the Navy, what expertise there was was divided among several groups none of whom had sole authority for missile development, and these dispersed and divided groups had only fitfully begun the long term process of coalition building within the Navy in support of a larger, unified missile development program.

Atlas and the Air Force's Western Development Division.

By the summer of 1955, the Air Force was also becoming heavily involved in ballistic missile development, but for entirely different reasons compared to those driving the Army's effort. These programs were run out of a new Air Force organization - the Western Development Division (WDD) - located in southern California at the heart of the growing U.S. aerospace industry. Unlike ABMA, which had both design and production functions in house, WDD was a management organization, staffed by the Air Force, which managed contracts with private aerospace companies. WDD had a special consultancy arrangement with the Ramo-Woolridge (later TRW) corporation to provide the technical and engineering expertise necessary for contract management, but development and production occurred in private industry. By late 1955, WDD had become responsible for the development of Atlas (the first U.S. ICBM),

Titan I (a more advanced ICBM), and Thor (a crash IRBM program using Atlas rocket motors). Unlike ABMA, WDD was also a brand new organization, formed in 1954 to manage the programs described above. As late as 1953, the Air Force had essentially no ballistic missile programs in place and no internal advocates pushing for their development. Furthermore, ballistic missiles faced formidable opposition in a service organized around the manned combat aircraft.

WDD and the several major programs assigned it by the end of 1955 were a result of a classic civilian intervention in the details of Air Force doctrine of the type which Posen ascribes explanatory power to in his theory of the sources of military doctrine. Civilian executives, Assistant Secretary of the Air Force Trevor Gardner in particular, took three specific steps beginning in 1953 designed to invigorate the Air Force's moribund ballistic missile development program. The military requirements that a ballistic missile would need to meet were relaxed, the substantial resources necessary for development were reprogrammed from other Air Force programs, and a highly autonomous developmental organization - the WDD - was established within the Air Force to manage this process separately from other Air Force programs.

Relaxing the military performance requirement was crucial

because the existing one was impossible to meet. Air Force intercontinental cruise missile programs of the same period faced a requirement for a one mile cep at the target, while the standing Air Force requirement for an ICBM was 1500 feet of cep.[54] Neither goal was remotely feasible for the time, as it took at least two decades for the ICBM accuracy goal to be met by an operational system.[55] A committee of civilian engineers and scientists appointed by Gardner to review the ICBM program relaxed this requirement to several miles. Combined with new, smaller and lighter thermonuclear warheads of megaton yield, such accuracies would be sufficiently lethal for any existing Soviet target.[56]

Armed with a more reasonable performance requirement, resources could now be profitably invested in an ICBM development program. A longstanding Air Force research contract with the Convair

---

[54]. On cruise missile CEPs, see Mackenzie, Inventing Accuracy, p. 113. On the original Atlas CEP requirement, see Beard, Developing the ICBM, p. 143.

[55]. Minuteman III and Poseidon, were .25 nautical mile (1500) CEP systems, when first deployed in 1970. Interestingly, Atlas' original specification also called for a 10,000 lb. throwweight over 5500 nautical miles, a capability which MMIII could not come close to matching.

[56]. This was the Von Neumann committee, set up by Trevor Gardiner. For the genesis of the new, more reasonable Atlas requirement, see York, Race to Oblivion, pp. 88-92.

Corporation became a development contract for what became Atlas. The money for this contract was reprogrammed away from existing Air Force programs at the direction of the Secretary of the Air Force. As the program expanded during its first year, more resources became necessary and Gardner was able to secure Congressional and White House support for a further expansion of funding for Atlas, and a new set of financial controls, called the Gillette proposals, which gave control over WDD finding to a set of civilian committees in the Air Force secretariat and in the Office of the Secretary of Defense (OSD).[57]

Finally, supported by an independent funding mechanism and realistic performance goals, WDD, under the leadership of General Bernard Schreiver, was able to establish its independence from normal development and procurement review by the Air Force's Air Research and Development Council (ARDC) and the Air Material Command (AMC). Instead, an extraordinary arrangement was established whereby WDD took on the role of prime system integrator for the Atlas, with the assistance of Ramo-Woolridge.[58] It was in this setting that basic design decisions were made, including the

---

57. Beard, Developing the ICBM, pp. 190-191.

58. Ibid., pp. 170-179.

important decision to scale back the size of Convair's initial proposal for a five engine Atlas to the smaller and simpler three engine design eventually developed and deployed. WDD also controlled the design of the two complementary missile programs added to Atlas in 1955. As insurance against development delays, the Thor IRBM program was begun as a technological fallout of the Atlas using one of its motors. As insurance against failures in any of the major Atlas subsystems, alternative technologies in propulsion, guidance, staging, and airframe design were packaged together in a second Titan ICBM program using a different set of contractors.[59]

By the summer of 1955, the Air Force's efforts in the realm of ballistic missile development had been completely transformed. Unlike in the case of the Army, this transformation was not the result of a protracted internal intraservice process of coalition building by advocates of this new technology. No such critical mass in favor of ballistic missiles existed in the Air Force in an organizational or a doctrinal sense. In this, the Air Force resembled the Navy. On the other hand, where the Navy's internal decision making about ballistic missiles occurred without interference from outside the organization, such autonomy from civilian

---

59. On the origins of Thor and Titan, see York, Race to Oblivion, pp. 94-96.

intervention did not apply to Air Force decision making. Beginning in 1953 with the efforts of Trevor Gardner, that process was fundamentally influenced by powerful intrusions by civilians in search of a greatly accelerated and expanded ballistic missile program.[60]

The Civil-Military and Intraservice Origins of First Generation Liquid Fuel Missiles.

Atlas, Thor, Titan and Jupiter constituted the first generation of U.S. ballistic missile development. Atlas, Thor, and Titan were the product of civilian intervention, while Jupiter was the product of a sustained push by well organized ballistic missile advocates within the Army. These programs and their organizational homes, WDD and ABMA, provide excellent examples of changes in service doctrine deriving from both civil-military and intraservice sources. Thus, they also provide examples of innovative behavior corresponding to both Posen's and Rosen's theories of the sources of innovative military doctrine. In both cases, substantial resources were shifted within a service away from investment in

[60]. On Air Force attitudes towards the agent of this intrusion, see Beard, Developing the ICBM, pp. 166-168.

traditional technologies towards more radical ones, and these shifts occurred in ways that were threatening to the existing role and mission structure of the relevant service. On the other hand, the new technologies in question - cryogenic liquid fuel missiles - were not innovative in other ways. They deepened rather than reduced the dependence of U.S. forces on strategic warning for survival.[61] At the symbolic level, they provided a timely counter to Soviet ballistic developments, but at the operational level, they made U.S. forces more not less vulnerable to attack by projected Soviet forces. Largely because of these vulnerabilities, these liquid fuel missile programs were abandoned by the early 1960s, but only after more survivable solid fuel missile were developed and deployed. Polaris was the first and most important solid fuel missile program. It eliminated the vulnerabilities that first generation missiles only exacerbated, but its development derived from very different sources.

The Interservice Origins of SPO and Polaris.

---

[61]. These drawbacks were related to the very conception of survivability still employed in the mid 1950s. Atlas appeared promising because of its invulnerability to opposing enemy active defenses. Survivability in the face of attcks by opposing offenive forces was not yet even a performance criteria. Beard, Developing the ICBM, p. 146.

The Navy position on the FBM underwent two dramatic shifts after the appointment as CNO of Admiral Arleigh Burke effective August 1955. One of his first acts in office was to revisit the FBM question. Within a month, a radically different approach to the FBM issue was developed and presented to DOD for approval. It involved the establishment of a new organization within the Navy and the formation of an alliance with the Army. Within the Navy, the FBM program would become the responsibility of the Special Projects Office (SPO). With the Army, a joint program was proposed whereby the Army would be reponsible for providing a version of its Jupiter IRBM which SPO would integrate into a sea basing mode. The goal of this new FBM program was to produce a sea-based Jupiter by 1965. It was accepted by DOD and approved by the NSC in November 1955, along with the Thor IRBM and the Atlas and Titan ICBM programs of the Air Force. At the same time, NRL's Vanguard was assigned the task of orbiting a satellite during the IGY.

Almost as soon as this first shift was completed, a second began. The joint Army-Navy liquid fuel FBM program became, in a little over a year, an independent Navy solid fuel FBM program. SPO's responsibilities expanded from the provision of a sea basing mode for Jupiter to the complete development of the entire Polaris weapon system. The next two sections describe the organizational

politics of these two phases, and the third section explains them.

Phase I: The Establishment of SPO

The establishment of SPO and the alliance with the Army addressed the intraservice and civil-military obstacles facing an FBM program. SPO resolved the internal Navy issue of jurisdiction over FBM development. As a new and initially temporary organization, it threatened neither BuAer nor BuOrd. The alliance with the Army directly addressed the concerns of DOD civilians such as Undersecretary Robertson regarding the proliferation of independent missile programs. Four programs would be initiated in order to determine technical feasibilities, two IRBMs and two ICBMs. Particularly in the former case, the issue of ultimate deployment and control over land based IRBMs remained open. Finally, the FBM program approved in November 1955 was not a missile program from the Navy's point of view. Thus, just as SPO settled the internal jurisdictional dispute between pro FBM Navy factions, the alliance with the Army assuaged the concerns of the rest of the Navy that a missile program might bleed the overall Navy budget white. Since the Army retained the responsibility for missile development, the Army would bear the brunt of the development costs and SPO (and the

Navy) would pay only for the launching system.[62]

The joint Army-Navy FBM program was acceptable to those within the Navy who had opposed BuAer's efforts to develop an independent Navy FBM, and to those DOD civilians who were generally interested in limiting the overall number of ballistic missile programs and who were quite skeptical regarding both the Navy's will and capability to pursue its own independent FBM program. Burke's compromise thus appeared to solve both these problems. On the other hand, this political compromise produced a technical and operational monstrosity from the perspective of internal Navy FBM proponents.[63] Aware of their weakness, they accepted the need for the initial compromise in their aspirations but began immediately to create more favorable technical and bureaucratic conditions for a true FBM. This dual strategy was explicit from the beginning of

---

[62]. This is reflected dramatically in the record of FBM appropriations. During FY 56 and 57, when the Army alliance remained intact, Navy costs were an order of magnitude lower than they would rapidly become with the commencement of Polaris. Sapolsky, <u>Polaris System Development</u>, p. 163.

[63]. The drawback for Jupiter was not merely that it used liquid fuels. The Soviets later used such fuels in their SLBM force. The problem was that Jupiter, and other missiles of its generation, used cryogenic fuels such as Liquid Oxygen (LOX). One can only imagine what then Captain Rickover's reaction to submarine basing for such a missile would have been. Kurth, "The Politics of Technological Innovation," pp. 231-232.

SPO's marriage of convenience with their Army counterparts at the Redstone asenal.

The Army, unlike the Air Force, had been enthusiastic about a joint program with the Navy. Of the three services, the Army had been most aggressive in its ballistic missile developments during the early 1950s. With the successful completion of the Redstone missile, the Redstone arsenal was eager to move on to the more ambitious Jupiter design, both as a weapon and as a satellite launcher. In the former case, the Army encountered the opposition of the Air Force and of DOD civilians. Jupiter was perceived to be duplicative in a doctrinal sense of an Air Force mission, and duplicative in a technical sense of Thor. Likewise, the Army's ambitions in the satellite arena were opposed by DOD civilians concerned with the clear military content of its programs compared to NRL. Thus, at the end of the summer 1955, the Army was engaged in a desperate fight to justify its ballistic missile program, and the Navy's interest in a joint FBM program provided such a justification.

SPO was quite explicit concerning its divergent objectives in its negotiations with the Army over the terms of their joint program. From the beginning, Navy officials emphasized their interest in a solid fuel missile compatible with existing surface

and submarine platforms. As soon as such a system appeared technically feasible, the Navy would seek the authority to pursue it independently with or without Army participation. The surface launched Jupiter FBM was purely an interim goal designed more to establish the Navy's right to pursue an FBM capability than to actually provide such a capability. The Army agreed to these terms because a solid fuel missile seemed a distant prospect, and the alliance with the Navy would protect Jupiter in the interim. DOD civilians accepted the logic of a Navy FBM more readily from a roles and missions standpoint than they did an Army land based IRBM. In making the case for the latter, the Army would use the Navy to fend off the Air Force and their allies in DOD. Thus began the titanic Thor-Jupiter controversy between the Air Force and the Army.

Phase II: The Establishment of the Polaris Program

This Army-Navy compromise rapidly unraveled in two stages, roughly corresponding to the technical evolutions from Jupiter to Jupiter S, and from Jupiter S to Polaris. By early 1957, the Navy had begun an independent FBM program whose scope exceeded the wildest dreams of FBM advocates and confirmed the worst nightmares of FBM

opponents both within the Navy and within the DOD civilian secretariat. This program developed at the expense of the Army's Jupiter program and replaced it as the object of strenuous Air Force attempts to maintain an effective monopoly over the development and operational control of ballistic missiles. The early stages of Polaris development were heavily influenced by growing Air Force-Navy disputes over roles and missions, budget shares, and strategy.

The first stage of the Navy's declaration of independence began immediately after the November 1955 decision and resulted in formal permission for the Navy to pursue Jupiter S in March 1956. As was shown above, Jupiter S remained quite unwieldy for the Navy's purposes. The significance of this step lay in the shift to solid fuels and, more importantly, the shift in SPO's role as a development organization. Under the terms of the original Army-Navy agreement for Jupiter development, the Army would develop the missile and the Chrysler corporation would produce it in quantity. SPO had no independent relationship with Chrysler or any other missile contractor. Jupiter S did not replace this arrangement, but instead was considered as a low level feasibility study to be conducted in addition to the original Jupiter. Nevertheless, Jupiter S did allow SPO to establish an independent link with its

own missile contractor, and with the producers of other major missile subsystems. Very limited appropriations for this purpose were approved by DOD, which were immediately supplemented by a large infusion of additional, reprogrammed internal Navy money.[64] At this point, contracts were written or promised with Lockheed and Aerojet for solid fuel rocket studies, and with MIT's Draper Lab for guidance and control technology.

Even the limited commitment to Jupiter S which DOD was willing to make in March had not come easily for SPO and the Navy. Once again, the spector of waste and duplication had caused DOD civilians to suggest that SPO join forces with the nascent solid fuel research being done in the Air Force rather than embark on their own program. Fortunately for the Navy, this suggestion was, for quite different reasons, as distasteful to the Air Force as it was to the Navy.

Solid fuels had their adherents within the Air Force as well, and the director of the Air Force's Western Development Division (WDD) General Schreiver was in the midst of deciding the future of that technology at the time that SPO was pressuring DOD to approve Jupiter S. Unlike SPO, WDD was awash with money and responsibili-

---

[64]. Sapolsky, Polaris System Development, pp. 26-27.

ty, simultaneously running the Atlas, Titan, and Thor programs. Despite the attraction of solid fuels, the technical and developmental risks were high, and Schreiver did not believe WDD to be capable of serious solid fuel work without jeopardizing the progress of existing programs. Where SPO was anxious to begin solid fuel work, WDD was anxious to avoid too hasty a commitment to solid fuels.

Paradoxically, DOD proposals for a merger of Air Force and Navy solid fuel research and development actually threatened WDD's position on solid fuels no matter what it did. Aware of SPO's strong interest in solid fuels, WDD knew that endless problems would result from an Air Force controlled solid fuel program in which WDD sought to impose its caution on solid fuels on SPO.[65] On the other hand, the Air Force understood that it could not very well oppose Navy solid fuel efforts as duplicative unless the Air Force had a major program to duplicate. Since the majority of WDD remained busy and quite skeptical of the near term promise for solid fuels, a deal was struck between the interested Air Force and Navy parties and presented as a unanimous recommendation to DOD. The Air Force stated that Navy solid fuel development "complemented

---

[65]. Ibid., pp. 25-26.

rather than conflicted" with existing Air Force solid fuel research. Thus the Air Force did not oppose SPO's interest in Jupiter S, and sought to appease its own solid fuel advocates by transferring their efforts from WDD to the Wright Air Development Center where they would not interfere with WDD activities.[66] Faced with this unanimous position, and given the small financial commitment involved, DOD agreed to Jupiter S.

Jupiter S caused major changes in SPO's orientation. Solid Fuel experts from within the Navy could now join SPO's efforts since it had cognizance over a missile program. Prime among these experts was then Captain Levering Smith who joined SPO at this time. Jupiter S also solved or greatly assuaged the problem faced by all proponents of new technologies - without money a concept can't be demonstrated, and without a demonstration there is often no money. Money could now be spent on a solid fuel rocket. The major technical advances which made Polaris possible occurred during the summer 1956. Improvements in the specific impulse of

---

[66]. This shift in authority for Air Force solid fuel work from WDD to Wright-Patterson was bitterly resisted by Air Force solid fuel advocates like Colonel Hall. It is a clear indication of the overwhelming priority on liquid fuels and the willingness to delay work on systems like Minuteman until well into the 1960s. Beard, Developing the ICBM, pp. 211, 217-218 and p. 218 note 4. See also, Reed, U.S. Defense Policy, p. 53.

solid fuel motors were discovered by engineers at Aerojet. These motors, employed in stages, greatly reduced the size and weight of a missile capable of "throwing" a given payload a given range. More important, projected advances in thermonuclear weapons design and in inertial guidance technology promised that a small solid fuel missile could still possess a militarily useful payload. The path by which these advances in thermonuclear weapons design found their way into the Polaris program is indicative both of SPO's aggressive search for ways to make Polaris possible, and of the rest of the Navy's attitude towards SPO and its FBM program as it struggled to reach its ambitious goals.

Project Nobska was a summer study held at Woods Hole Oceanographic Institute in summer 1956. Woods Hole, the site of major early postwar advances in low frequency, narrow band passive accoustics and other ASW relevant technologies, was chosen because the purpose of the conference was to explore new ways of countering the growing Soviet submarine force.[67] Thus, as a senior Navy captain representing the CNO's office noted, the conference was supposed to be about killing submarines not finding new uses for

[67]. On Nobska's focus on ASW, see Gary Weir, *Forged in War: The Naval-Industrial Complex and American Submarine Construction, 1940-1961* (Washington, D.C.: U.S. Government Printing Office, 1993) p. 210.

them. In the context of various ASW methods, attendee Edward Teller noted that discussions of future ASW weapons were premised on outdated assumptions concerning the yield/weight ratio of thermonuclear weapons. Teller predicted that advances in this area would occur beyond the then current state of the art of equal significance to the advances which had made the initial ballistic missile programs possible. Thus, megaton range weapons would weigh several hundred pounds, rather than several thousand pounds. These predictions were not made in the specific context of the Navy's FBM, but enough participants at the conference were aware of that system's unique requirements for this to be noted as a serious possibility. Inquiries were made with the Atomic Energy Commission as to the accuracy of Teller's claims and these were confirmed. In the end, these issues were a mere footnote to the overall Nobska report, but Nobska would be remembered for little else.[68]

The promise of these technical advances increasingly pointed the SPO in the direction of making a clean break with the Army and its Jupiter program. At the same time, such a break demanded that

---

[68]. The Teller story is described in many accounts of Project Nobska's role in expediting Polaris. Project Nobska was also instrumental in causing the shift to ASW as a primary mission for U.S. attack submarines. *Ibid.*, pp. 210-225.

SPO confront several issues of intraservice and civil-military politics which the initial Army-Navy program designed by Burke had succeeded in deflecting during the programs first and most vulnerable year. First, as Jupiter S evolved into what became Polaris, SPO was clearly becoming involved in the development of a fifth ballistic missile in clear opposition to stated DOD policies which only grudgingly approved four in November 1955. Second, as SPO increasingly focussed on developing an entire strategic offensive weapon system oriented around a dedicated force of nuclear powered ballistic missile submarines, questions of internal Navy budget, role, and mission priorities could no longer be ignored or finessed via the mirage of Army participation. SPO needed a new strategy for dealing with these intraservice and civil-military obstacles to Polaris. Admiral Burke's solution involved two steps - one small and one big.

The first involved a direct attack against DOD opposition to a fifth program. During the Fall 1956, the Thor-Jupiter controversy had reached a boiling point. From the beginning, DOD had been reluctant to accept the Army's case for an independent IRBM capability. The Navy's support for Jupiter in November 1955 had been an important assist to the establishment of the program. In November 1956, Admiral Burke withdrew his support within the JCS

for an independent Army IRBM operational capability. By shifting the Navy's position on this issue and voting with the Air Force and the Chairman, Burke isolated Army Chief of Staff Maxwell Taylor and provided political cover for Secretary Wilson's decision to give the Air Force sole operational control over all land based ballistic missiles of greater than 200 mile range.[69] Jupiter missile development would only continue as a backup to the Thor program. This shift in the Navy's position on Jupiter coincided in time with its formal proposal to the DOD ballistic missile committee for an independent Polaris FBM program. This proposal was accepted by DOD in December 1956. Only at this point, as the summary of FBM technical development showed above, did the Navy begin the development of what actually became Polaris. At the same time, from this point on, SPO and the Navy never had another serious problem justifying Polaris development on the civil-military front.

Polaris caused more difficult problems internally within the Navy. Where the initial establishment of the FBM program and of SPO had caused intraservice problems, Burke had managed to largely "export" these problems through the alliance with the Army. The Army would fund the bulk of the development costs, and SPO would

[69]. Sapolsky, Polaris System Development, pp. 32-34.

only be reponsible for system integration, and that on a one time basis. The costs of Polaris could not be exported in the same way for obvious reasons. The Navy had fought for its own independent program and now had to decide collectively how to pay for it and at which other important program's expense. Clearly some of those programs would be naval programs, but the heart of Burke's solution to the intraservice problems posed by Polaris was to seek to ensure that some would be Air Force as well. The costs of Polaris would be at least partially met by exporting them into the realm of interservice politics in a competitive rather than a cooperative manner. Rather than joining the Army, the Navy began a campaign to improve its overall budget share at the expense of the Air Force.

On the other hand, the Army's experience with Jupiter provided a warning to FBM proponents and the Navy as a whole. Though Jupiter had derived from the lobbying of an existing, semi-autonomous component of the Army, the Army as a whole tended to ignore if not oppose Jupiter and the resources which it consumed. DOD's decision to assign the Air Force sole control over long range land based missiles caused an almost audible sigh of relief among the more traditional elements of the Army. SPO and its FBM program occupied a scmewhat analagous position with regard to the rest of the Navy. Though civilian support for Polaris development would grow in the

coming years, the issue of operational control was likely to arise, and here DOD's proclivities towards centralization and unification and Air Force role and mission sensitivities could easily combine to produce an outcome where the Air Force was assigned operational control over all missiles.[70] As the substantial bills for Polaris came due within the Navy budget, they would be unlikely to meet with the enthusiasm of the traditional Navy unless Polaris was perceived to be a program which in some way benefited the traditional Navy. Jupiter never passed this test in the Army, and FBM proponents within the Navy had good reason to fear that Polaris would not pass it in their own service.

Army missile advocates had often argued that missiles were the wave of the future, and that the traditional Army - as useful as it would remain in some cases - was perceived as obsolete. As the director of the Redstone Arsenal during the mid 1950s argued:

> "You're fighting a losing game. If you put all your energy and effort into justifying these conventional weapons and ammunition, even though I know we need them, I think you are going to get very little money of any kind. It is far easier to justify a budget with modern items that are popular, and I would strongly recommend that you increase the amount you show in the budget for

---

[70]. This issue did arise and produced a compromise whereby the Air Force chose targets but the Navy retained operational control. See Rosenberg, "Nuclear Strategy," pp. 60-65.

> 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?"[71]

Of course, the "other stuff" was what the vast bulk of the Army was trained and organized to do for a living. FBM advocates, Admiral Burke prime among them, had no interest in using Polaris to replace the "other stuff" in the rest of the Navy, and understood that Polaris would not be actively supported within the Navy as long as it might be perceived in that fashion.

Out of this dilemma emerged a new doctrine for Polaris which justified rather than replaced those elements of the mainstream Navy whose existence was most threatened by it. This doctrine exploited those technical attributes of the Polaris system which were unique to it, and which other strategic weapons were least able to provide. In so doing, it made the case for Polaris in a way that threatened the mainstream of the Air Force more than it threatened the Navy. In addition, it made the case for a new or alternative set of national military policies which benefited the mainstream of the Army as well. Thus, while the birth of Polaris

[71]. Medaris, p. 65.

came at the expense of the Navy's joint program with the Army, its development increasingly became part of a larger joint Army-Navy effort to refashion U.S. military policy.

Until 1957, Navy doctrine had contemplated the use of their nuclear weapons against "targets of naval opportunity" such as enemy naval airfields and submarine bases.[72] This Navy targeting doctrine had first emerged in the late 1940s during the period of America's scarce atomic monopoly in opposition to the Air Force's concept of a decisive atomic blitz against Soviet cities. Later, it served as a complement to the Air Force during the early Eisenhower years and as the rationale for Navy carrier strike forces. Initially, the Navy's FBM program was also characterized in this way. This doctrine had the advantage of appearing not to duplicate Air Force efforts and of justifying investment in assets which the Navy wanted in any event during the years when Massive Retaliation emphasized nuclear over conventional weapons. Unfortunately for the Army, no such doctrinal compromise could hide the fact that they advocated investment in essentially conventional forces. The Navy and the Army both had serious misgivings about Eisenhower's massive retaliation policies from their outset, but the Navy was

---

72. Kurth,. "The Politics of Technological Innovation," p. 257.

better able to adapt in a budgetary sense between 1952 and 1957.

In 1957, Navy nuclear doctrine began to shift away from targets of naval opportunity and toward Soviet cities. This shift was explicitly linked to accompanying analyses arguing the superior capabilities of Polaris for such a "deterrent" doctrine. This strand of internal Navy behavior was soon linked with joint Army-Navy efforts to illuminate and criticize the nature of existing Air Force war plans, and the way in which that planning process influenced the force planning process. Eventually, both critiques merged into a more general public assault on Eisenhower's massive retaliation policies which called for an "alternative undertaking" where a "finite deterrent" capability would deter nuclear attacks against the United States, and more flexible nuclear and conventional forces would deter attacks against Allies.[73]

This challenge to existing doctrine ignited an intense bout of overt interservice competition between the Air Force on the one hand and the Army and the Navy on the other. These battles over resources, roles and missions had a number of effects. Polaris and its accompanying concept of finite deterrence eventually provoked radical responses by the Air Force at both the technical and

---

[73]. Rosenberg, "The Origins of Overkill," pp. 50-61.

doctrinal levels. Air Force reticence about solid fuels evaporated as Polaris proceeded, and in 1958 the WDD abruptly reversed course by initiating the Minuteman ICBM program.[74] Likewise, the Navy's concept of finite deterrence provoked a doctrinal debate within the Air Force out of which emerged the concept of a counterforce, damage limiting doctrine.[75]

At the same time, existing programs began to suffer in comparison to the rapidly emerging missile programs. Specifically, the Navy and the Air Force encountered increasing opposition to aircraft carriers and manned bombers. The slow death of the Air Force's B-70 began in the last years of the Eisenhower administration.[76] The most intense bout of cold war carrier construction also ended during this period.[77] In each case, civilian opposition to these programs was at least implicitly based on the assumption that missiles had in some senses rendered them obsolete. This civilian opposition was greatly assisted by the fact that each of these service programs were unanimously and publicly opposed by the other

---

74. Reed, "U.S. Defense Policy," pp. 53-57.

75. Rosenberg, "Nuclear Strategy," pp. 57-60.

76. Nick Kotz, Wild Blue Yonder, pp. 34-35.

77. After the second Kitty Hawk was authorized in FY 58, no new carrier construction was authorized until the America was authorized in FY 61.

services. Competition between the services had generated a bevy of technical and doctrinal choices for civilian leaders and competition greatly assisted the political process of beginning to actually make choices. Though the process was messy, it produced rapid and radical change.[78] In the particular cases of Polaris and Minuteman, competition contributed greatly to doctrinal innovations by the Navy and the Air Force which the best civilian minds had not anticipated and which the mainstream of each service generally opposed all in the short space of several years.

Explaining SPO and Polaris

The Navy's decision to aggressively pursue a near term FBM capability in the late summer of 1955 constituted a radical reversal in policy. The decisions in late 1956 and early 1957 to abandon the Army alliance over Jupiter and strike out on its own with Polaris were also radical. In both cases, the arguments in favor of these decisions flew in the face of entrenched Navy and OSD opposition. Clever political strategies were adopted to defeat this opposition,

78. In addition to new carriers and manned bombers, other casualties included cruise missile programs in both the Air Force and the Navy. Even more significant shifts in resources would await the first several years of the Kennedy Administration.

but descriptions of their origins and success do not explain the motivations of their architects. Why did Arleigh Burke so quickly and decisively reverse the Navy's decision to go slow on an FBM in the summer of 1955? Why having succeeded in that reversal, did he immediately undermine the set of political compromises that supported that reversal by embracing Polaris a year later? If SPO and Polaris were not in the perceived doctrinal interests of the bulk of the Navy, and if civilians considered these programs duplicative of ongoing Air Force and Army programs, why did Burke engineer such a radical shift in what, during the summer of 1955, seemed a sensible policy of continuing the Navy's marriage of convenience with the Air Force and Eisenhower's Massive Retaliation policies?

Burke, unlike his predecessor, did not believe that the Navy could live forever under the terms of the compromise that the Navy had engineered with the Air Force and the Eisenhower administration during the latter's first term.[79] This compromise involved a trade in which the Navy chose not to openly voice its opposition to the policies underlying Massive Retaliation as long as traditional Navy

---

[79] On the evolution of Burke's views on the Navy and Massive Retaliation, see David Rosenberg, "Arleigh Burke," in Robert Love (ed), *The Chiefs of Naval Operations* (Annapolis: Naval Institute Press, 1980) pp. 278-279, 292-293, 300-301, and 304-305.

programs remained associated with and well funded under these policies. Thus, to cite the most prominent example, aircraft carriers were, according to Naval doctrine, most suited to the type of limited war operations that they had conducted during the Korean war, and were less suited to duplicating the Air Force's strategic bombardment mission. Furthermore, the Navy, along with the Army, did not believe in the credibility of threats to use the Air Force's strategic bombardment capabilities as a deterrent of the limited Korean type wars that they expected in the future, and which the Eisenhower administration refused to fight. Nevertheless, beginning in 1952, the Navy received appropriations for a new carrier during every year of the Eisenhower administration's first term because these platforms were, symbolically and in some limited operational ways, associated with the strategic bombardment mission. Carriers, along with SAC bombers, symbolized atomic airpower and were emphasized in Eisenhower era defense budgets at the expense of more traditional Army, Navy, and Tactical Air forces.[80]

Burke believed that the growing ballistic missile programs of

---

[80]. This was the case made by Admiral Carney, Burke's immediate predecessor as CNO and a staunch opponent of an early FBM program.

the Eisenhower administration threatened this compromise because of their budgetary implications. During Eisenhower's first term, the Air Force consistently received over half of all defense spending, the Navy roughly a third, and the Army roughly a fifth. These relatively constant service shares were carved out of an overall annual budget ceiling imposed on the Department of Defense by the Bureau of the Budget. The budget ceilings reflected Eisenhower's aversion to deficit spending, and the budget shares represented his emphasis upon nuclear at the expense of conventional general purpose forces. As the Eisenhower ballistic missile program grew from its beginnings in the Air Force Atlas and Army Jupiter programs to include Titan and Thor as well, the money to pay for these programs promised to take an ever larger chunk out of a fixed overall DOD budget. If service budget shares remained constant, these programs would consume existing dollars in Army and Air Force budgets and Navy programs would be unaffected. More likely, service budget shares would be realigned at the expense of general purpose forces and, more importantly, at the expense of future investment in manned aircraft for the delivery of nuclear weapons.[81]

---

[81] For evidence that Eisenhower himself saw ballistic missiles as an eventual replacement for manned bombers and aircraft carriers, see "Memorandum of a Conference With the President, November 11, 1957," *Foreign Relations of the United States, 1955-1957,*

In this scenario, the Navy might experience the fate already experienced by the Army during the first term of the Eisenhower administration.[82]

Burke's contribution lay not in the identification of this threat, for it was easy to imagine. Rather, his contention was that the transition to guided missiles and the role and mission consequences of this transition would provoke intense debate. Without a ballistic missile program of its own, the Navy would not have a role in this debate and could not shape its outcome.[83] With such a program, the Navy could attempt to use its own ballistic missile program to fashion a doctrinal vision of the future that

---

Volume XIX, National Security Policy.

[82]. At the time, these two different outcomes were predicted by two opposing schools of thought about how service budet shares are determined. The "Fixed Budget Share" theory argued in favor of Admiral Carney's position because it held that budget shares were predetermined and that programs like Polaris would be entirely funded out of the Navy's relatively fixed portion of a fixed overall defense budget. The "Variable Budget Share" theory argued that service shares could shift with the ebb and flow of new programs in one service rendering those in other services obsolete. Burke embraced this latter view. For a description of these two theories, see Paolucci, "The Development of Navy Strategic Offensive and Defensive Systems," p. 216.

[83]. Thus, Burke was obsessed with beating or equalling Air Force missile development efforts in order to enfluence the debate about their operational and doctrinal significance. Hewlett, Nuclear Navy, p. 308

preserved and perhaps even expanded the role of traditional naval forces such as carrier task forces and ASW groups. Such a doctrine would provide an alternative to a continuation of the nuclear oriented Massive Retaliation policy and Air Force dominated defense budgets of the first Eisenhower administration.

The alliance with the Army over Jupiter and the establishment of SPO allowed the Navy to establish for itself, however tenuously, a legitimate role in the field of ballistic missile development and operations. On the other hand, the political advantages of the SPO-Army alliance went hand in hand with serious operational disadvantages. Because the original FBM program depended upon Jupiter, it was acceptable to the mainstream Navy and to civilians in OSD, but this also produced a bulky and dangerous system quite unsuited to a shipboard, never mind a submarine, environment. Furthermore, Jupiter provoked an intense role and mission controversy with the Air Force because it appeared to duplicate that service's Thor IRBM program. Thor was the clear favorite of OSD officials and Jupiter's future appeared tenuous, making a Jupiter FBM program tenuous as well. These factors made the shift to an independent solid fuel FBM program sensible, but such a shift threatened to reignite the opposition of the mainstream Navy and civilians in OSD that had been appeased through the alliance with

the Army. Civilian opposition to what became the Polaris program was skirted when the Navy voted with the Air Force to kill the Jupiter program and assign operational control of long range land based missiles to the Air Force. This shift in the Navy's position isolated the Army in the JCS and lent political weight to preexisting OSD opposition to Jupiter. Paradoxically, the internal Navy opposition to an expanded solid fuel FBM program required a new alliance with the Army which provoked an even more bitter round of interservice conflict with the Air Force.

Polaris promised to be an extremely expensive program. It threatened to divert Navy investment away from traditional platforms unless the Navy's overall budget share were expanded. It also threatened to undermine the rationale for existing Navy platforms such as carrier task forces. These had been justified as nuclear strike assets under Eisenhower's Massive Retaliation policies. With Polaris, that role would become harder to justify. Over the course of 1957, the architects of the Polaris program shifted their approach to justifying Polaris in a way that sought to export the financial and doctrinal risks associated with its development so that the Air Force rather than the Navy would bear their burden.

The costs of developing Polaris could be exported outside the

Navy's existing budget if Polaris were funded at the expense of ongoing land based nuclear delivery systems. From the beginning, Polaris was touted as a more advanced and more capable system than the "outmoded" bombers and liquid fuel missiles upon which Air Force development efforts focussed. Because Polaris came to be perceived as an alternative to existing Air Force programs, its architects were under tremendous pressure to maximize its capabilities across the spectrum of operational requirements demanded of the nuclear forces. Thus, the survivability inherent to submarine basing was a necessary but not sufficient part of the case for Polaris. SPO also ensured that Polaris would not be wanting in other operational capabilities, such as high yield warheads, accuracy, and continuous communications. SPO's efforts in these areas ensured that Polaris' critics, and the Air Force in particular, could not fault the system by pointing to military requirements that it could not meet.[84]

---

[84]. Air Force attempts to criticize Polaris on technical grounds led to a curious interlude in policy analysis pamphleteering. In an unclassified and widely distributed monograph entitled "The Puzzle of Polaris", William Kaufmann described its inadequacies for the emerging couterforce doctrine he was than promoting within the Air Staff. See Fred Kaplan, *The Wizards of Armageddon*, pp. 237-239. At roughly the same time, the Air Force commissioned a classified RAND report on the technical characteristics of Polaris. This analysis showed convincingly that despite the Navy's doctrinal rhetoric, Polaris was a potent counterforce weapon,

As Polaris developed momentum, and as it became clear that it would succeed in meeting its operational goals, the Navy developed a doctrine for its use which was designed to preserve rather than threaten traditional naval roles and missions. This doctrine, originally given the name finite deterrence, called for a shift of resources away from nuclear and towards general purpose forces. Several changes in the external security environment were cited in support of this new doctrine. Polaris itself, and the eventual liklihood of such systems on the Soviet side were a prime cause. They promised to reduce if not eliminate the advantage of going first in a nuclear exchange and the prospect for limiting damage from the enemy's retaliation. Without the prospect for limiting the damage from a nuclear exchange, nuclear weapons could not serve as a military substitute for general purpose forces in the way that they had during the massive retaliation years. The threat of nuclear escalation would always be present and nuclear weapons would continue to have some deterrent effect on large scale conventional conflicts, but these deterrent effects would not be

---

especially against time urgent targets. See Rosenberg, "Nuclear Strategy," pp. 57-58; and Robert Glasser, "Enduring Misconceptions of Strategic Stability: The Role of Nuclear Missile-carrying Submarines," *Journal of Peace Research*, Vol. 29, No. 1 (1992) p. 27-28.

based on nuclear superiority. Instead, they would be based on perceived asymmetries in the willingness of states to run risks of mass societal destruction. Under such circumstances, nuclear weapons would mostly serve as a deterrent to their use by others rather than an all purpose deterrent of all types of conflict.[85]

For the Navy, and the Army as well, finite deterrence provided a justification for a substantial shift of defense budget shares away from the Air Force and towards the general purpose Navy and Army. Polaris provided a relatively cheap and reliable path towards an indelicate balance of terror, and its substitution for expensive and vulnerable land based nuclear forces would free the resources necessary for greater investment in general purpose forces for limited war.

Beliefs about the interservice consequences of a Navy FBM program were a powerful determinant of the positions taken by both supporters and opponents of what eventually became Polaris. Prior to the summer of 1955, Navy planners believed that their budget share, and the roles and missions supported by that budget share, were reasonably secure. A new Navy ballistic missile program would

---

[85]. The best contemporary description of the new doctrine is in Paul Backus, "Finite Deterrence, Controlled Retaliation," *U.S. Naval Institute Proceedings*, Vol. 85, No. 3 (March 1959) pp. 23-29.

divert money from established programs and undermine their doctrinal rationale. The same consideration applied to the other service's programs. If as a result of intraservice or civil-military conflict, these other services undertook major investments in ballistic missiles, that was their business and their efforts to preserve existing programs would not come at the expense of Navy budgets or roles and missions. If anything, the prospect of a Navy ballistic missile program threatened to ignite an interservice conflict where none would otherwise occur, causing threats to traditional naval programs of the type that arose during the last such bout of interservice conflict in the late 1940s.

After the summer of 1955, with the arrival as CNO of Arleigh Burke, the Navy's position regarding an FBM program shifted. Burke believed that growing ballistic missile programs in the Army and Air Force would threaten Navy budget shares and roles and missions. He did not believe that the budget shares between the services were fixed and he feared that, within a fixed overall budget ceiling, these budget shares could and would be realigned at the expense of naval programs just as they ad been realigned at the expense of Army programs after the Korean War when Massive Retaliation was established as national policy. Between 1955 and 1957, Burke struggled to estalish an FBM program in the face of considerable

civilian and naval opposition. As originally constituted, this program was a temporary and defensive measure designed to establish and maintain a naval voice in interservice debates over ballistic missile development. The very attributes which made the original Jupiter FBM program acceptable to OSD civilians and the Navy made its long term prospects tenuous.

After 1957, with the establishment of the Polaris program, the Navy's FBM efforts entered their most innovative phase. Having used the period from 1955 to 1957 to determine the feasibility of a solid fueled submarine launched ballistic missile, SPO was able to defeat civilian opposition to an independent Navy FBM program by helping OSD to kill the now vulnerable Jupiter IRBM program. With civilian support for Polaris, the Navy then developed a doctrine and a budget strategy for the new system which defused the considerable internal naval opposition to an expensive dedicated nuclear strike system. The doctrine called for acceptance of the imminent arrival of a nuclear stalemate between the two superpowers, the elimination of vulnerable nuclear forces more suited to an era of unilateral U.S. advantage, and the reinvestment of the funds thereby liberated within a fixed amount of defense spending in general purpose forces for limited war. In this way, Polaris came to be perceived by its potential naval opponents as more of a

threat to Air Force nuclear systems than to conventional Navy systems.

Thus, both the origins and the development of Polaris were greatly influenced by interservice conflict. Originally, FBM advocates like Burke believed that interservice conflict for budget shares within a fixed ceiling would arise as a result of expensive new ballistic missile programs in the Army and the Air Force. He feared that these programs might cause resources to flow away from the Navy unless it developed a program of its own. Though successful, the original FBM program was a temporary compromise designed to appease civilian and naval groups opposed to an independent naval program. Once solid fuel SLBMs became feasible, a new round of interservice competition was intentionally provoked by Burke using Polaris as a weapon, first to kill Jupiter and gain civilian support, and second to expand Navy budget share at the expense of the Air Force in order to protect traditional naval programs.

CHAPTER 5: Trident II and the Window of Vulnerability.

Like Polaris when it was first deployed, Trident II provided decision makers the full range of strategic nuclear capabilities demanded by national nuclear policies. The Trident II missile, deployed in sufficient numbers, was lethal enough to cover the full range of Soviet targets with high confidence, while EHF satellite communications provided the option to add survivable, covert, two way command links to the one way links already supporting deployed SSBNs. These new capabilities, combined with the traditional advantages of an untargetable submarine basing mode, made Trident II the only system to emerge from the second major cold war strategic modernization program to eliminate the force vulnerabilities which provoked that program in the first place. Here, though, the similarities with Polaris cease.

First, Trident II's full scale development was delayed for so long, its new capabilities were deployed years after the demand for them arose. Soviet MIRV'd ICBM tests in 1976 of more accurate SS-18s and SS-19s played a similar role to Sputnick's launch in 1958 in creating a crisis atmosphere within the defense department, galvanizing efforts to begin or accelerate modernization programs

designed to counter this long anticipated but threatening development.[1] Polaris had entered full scale development in 1957 and reached initial operating capability (IOC) at the end of 1960, a year before new intelligence decisively confirmed suspicions that the progress of Soviet ICBM development had been considerably exagerrated.[2] The Soviets did not begin deploying a sustantial

---

[1]. The threat, specifically, lay in the development by the Soviets of ICBMs with ceps approaching .10 of a nautical mile, i.e. systems with roughly the accuracy of Minuteman III with the NS20
guidance upgrade. For the operational consequences of various combinations of yield and cep against targets of varying hardnesses, see Jeffrey Merkley, "Trident II Missiles: Capability, Costs, and Alternatives," *The Congressional Budget Office* (Washington D.C.: U.S. Government Printing Office, 1986) pp. 5-12. A series of tests in 1976 and 1977 led U.S. intelligence analysts to conclude that new models of the SS-18 and SS-19 would achieve such ceps. For then Undersecretary for DDR&E William Perry's reaction to these Soviet tests, see John Edwards, Superweapon: The Making of MX (New York, N.Y.: W.W. Norton & Co., 1982) pp. 143-144. The CIA later adjusted its estimate of the SS-19's cep upward, but left its estimate of SS-18 Mod4's cep unchanged. See: Michael Gordon, "CIA Downgrades Estimate of Soviet SS-19," *National Journal*, Vol. 29, July 20, 1985, p. 1692; Bill Keller, "Imperfect Science, Important Conclusions," *New York Times*, July 28, 1985, p. 4E; Jeffrey Richelson, "Old Surveillance, New Interpretations," *Bulletin of the Atomic Scientists*, Vol. 42, No. 2, February 1986, pp. 18-23; and Donald Mackenzie, Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance (Cambridge, MA.: MIT University Press, 1990) pp. 427-430.

[2]. The first operational Polaris patrol in November, 1960 corresponded almost exactly in time to the first successful recovery of a Discoverer satellite film capsule containing clear imagery of Soviet ICBM facilities. On the latter, see Lawrence

ICBM force until the mid 1960s. The entry into full scale development of Trident II was delayed from 1976 to 1983 and IOC was only achieved in 1989. Meanwhile, the threat posed by heavy MIRV'd Soviet ICBMs grew over time to match, sometime during the 1980s, the initial, inflated estimates of the late 1960s and 1970s. Thus, even though Soviet ICBM developments were exagerrated in both the late 1950s and the late 1970s, in the latter case the best solution still lagged rather than preceded the arrival of the threat it was supposed to counter.

Second, the technical risks associated with Trident II development were treated differently than the technical and political risks associated with contemporary Bomber and ICBM programs, not to mention the risks of the earlier Polaris program. The comparison is particularly acute in the case of the MX ICBM program where a missile was aggressively developed amidst great controversy in the years between 1976 and 1983 without an approved basing mode, and thus without any guarantee that it would reduce the vulnerability of U.S. forces to heavy MIRV'd Soviet ICBMs. During the same period, potential improvements in SLBM accuracy and SSBN communications were treated as less certain and more risky if

---

Freedman, U.S. Intelligence and the Soviet Strategic Threat (Princeton, N.J.: Princeton University Press, 1986) pp. 72-73.

not impossible, when they were in fact more feasible in both a technical and political sense than any of the proposed survivable basing schemes for MX. Similar concerns about Polaris were, in the late 1950s, more compelling, yet these concerns were met and defeated through the aggressive and timely exploitation of radical new technologies. A similarly aggressive approach to Trident II development was lacking even though the technical challenges in this case were much less daunting.

Third, the technical conservatism of the Trident II program and the delays in its full scale development prevented it from being conceived as an alternative to an aggressive land based modernization program. This prevented Trident II from playing the role that Polaris had played in the late 1950s whereby the superiority of a new sea-based system undermined the case for new or existing land based delivery systems and the dominant Air Force role in the nuclear deterrence mission. In response to the earlier threat of Polaris, the Air Force was driven to innovate itself with its own survivable, solid fuelled Minuteman ICBM program. Trident II produced no such response from the Air Force because it did not pose such a threat. Air Force modernization programs whose origins dated to the years immediately after the SALT I negotiations rumbled onward without modification and despite the existence of

superior alternatives.

Fourth, because the search for a solution to the Window of Vulnerability was thereby arbitrarily limited to land based modernization programs, when those programs foundered, the perceived lack of a sea based alternative led to compromises that were expensive and that led to the abandonment of the very goals that had provoked the modernization program in the first place. In particular, the failure to deploy a survivable MX force that did not need tactical warning to survive led, during the early Reagan years, to a compensating decision to restart the B-1 program and continue the ATB program. Then, after the Scowcroft commission report, the administration decided to deploy a vulnerable silo based MX force in the interim, begin the development of a rail basing mode for MX in the longer run, and begin also a new single warhead ICBM (SICBM or "Midgetman") program. All of these expensive new delivery systems were completely dependent upon tactical warning for survival.[3] A modernization program which began with the objective of eliminating or greatly reducing the

---

[3]. Even SICBM, whose small size was initially considered conducive to a truly road mobile (and therefore survivable) deployment mode, became dependent upon tactical warning when it became clear that it's peacetime deployment patterns would be confined to secure areas on existing military bases.

dependence of land based forces upon warning for survival actually resulted in a substantial deepening and institutionalization of such dependence on the part of land based forces.

The analagous outcome in the late 1950s would have involved a decision to delay Polaris and Minuteman, continue investment in the development of liquid fuel missiles, and further deepen the dependence of the bomber force on overseas operating bases. Such a decision could easily have been made if the technical challenges facing solid fuel missiles had been exagerrated and the dangers of dependence upon strategic warning understated. As we have seen, such a decision was not made in the late 1950s but was in the years between 1976 and 1983, when the technical challenges facing Trident II were exagerrated and the dangers of dependence upon tactical warning understated.

The explanation for the outcome of the latter case does not follow the explicit predictions of either Posen's or Rosen's theories of the sources of stagnant military doctrine. Trident II enjoyed high degrees of support both among civilian executives in the White House and in OSD, and amongst various sub-organizations within the Navy. Furthermore, the specific technologies which would, if aggressively exploited, enable Trident II to engineer the same type of doctrinal innovation as had Polaris were also blessed

with a high degree of civilian and intraservice support. Thus, Trident II was amply blessed compared to Polaris with both types of causal mechanisms that, according to theory, induce radical doctrinal innovation.

Even more curious, the interservice politics of an aggressive Trident II development program should have been at least as compelling from the perspective of the Navy as a whole, as was the case with Polaris. Air Force nuclear modernization programs of the late 1970s and early 1980s were expensive, politically controversial, and riven with technical uncertainties. Even more than the Air Force programs of the mid to late 1950s, they should have been a ripe target for any Navy effort to export the costs of Trident II onto the Air Force (or, to put it another way, to import Air Force nuclear money into the Navy's general purpose budget). Likewise, in the late 1970s, the Navy was having considerable difficulty justifying budgets for continued investment in conventional power projection forces such as carrier battle groups and amphibious shipping, even as the forward deployment of such forces was increasing due to developments in the Indian Ocean. The civilian and intraservice support for Trident II, and the potential attractiveness from the Navy's perspective of using money invested in Trident II as a means of liberating a much larger amount of Air

Force money for investment in traditional naval forces did not result in a development effort designed to aggressively exploit Trident II's potential capabilities.[4] Nor did it involve the development of new nuclear doctrine that made the case for Trident II and Navy general purpose forces, and that made the case against new land based nuclear forces. Instead, the Navy perceived that one of the keys to safeguarding its traditional shipbuilding programs lay in preventing Trident II from being placed in competition with new land based Air Force strategic nuclear programs. Whereas Polaris' boosters were driven to interservice conflict, and to the development of the finite deterrence doctrine, out of a need to protect conventional naval programs, such conflict spurred by Trident II was perceived to constitute a major threat to conventional naval programs.

In order to avoid this threat, Trident II supporters fashioned a different strategy than their predecessors had with Polaris. This strategy sought to preserve a particular pattern of interservice relations that more closely resembled collusion than competition, and which required that the Navy cede preeminence to

---

[4]. This is especially surprising given the budgetary implications of the 600 ship Navy, which starting in the late 1970s, became the Navy's programmatic goal.

the Air Force in the those mission areas, including the strategic nuclear forces, where it had vital interests in return for a similar agreement by the Air Force not to impinge on those mission areas deemed vital to the Navy.[5] Since the SLBM/SSBN force did not fall in the latter category, an aggressive effort to use Trident II to discredit the case for the MX and the B-1 would have broken this tacit agreement between the two services and would have caused overt efforts by the Air Force to undermine the case for sea based power projection by Navy carrier battle groups and Marine amphibicus task forces. Thus, in the larger scheme of the interests of the Navy as a whole, the pace and scope of the Trident II program was dominated by concerns about its impact on more traditional general purpose naval roles and missions.

The Navy could have viewed FBMs in general and Polaris in particular in the same way. Many naval officers in fact did oppose vigorous FBM development in the late 1950s because of the threat such a program would pose to general purpose naval forces, and to good relations with the Air Force. These concerns did not prevent

---

[5]. Despite the intervening time, these mission areas remained roughly the same in the late 1970s as they were in the late 1950s. Both the Navy and the Air Force had as their primary goal the rejuvenation of their traditional platforms - aircraft carriers and manned bombers.

a major bout of interservice competition with Polaris leading the charge, whereas in the later case, they resulted in the continuation of a pattern of interservice collusion that kept Trident II's true significance hidden until the spector of an interservice row with the Air Force had dissipated. In neither case did different patterns of civil-military or intraservice relations have the effects predicted of them. In fact, outcomes in the two cases flowed in the opposite direction from those that would have resulted if either or both of these factors were truly independent, causal variables.

In the sections that follow, I describe in more detail the case of Trident II's development. The first section continues the summary of grand strategy, service doctrine for strategic nuclear weapons, and technology provided at the beginning of Chapter 3 for the 1940s and 1950s. This discussion establishs the point of departure for the current case. The second section describes the favorable civil-military and intraservice politics of the Trident II program. The third describes in more detail the civil-military and intraservice politics of those technologies necessary to radically improve the lethality and communications capabilties of Trident II over its predecessors. The fourth describes the political and technical vulnerabilities of the various Air Force

modernization programs of the same era. Taken together, sections two through four depict an overwhelmingly favorable climate for the type of interservice battle over nuclear roles and missions of the type waged by the Navy on behalf of Polaris. In the final section, I show how such a battle was systematically avoided by the Navy and how perceptions of the need to maintain interservice peace dominated the pace and content of the Trident II's development.

Fleet Ballistic Missiles and Flexible Response

Just as Polaris posed a threat to less survivable Air Force delivery systems, finite deterrence posed a threat to the Air Force's doctrine of massive preemption on strategic warning. Finite deterrence also developed, with Army support, into a larger challenge to the Eisenhower administration's grand strategy of massive retaliation using nuclear weapons to compensate for conventional weakness.[6] This Army-Navy critique of Eisenhower's defense policies was embraced by the democrats, along with their somewhat contradictary embrace of the primarily Air Force driven campaign to close the missile gap that was allegedly opening in the

[6]. See, for example, Maxwell Taylor, The Uncertain Trumpet (New York, N.Y.: Harper & Row, 1960).

Soviet Union's favor. Kennedy's narrow victory brought into power an administration that had pledged during the campaign to launch crash programs to both accelerate the modernization of the nuclear forces, and to revitalize and expand the general purpose forces. The flexible response strategy developed by the new administration combined these competing and often contradictary strategic and doctrinal currents into one big compromise package that provided options rather priorities and guidance.

In this new environment, modernization decisions for the nuclear forces were favorable to Polaris and much less so for the Air Force. Though Minuteman was accelerated and B-52 production maintained to support a 15 wing force, literally every other Air Force nuclear delivery system was reduced, cancelled, or eliminated. On the other hand, the doctrinal disputes between the Navy and the Air Force were settled in more even handed fashion. After an initial flirtation with finite deterrence, McNamara adopted a second strike counterforce/no cities doctrine which sought:

> "...the capability, in the event of a Soviet nuclear attack, first to strike back against Soviet bomber bases, missile sites, and other installations associated with long-range nuclear forces, in order to reduce Soviet power and limit the damage that can be done to us by vulnerable Soviet follow-on forces, while, second,

holding protected reserve forces capable of destroying the Soviet urban society, if necessary, in a controlled and deliberate way."[7]

Contrary to declaratory policy on several occasions, this doctrine guided operational planning for the next 30 years.[8]

The counterforce/no cities doctrine had originally emerged out of efforts by the RAND corporation to develop an Air Force doctrinal response to the Navy's finite deterrence doctrine which preserved a primary role for bombers. The Air Force rejected this alternative to its existing doctrine of massive preemption, but McNamara later found it useful because it finessed and left ambiguous the grand strategic role of the nuclear forces. As a retaliatory strategy at least in name, counterforce/no cities, despite its expense compared to finite deterrence, was consistent with a renewed emphasis on conventional deterrence. On the other

---

[7]. The quote is of Robert McNamara, writing in *Draft Memorandum for the President, Recommended Long Range Nuclear Delivery Forces, 1963-1967*, September 23, 1961, as quoted in Scott Sagan, Moving Targets: Nuclear Strategy and National Security (Princeton, N.J.: Princeton University Press, 1989) p. 29.

[8] See, for example, Aaron Friedberg, "A History of the U.S. Strategic Doctrine - 1945 to 1980," *Journal of Strategic Studies*, Vol. 3, No. 3, December 1980

hand, forces that could be used in retaliation could also be used preemptively, and so counterforce/no cities retained a powerful if tacit ability to continue using the threat of nuclear escalation as a counter to Soviet conventional superiority.

In its original RAND formulation, counterforce/no cities emphasized the unique counterforce capabilities provided by bombers against hardened military targets as opposed to the purely countervalue capabilities provided by missiles like Polaris and Minuteman. At the outset, actual operational planning to implement counterforce/no cities exploited the fact that no such hardened targets existed in the Soviet Union.[9] Polaris and Minuteman were apparently used both as counterforce and countervalue weapons in early SIOP planning.[10] In the longer run, the future hardening of

---

[9]. For a contemporary, unclassified discussion of the hardness and degree of dispersal of Soviet ICBMs, see Jeremy Stone, Containing the Arms Race: Some Specific Proposals (Cambridge, MA.: M.I.T. University Press, 1966) pp. 136-137. The chief means of intercontiniental delivery for the Soviets remained their small force of Bison and Bear bombers, whose bases were exceedingly soft targets.

[10]. In 1963, McNamara provided an illustrative list of Soviet targets in 1969, along with the allocation of forces assigned those targets in the SIOP. In it, cities were covered only by ballistic missiles, time urgent counterforce targets by ballistic missiles, hardened time urgent counterforce targets by ballistic missiles and gravity bombs, and other military targets mostly by gravity bombs and air launched missiles. Thus, in this allocation, counterforce was mostly performed by ballistic

Soviet forces could be met by matching advances in U.S. missile accuracy.[11] By the mid-1960s, the Deputy Secretary of Defense Roswell Gilpatrick was writing that bombers would be completely phased out of the nuclear force structure by the end of the decade.[12] Though this particular prophecy did not come true, all that remained of the once several thousand strong bomber force at the end of the decade was the B-52 force. Retirements and the absence of new production shrank this force from 600 to 260 by the early 1980s.[13]

Just as counterforce/no cities proved not to be the force builder for bombers that the Air Force had originally anticipated, the democratic initiative to restore U.S. conventional forces did not benefit the Navy in quite the way it had anticipated either. In particular, aircraft carriers faced hard going during the

---

missiles, not bombers. See Sagan, *Moving Targets*, p. 35.

[11] Again, for a contemporary view of this issue, see Stone, Containing the Arms Race, p. 139.

[12]. Roswell Gilpatrick, "Our Defense Needs," *Foreign Affairs*, April 1964, p. 373.

[13]. For a chronology of these reductions, see Norman Polmar and Timothy Laur (eds), The Strategic Air Command: People, Aircraft, and Missiles (Baltimore, MD.: The Nautical & Aviation Publishing Company of America, 1990).

McNamara years.[14] Compared to the six carriers authorized during Eisenhower's two terms, the Kennedy and Johnson administrations authorized only two, USS Kennedy (CV-67) and USS Nimitz (CVN-68). Beginning during these years and extending through to the end of the Carter administration, the Navy faced a basic and essentially continuous challenge to its doctrine for conventional war at sea. This doctrine included offensive carrier task force operations as a central mission. To varying degrees, every administration between Eisenhower and Reagan opposed funding this mission. From 1961 to 1983, only five carriers were authorized, one by each president. The last of these five, USS Roosevelt (CVN-71), was saved from a Carter adminstration rescission and funded by Congress.

Beginning in the early 1960s with the establishment of the doctrinal and programmatic trends described above, the Navy's FBM program found itself in a dramatically different political setting. These new political circumstances caused a subtle change in

---

[14]. For McNamara's disbelief in the benefits of nuclear powered carriers, see Alain Enthoven and K. Wayne Smith, How Much is Enough?: Shaping the Defense Program, 1961-1969 (New York, N.Y.: Harper & Row, 1971) pp. 325-326. For his disbelief in the need for new construction of any carriers in order to replace older ones, see William Kaufmann, The McNamara Strategy (New York, N.Y.: Harper & Row, 1964) pp. 184-185.

doctrine and a dramatic change in attitudes toward technical risk. The traditional Navy ignored the FBM program during these years. The political and budgetary benefits from Polaris had been collected. Under the new circumstances, traditional naval forces had to be justified to civilians in OSD in isolation from any decisions about budgets for Air Force nuclear programs. Money no longer flowed between these accounts as a consequence of shifting service budget shares.[15] In essence, the intraservice politics of FBMs reverted back to the mid-1950s, when such weapons were perceived as a drain on Navy general purpose investment. SPO, faced with a loss of intraservice support, became utterly dependent for funding on civilians in OSD. The loss of Navy support and the dependence upon OSD also caused SPO to avoid new conflicts with the Air Force. Finally, SPO's insecurity made it become a deeply conservative organization in a technical sense. Each of these factors had powerful effects on Poseidon and Trident I, the SLBMs developed by SPO in the years separating Polaris and Trident II.

The main doctrinal effect of SPO's new circumstances under

---

[15]. This new reality was manifest in McNamara's use of a program budget, rather than the traditional budgets broken out be service share or by appropriation category (i.e. R&D, Procurement, O&M, etc.). Kaufmann, The McNamara Strategy, pp. 174-175.

flexible response was an effort to differentiate SLBMs from ICBMs and bombers in complementary rather than competitive fashion. Where finite deterrence was designed to undermine the case for land based forces, SPO carved out a doctrinal niche for itself within flexible response that left plenty of room for, and in fact demanded ICBMs and bombers. Each leg of the triad of nuclear forces had unique and necessary contributions to make to flexible response. Initially, during the counterforce/no cities era, bombers did counterforce, ICBMs did defense suppression for the bombers and other time urgent missions, and SLBMs were withheld from the initial exchange of land based forces in order to hold Soviet cities at risk, thus giving the Soviets an incentive to withhold attacks against U.S. cities.[16] These declaratory roles, as I noted above, understated the considerable counterforce capabilities provided by missiles in the early 1960s, but they were the roles used by the Air Force and the Navy to justify future investments in their respective systems.

---

[16]. The roles described here for bombers and SSBNs are familiar. For the declaratory link between ICBMs and the defense suppression mission, see Desmond Ball, Politics and Force Levels: The Strategic Missile Program of the Kennedy Aministration (Berkely, CA.: University of California Press, 1980) pp. 224-231. That this was a less than precise description of the Minuteman force's real role, see Enthoven and Smith, How Much is Enough?, pp. 257-259.

This doctrinal niche emphasizing enduring survivability and city busting interacted with a growing technical conservatism in SPO to produce a powerful set of incentives against adopting ambitious performance requirements during the devlopment of succeeding generations of SLBM after Polaris. For example, city busting did not require high accuracy and high accuracy was a risky thing technically to promise in advance. Thus, SPO quickly developed a practice of accepting accuracy "goals" but not "requirements" for its systems. Furthermore, these goals were themselves conservative. An accuracy goal was not a contractual requirement. SPO and its contractors would seek to meet the goal, but would not ensure its achievement in advance.[17] In this way, by damping down expectations at the outset, SPO bought insurance against the case in which it did not meet its accuracy goals. In practice, this never happened and in at least one significant case, SPO greatly exceeded its accuracy goal for a particular system.[18]

---

[17]. On the distinction between goals and requirements, see Mackenzie, Inventing Accuracy, p. 149. The Air Force became much more aggressive than SPO in claiming accuracy capabilities for its ICBMs. Ibid., pp. 367-368.

[18]. This was Trident I, whose goal was .25 n. miles, but whose actual performance in tests was .12 n. miles. See William Arkin, "Sleight of Hand with Trident II," *Bulletin of the Atomic Scientists*, Vol. 40, No. 11 (December 1984), p. 6.

Nevertheless, this conservative approach to adopting requirements contributed to the perception that SLBM were intrinsically inaccurate.[19] Important actors within the Navy and, more importantly, within OSD were impatient with this technical conservatism, and with the doctrinal compromise with the Air Force that reinforced it. Nevertheless, SPO perceived that its future as a developmental organization for FBMs would be best assured if it adopted conservative performance goals and refrained from direct competition with Air Force programs. Thus, by default or design, SPO sought to optimize FBMs so that they were capable of the city busting countervalue component of flexible response, and only that mission.[20]

The Civil-Military and Intraservice Politics of Trident II.

Whether radical innovations in military doctrine are caused by

---

[19]. Some would in fact claim that SPO's conservative approach to cep requirements means that SLBMs are the only systems which will perform as advertised and that, by implication, ICBMs are likely to stray far from their test range performance in actual operations. See Topping, "Submarine Launched Ballistic Missile Improved Accuracy," p. 7.

[20]. In operational terms, SPO designed SLBMs to penetrate Soviet ballistic missile defenses and destroy soft, area targets.

civilian intervention or intraservice conflict, Trident II benefited on both counts from a more substantial base of support than did Polaris. This was fortunate in that with Trident II the Navy was introducing both a new SLBM and a new SSBN, whereas for the intervening generations of SLBMs between Polaris and Trident II - Poseidon and Trident I - new missiles were developed to be deployed on the original boats developed for Polaris. Thus, the politics of Trident II really begin with the politics of a new SSBN. This issue first arose during the STRAT X study, begun during the late 1960s at the tail end of McNamara's tenure at OSD, and it reached a boiling point during and immediately after the negotiation of the SALT I agreement during the Nixon administration. Thus both strands of the story of the politics of Trident II begin at this point.

The White House, OSD and the Origins of Trident II.

The STRAT X study was intended as a review of alternative basing modes designed to meet the needs of a Soviet threat consisting of a large force of ballistic missiles and ballistic missile

defenses.[21] It thus focussed on means other than those provided by the newly minted triad of existing forces to survive massive attack and penetrate defenses. Various accounts of the results of this study locate the origins of Trident II in the winning system, then called the Undersea Long-Range Missile System (ULMS).[22] As originally envisioned, ULMS would be a 6000 mile range heavy SLBM deployed in large numbers on a new class of large but austere SSBNs. Though it did not lead directly to a development program, STRAT X is significant for two reasons.

First, it clearly indicated the large burden of proof facing advocates of new land based systems - whether Bombers or ICBMs - under the Soviet threat anticipated for the 1970s and 80s. The future of the manned bomber had already become quite cloudy during the 1960s, with important officials in OSD projecting a complete phaseout of bombers in the not so distant future.[23] With STRAT X, Air Force ICBM programs also became threatened by the prospect of

---

[21]. The STRAT-X Report (Arlington, VA.: Institute for Defense Analyses, August 1967) Vol. I.

[22] See for example Norman Polmar and Captain Dominic Paolucci, USN (RET), "Sea Based Strategic Weapons for the 1980s and Beyond," United States Naval Institute Proceedings, Vol. 104, No. 5 (May 1978), pp. 100-102.

[23]. See note 12 above.

a phaseout over a somewhat longer term at the expense of a new SLBM/SSBN system. Thus, STRAT X raised anew, albeit in the much less charged context of an OSD initiated DOD contractor study, the spector of another bout of intense Air Force-Navy competition over nuclear roles and missions. The just completed development of Poseidon and Minuteman III had by and large been free of such conflict, but STRAT X indicated that the case for a follow on to Minuteman III, never mind a successor to the B-52, would be hard to make in the face of ULMS.

Second, STRAT X also gave the Navy the first opportunity to look beyond the physical constraints on SLBM development imposed by the volume of the launch tubes in the Polaris/Poseidon SSBNs. Poseidon had been designed to exploit fully the available room within these tubes, and the prospect of a new SSBN allowed those involved with FBM development to consider the operational benefits to be gained through the development of a larger SLBM.[24] The participation of Admirals Levering Smith and George Miller,

---

[24]. The missile tubes on Polaris boats had originally been designed with a generous degree of shock protection between the missile and the tube liner. This was reduced to a minimum for Poseidon which thereby gained 3 feet in length and 20 inches in diameter. This exhausted missile tube volume as can be seen from the newer Trident I missile, which is exactly the same volume as Poseidon. See Richard Fuhrman, "Fleet Ballistic Missile System: Polaris to Trident," *AIAA Paper 78-355*, pp. 20-21.

respectively the directors of SPO and of OP-06, lent weight to the proposition that ULMS was more than a mere paper study. Its emphasis on increased range for survivability and on the use of larger missile payloads for the purposes of defense penetration rather than increased lethality were a continuation of the decisions made in the Polaris A-3 and Poseidon programs.[25]

If STRAT X indicated both the obstacles in the path of further Air Force modernization efforts and the future inclinations motivating Navy plans for such modernization, the process of negotiating the SALT I interim agreement on offensive forces between 1968 and 1972 raised the issue of translating these analytical issues into specific programs. Both sides had warm ICBM and SLBM production lines that would allow them to continue to modernize th missiles allowed them under an interim agreement designed only to freeze the number of missile launchers deployed by each side. The last U.S. silo was completed in 1967 and the Soviet silo construction program was approaching completion by the late 1960s. Thus, an agreement to freeze the number of ICBM silos came rather early in the negotiation process. On the other hand, the

[25]. On the dominance of the penetration problem against anticipated Soviet defenses as a design criteria in Polaris A-3 and Poseidon, see Greenwood, Making the MIRV, pp. 4 and 44-45.

Soviets were reluctant to agree to numerical caps on SLBM launchers since their SSBN production program lagged considerably behind the U.S. side. Wheras production of Polaris/Poseidon SSBNs had also been completed by the U.S., Soviet production of the roughly analagous Yankee SSBN had only just begun. As this issue grew to become the primary sticking point in the path of an agreement acceptable to the United States, U.S. negotiaters became interested in creating incentives for the Soviets to accept such limits for SLBM launchers as well.[26] The obvious means of achieving this end lay in a new U.S. launcher construction program. Whether on land or at sea, the prospect of both expansion and modernization of U.S. forces presumably would cause the Soviets to accept an agreement which capped all forms of missile launchers.[27]

This bargaining initiative could just as easily have been based on a threat of new silo construction as of new SSBN construction - either type of program would have had the same affect on Soviet calculations. Interestingly, U.S. decision makers were not initially inclined to pursue the former path. As with

---

[26]. Raymond Garthoff, Detente and Confrontation: American-Soviet Relations from Nixon to Reagan (Washington D.C.: Brookings, 1985) pp. 156-165.

[27]. Elmo Zumwalt, Jr., On Watch: A Memoir (New York: The New York Times Book Company, 1976) pp. 154-157.

STRAT X, SSBNs were perceived to be superior to ICBMs. In addition, new SSBNs were chosen in order to allow the future development of a ULMS type SLBM requiring much larger volume launch tubes than those available on Poseidon SSBNs. Thus, SALT I led to pressures emanating from the highest levels of the White House for a new SSBN program. These pressures took the form of an urgent demand in late 1971 for the inclusion of substantial funds in the FY 73 defense budget for what came to be the Trident SSBN program.[28] Large Trident SSBNs, in turn, created the foundation for what came to be the Trident II SLBM.

ULMS, Trident, and the Navy.

These civilian pressures in favor of a new SSBN program found a receptive audience amongst important elements within the Navy. At the same time, they also abruptly resolved a serious intraservice conflict among these competing Navy branches over their somewhat contradictary interests in such a new program. The three most important groups were the office of the CNO (OPNAV) under Admiral Zumwalt, Strategic Systems Project Office (SSPO, formerly SPO

[28]. Henry Kissinger, White House Years (Boston, MA.: Little Brown, 1979) p. 1129.

during Polaris' development) under Admiral Smith, and Naval Reactors under Admiral Rickover. Prior to the urgent White House intervention in late 1971, these actors had struggled for a year to resolve their differences with the intermittent involvement and intervention of OSD.

Appointed as the new CNO in 1970, Admiral Zumwalt supported a new SSBN program both out of concerns over the pace of the Soviet strategic modernization program and out of beliefs that land based forces would become increasingly vulnerable to these forces as they continued to be modernized.[29] His support for Trident was important because it defused the continuing opposition from other Navy platform sponsors to investment in nuclear as opposed to general purpose forces.[30] On the other hand, because of these concerns which Zumwalt himself shared to some degree, he initially sought a cost effective program using evolutionary technologies.

As director of SSPO, Smith also responded favorably to the prospect of a new SLBM program along the lines of the ULMS proposal of the late 1960s. Thus, SSPO's initial response in 1970 was to propose a large new SLBM (twice the volume of Poseidon) to be

---

29. Zumwalt, On Watch, p. 154.

30. For indications of such opposition in the case of Poseidon, see Greenwood, Making the MIRV, p. 34.

deployed on a new class of large, austere SSBNs. These boats would emphasize cost effective survivability by sacraficing maximal speed and depth performance requirements and substituting extensive quieting measures and enlarged patrol areas. Most importantly, such a design, with a total displacement of 18,000 tons, could be powered by an existing 17,000 shp reactor design originally developed for the one off Narwhal attack submarine class. This would cut development costs and, more importantly, keep Admiral Rickover's involvement in the program to a minimum.[31]

As director of Naval Reactors, Admiral Rickover's interests in the Trident program clashed directly with the interests of SSPO. For Rickover, Trident offered the opportunity for a new reactor development program. Rickover was thus violently opposed to SSPO's proposal for an austere submarine using a Narwhal reactor. Instead, he proposed a 30,000 ton submarine with twin 30,000 shp reactors of a new design. Both submarines would accomodate larger launch tubes for a new class cf SLBMs to be designed by SSPO, but Rickover's submarine would be faster, deeper diving, and of course,

---

[31]. Smith and SSPO's position is described in detail in Mary Schumacher, "Trident, Setting the Requirements," *Kennedy School of Government Case Study C15-88-802.0*, Harvard University, 1977. The following discussion also draws heavily on this account of the politics of Trident submarine design and development.

much more expensive.

These three positions evolved as they came into competition with each other. Admiral Zumwalt's interest in limiting the costs of the Trident program made him an initial supporter of the SSPO approach, but Rickover's opposition changed his mind. Flouting Rickover on the Trident decision would make Naval Reactors even more likely to oppose Zumwalt's austere surface ship program for the general purpose Navy. These ships were the centerpiece of the CNO's program and his interest in an economical Trident program derived from his interest in protecting them. Once it became clear that Rickover would oppose this program without his version of Trident, Zumwalt changed his position and supported Rickover in his dispute with SSPO. This shift caused a compromise between Rickover and Smith whereby Rickover would get his submarine and Smith would design a large new SLBM for it.

Deputy Secretary of Defense Packard rejected this compromise because of its costs. Unlike Zumwalt, he did not need to appease Rickover in order to protect the Navy's austere surface ship construction program. In response to Packard's opposition, a new compromise was crafted. A smaller 14,000 ton SSBN with one of Rickover's new 30,000 shp reactors would be developed. Dubbed the Super 640, this boat was portrayed as a less costly and more

evolutionary improvement over the Poseidon SSBNs. By the same token, it would provide for only a slight increase in missile tube volume over the previous class and would thus limit the ability of SSPO to design a large, long range SLBM of the type envisioned in the ULMS study. Thus, Smith showed the least support of the three key Navy actors for this new compromise.

SSPO sought above all to maintain the autonomy of its missile development programs and its reluctance to lose development control over the missile's launching system reflected its desire to maintain that autonomy. Cost overruns and schedule delays often accompanied ambitious new submarine designs, and any new submarine with a new reactor would be both ambitious and dominated by Rickover's Naval reactor group. Given that the Super 640 did not resolve these fears on the part of SSPO, and since it did not call for a greatly enlarged new SLBM, Smith came up with an alternative that severed completely the link between a new submarine and a new missile. He proposed to develop a near term SLBM compatible with existing Poseidon launch tubes. This extended range Poseidon (EXPO, later to become the Trident I SLBM) would, using existing Poseidon SSBNs, meet many of the original objectives of ULMS by extending the range achievable from existing launch tube volumes

from 2500 to 4000 miles at some loss in payload weight and volume.[32] Zumwalt was opposed to EXPO because he feared that it would kill the case for a new submarine and his fears were realized when Packard, upon hearing of the EXPO option, killed Super 640 in September 1971. He directed instead that the Navy proceed instead with an accelerated EXPO (Trident I) program with a planned IOC of 1977, while planning on a new SSBN and SLBM (Trident II) for deployment in the early 1980s pending the outcome of advanced development work necessary to maximize the performance and minimze the cost of this ambitious new system.

It was at this critical juncture that the White House became directly involved in the Trident program. Specifically, it was in October 1971 that Packard and other executives in OSD first became aware of the need not just to modernize the existing SSBN force but to also create for SALT I purposes the potential of increasing the numbers of its launchers with new SSBN construction. This need was comunicated directly to OSD by both Henry Kissinger and President

---

[32]. The key innovation that made EXPO possible was the addition of a third stage in the midst of the payload section atop the missile. This allowed EXPO to further exploit the volume of
existing tubes using the same external volume as Poseidon. This was actually not a new idea. See Spinardi, From Polaris to Trident, p. 117, n. 20.

Nixon. Packard and Secretary of Defense Laird resented this sudden White House intrusion into the OSD decision making process.[33] It undermined their position in favor of EXPO since that program did not involve any expansion of the number of SSBN launchers. It also became clear that in the interests of speeding new submarine development, the White House might advocate simply reopening the Poseidon SSBN production line, an option strenuously opposed by the entire Navy except Smith.[34] Given this dilemma, Laird and Packard chose to return to an accelerated and larger version of the Super 640 with a new reactor. Displacing almost 19,000 tons, it would also accomodate a new, larger SLBM. In the final formulation, EXPO and the new submarine would both be put on a development schedule leading to an IOC in 1977, while the larger SLBM would be developed

---

[33]. This resentment by Laird and Packard was a reflection of their general attitude toward the transformation of defense policy into an interagency process run from the White House by Henry Kissinger in which they had to compete with others for a voice. See Morton Halperin, *National Security Policy-Making: Analyses, Cases, and Proposals* (Lexington, MA.: D. C. Heath and Company, 1975) pp. 153-154.

[34]. The attraction of simply reopening the Polaris submarine line lay in its timeliness. Compared to Trident, existing designs could be available sooner and would, from a political perspective, serve as a better lever in the SALT interim agreement negotiations, which only contemplated a five year agreement. The first Trident boat could barely be available in that timeframe and thus might not provide the same incentive to negotiate to the Soviets.

later. In the event of delays in the new Trident SSBN, EXPO or Trident I could be backfitted on Poseidon boats. Upon deployment, Trident boats would also deploy Trident I with the understanding that their expanded missile tube volume would be exploited later through backfitting of a much larger and more capable Trident II.

Thus, by the beginning of 1972, the full scale development of a missile launching system sized according to the demands of Trident II had already begun. Though Trident II's development would await the completion of Trident I development, this would still allow for a program start in 1977 or 1978. By that time, the technological grounds had been laid for a Trident II system which would combine the survivability traditionally associated with the Navy's FBM program with the lethality and communications capability traditionally associated with the Air Force's ICBM programs.

The Civil-Military and Intraservice Politics of Counterforce SLBMs and Improved SSBN Communications.

The interservice competition which caused Polaris and presented its developers with demands for high lethality and continuous long range communications with submerged submarines lapsed in the early 1960s. The Navy's intent in developing Polaris had been achieved.

Much of the Air Force's budget for new strategic forces was scrapped and the bulk of the money thereby saved flowed into general purpose force accounts in the Navy's and the Army's budgets.[35] Furthermore, the strategic force programs that remained in the Air Force's budget, such as the silo based Minuteman ICBM, were more competitive with Polaris' capabilities. The two generations of SLBMs and ICBMs following Polaris and Minuteman I were not developed in a competitive atmosphere. Instead, they were designed to complement each other with SLBMs focussing on countervalue missions and ICBMs focussing on counterforce missions. Though expensive, these programs did not include new launchers and overall spending on strategic forces remained relatively low throughout the 1960s. Trident I continued the Navy's emphasis on countervalue missions and, as we have seen above, emerged from SALT I with extensive support. On the other hand, the parallel development of the Trident SSBN greatly increased the scale of the post SALT I modernization program for sea based forces and promised to shift for the first time the balance of investments in strategic

---

35. For a dramatic depiction of these shifts in budget shares and missions, see Kevin Lewis, "Historical U.S. Force Structure Trends: A Primer," *P-7582 The Rand Corporation*, July 1989, p. 13.

modernization in favor of sea based forces over land based forces.[36]

This complicated the politics of ratifying as opposed to negotiating SALT I.[37] Specifically, the price to be paid for unified JCS support before the Senate during the ratification debate would involve not just the Trident program, but also a new manned bomber and a somewhat less well defined ICBM modernization program. Taken together, these modernization programs would maintain the traditional balance of investment between land and sea based forces. Though they would not bring overall spending on strategic nuclear forces back to levels reached in the late 1950s and early 1960s, they would, if fully funded, double spending on strategic forces compared to the mid 1970s period.[38]

---

[36]. Ibid.

[37]. Thus, at the time the Soviets signed SALT I, there were no other new strategic modernization programs in the defense budget other than Trident. First the B-1, and then MX gained support in the budget as the price for the Joint Chiefs' (and the Air Force's in particular) unanimous support for SALT ratification by the Senate. For a clear indication of this distinction, see John Newhouse, *Cold Dawn: The Story of SALT* (New York: Holt, Rinehart & Winston, 1973) pp. 39-40. On this point more generally, see Steven Miller, "Politics Over Promise: Domestic Impediments to Arms Control," *International Security*, Vol. 8, No. 4, Spring 1984, pp. 80-84.

[38] For example, in constant FY96 dollars, peacetime spending on strategic nuclear forces during the Cold War reached

The case constructed by the Air Force for modernising the entire strategic nuclear triad rather than just its sea based leg had two elements. First, and most important, land based modernization was justified out of the need to preserve the unique capabilities provided by manned bombers and modern ICBMs which, the argument went, could not be provided by SLBMs alone. Second, land based modernization provided a hedge against unforseen advances in Soviet ASW capabilities which might compromise the heretofore unchallenged survivability of the SSBN force.[39] In practice, these

---

a peak of $75 billion in 1958, declined steadily from there to a nadir of $24 billion in 1980, and shot back up to $55 billion by 1986. The second peak during the Reagan years represented the bill for systems first begun in the aftermath of SALT I. With the end of the Cold War, spending dropped to about $13 billion by 1996, an amount which included continued procurement of Trident SSBNs and Trident II SLBMs, but essentially no money for new land based
forces. Annual spending on strategic forces since WWII, measured in constant FY 96 dollars, can be compiled using: Les A__in, *The Annual Report of the Secretary of Defense to the President and Congress* (Washington, D.C.: U.S. Government Printing Office, 1994) p. 151; Kevin Lewis, *Historical U.S. Force Structure Trends: A Primer*, P-75 2 (Santa Monica: Rand, 1989) p. 16; and Steven Kosiak, *Analysis of the Fiscal Year 1996 Defense Budget Request* (Washington, D.D.: Defense Budget Project, March 1995) Table 3.

39. The coming into vogue of the "triad" as an end in itself occurred in the early 1970s. See Robert Frank Futrell, Ideas, Concepts, Doctrine: Basic Thinking in the U.S. Air Force 1961-1984, Vol. II (Maxwell Air Force Base, AL.: Air University Press, 1989) pp. 384-389.

arguments boiled down to three claims - SLBMs could not be made lethal against hardened counterforce targets, SSBNs did not enjoy reliable communications with national command authorities, and SSBNs might not always remain survivable. The first two were the most important because, if true, they served to justify the forces that the Air Force actually wished to develop, while the third, even if true, led only to an emphasis on alternate means of deploying highly survivable forces which was becoming a goal that land based forces were finding it increasingly difficult to meet. Put another way, the emergence of a highly lethal SLBM and robust two way communication links with deployed SSBNs would likely lead to a situation in which land based forces could only be justified if they provided survivability equal or superior to the SSBN force. Even the Air Force found this a difficult claim to make and so the case for what became the B-1 and MX programs focussed on touting their unique advantages over SLBMs in the areas of counterforce and command and control (C2) capabilities.[40]

---

[40]. Admittedly, there were other "unique" capabilities claimed for land based forces, but they were either highly disputable or irrelevant as a justification for modernization. Thus, bombers were touted as a means of detecting and attacking otherwise undetectable mobile targets deep inside the Soviet Union. Few in or outside the Air Force actually believed this contention. Likewise, ICBMs were touted for their ability to launch very small strikes without compromising the survivability

Here, the Air Force had an ally, unwitting or not, in the Navy's SSPO office. As the Navy embarked on the Trident I SLBM and Trident SSBN programs, SSPO sought to maintain the operational division of labor between the Air Force and the Navy which had successfully guided modernization efforts during the 1960s. They were largely successful in this endeavor at first, but as the late 1970s approached, the technological basis for this complementary development strategy, never solid in the first place, became even more shaky due to advances in missile guidance and communication technologies developed by actors external to SSPO.

OSD, OPNAV, Kearfott, and Counterforce SLBMs.

With Polaris and Poseidon the difference between the lethality of these systems and their ICBM counterparts was a function more of warhead choices than of intrinsic differences in accuracy. Trident I was the first SLBM whose accuracy requirement was substantially less than ICBMs of the same generation. The argument by SSPO was that as ballistic missile guidance systems reached the limits of

---

of other weapons as might occur if an SSBN launched only one of its SLBMs. Though possibly true, this argued only for the maintenance of the existing ICBM force, not its modernization.

their performance after some twenty years of continuous development, the sources of error in those systems which contributed to target misses were becoming increasingly difficult to measure and isolate from one another so that they could be corrected. With SLBMs, there were more sources of error because of the mobility of the launch platform and so the problem of discrimination was greater, leading to an irreducible, if small disadvantage compared to fixed silo based ICBMs. Several powerful actors within and without the Navy were impatient with this contention by SSPO and they acted aggressively to impose their desires for high SLBM accuracy on SSPO.

Secretary of Defense Schlesinger was impatient with the idea that testing could not isolate and measure sources of error in guidance systems.[41] Officers within the CNO's staff in OPNAV had always been impatient with SSPO's instinct to complement rather than compete with the Air Force's de facto monoploy on the counterforce mission and saw in both Trident I and Trident II opportunities to combine improved accuracy with high yield warheads

---

[41]. On Schlesinger's impatience, see Mackenzie, Inventing Accuracy, p. 284.

in such a way as to eliminate that monopoly.[42] Finally, the Singer-Kearfott corporation saw in Trident I and Trident II the opportunity to promote its expertise in stellar-inertial guidance systems which offered the capability to correct for some of the error sources in ballistic missile guidance which were unique to mobile platforms like SSBNs. Admiral Smith's strategy for dealing with these pressures was to resist their application to Trident I, with the understanding that they would be applied instead to Trident II.

Schlesinger's critique of SSPO's mode of operation was the most basic one. SSPO had, rightly, prided itself on delivering reliable products which met their initial performance requirements on time and within planned budgets. High accuracy requirements threatened this reputation by creating expectations that existing testing methods were incapable of matching with high confidence.[43]

---

[42]. In fact, many in OPNAV suspected a conspiracy between the Air Force and SSPO designed to keep the latter from deploying accurate systems that might compete with Air Force programs. See Greenwood, Making the MIRV, p. 55.

[43]. This attitude towards living within one's technical means is most strongly associated with Admiral Smith, but it infused the whole of SSPO from the early 1960s onwards. It is best explained as a byproduct of the perceived need to always meet cost, schedule, and performance goals in order to protect the program from criticism and outside intervention. Thus, when accuracy improvements came without substantial development risk,

In order for a test to validate the achievement of a given accuracy requirement, the instrumentation on the test range had to be superior in its resolution to the needs of that accuracy requirement. Existing test ranges did not meet this demand during the early 1970s. They were capable of observing and measuring the fall of shot as it were, but they were not capable of measuring the individual components of error which when combined, produced the overall miss distance observed at the target. This latter objective demanded the creation of better test range instrumentation.[44] Schlesinger, with the prior approval of the CNO, directed the creation of such instrumentation and the development of better models of SLBM error sources based upon tests on this improved test range. This Improved Accuracy Program (IAP) began in 1974 and ran through 1982.[45] Given Trident I's development schedule, Smith was able to resist pressures to have IAP test results used as a basis for establishing accuracy rquirements for

---

Smith was happy to provide them. See Greenwood, *Making The MIRV*, p. 56. This reference explains how Poseidon achieved double the accuracy of Polaris A-3.

[44]. See Captain Robert Topping, USN, "Submarine Launched Ballistic Missile Improved Accuracy," *AIAA Paper 81-0935*, May 1981. This paper describes in great detail the changes made to the Eastern Test range to support the IAP.

[45]. Spinardi, From Polaris to Trident, pp. 141-146.

that missile, except on a retroactive basis where possible.[46] On the other hand, given Trident II's more distant development schedule, it was clear that that SLBM's accuracy requirements could be based on the results of an extensive IAP test program.

Even under circumstances where SLBMs rivalled the accuracy of ICBMs, their comparative lethality against hardened counterforce targets depended also on warhead choices. Throughout the 1960s, officers within OPNAV had been critical of SSPO's preoccupation with the countervalue mission as manifest in its choices of large numbers of small warheads for SLBMs. Poseidon was a particularly acute case in point. Poseidon and Minuteman III, as originally deployed, both had CEPs of about a quarter of a nautical mile (approx. 1500 feet.)[47] In addition, Poseidon had a significantly greater throwweight than Minuteman III.[48] High accuracy and

---

46. Mackenzie, Inventing Accuracy, p. 284

47. Ibid., pp. 428-429.

48 In fact, Poseidon had almost twice the throwweight of the Minuteman III - 2000 to 1150 kilograms. See "Memorandum of Understanding on the Establishment of the Data Base Relating to the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms," in *Treaty with the Union of Soviet Socialist Republics on the Reduction and Limitation of Strategic Offensive Arms* (Washington D.C.: U.S. Government Printing Office, 1991) p. 324.

throwweight are the traditional signs of a counterforce capability but SSPO chose instead to optimize Poseidon for the countervalue mission by deploying ten 40 kiloton warheads, while Minuteman III deployed two to three 175 kiloton warheads. Poseidon could easily have deployed more than three Minuteman Mk. 12 warheads, making it a superior counterforce system to the Minteman III.[49] This and other heavy warhead options were pressed upon SSPO during Poseidon's development by both OPNAV and by OSD, but Smith was successful in resisting their implementation.[50]

The same groups also pressed for a larger warhead for Trident I in the face of SSPO's inclination to simply reuse Poseidon

---

[49]. For discussions that note the counterforce potential of Poseidon, if not always for the right reasons, see: Desmond Ball, "The Counterforce Potential of American SLBM Systems," *Journal of Peace Research*, Vol. 14, No.1, 1977 and Albert Langar, "Accurate Submarine-Launched Ballistic Missiles and Nuclear Strategy," *Journal of Peace Research*, Vol. 14, No. 1, 1977.

[50]. Along with the option to use heavy warheads, Poseidon was also a candidate for stellar-inertial guidance of the type eventually adopted for Trident I. Stellar-inertial promised even greater accuracy than the improvements which were actually achieved. Thus, SSPO used the prospect of stellar-inertial to kill off the heavy warhead proposals. With high accuracy, light warheads could still kill hardened point targets. Once the heavy warhead options were dead, SSPO allowed work on stellar-inertial to languish until it was killed in the anti-counterforce years of Nixon's first term. See Greenwood, Making the MIRV, pp. 70-71; Mackenzie, Inventing Accuracy, pp. 264-270; and Spinardi, From Polaris to Trident, pp.90-100.

warheads.[51] Here, the effort succeeded but in only a contingent way due to the design of the Trident I. In order to improve on the range of the Poseidon using the same launch tube volume, SSPO designed Trident I with a "through deck" third stage at the center of the missile payload section. This third stage gave added range at the expense of throwweight and, more importantly, payload volume. Trident I warheads were limited to the diameter of the annular space around the third stage motor, which in turn limited their maximum yield to about 100 kilotons.[52] Though larger than Poseidon warheads, these were no longer sufficient to provide counterforce capabilities against Soviet targets hardened against thousands rather than hundreds of pounds per square inch (psi) overpressure. Such tradeoffs between range and payload volume would be nearly non-existent once SLBM designers were liberated from the 74" diameter of the Poseidon SSBN launch tubes. Trident SSBNs added 10" of diameter for them to work with, allowing much

---

[51] On the politics of the Trident I warhead decision, see Sybil Francis, *Warhead Politics: Livermore and the Competitive System of Nuclear Weapons Design*, PhD Dissertation, M.I.T., 1995.

[52]. These physical constraints on diameter had other effects on warhead design. See John Harvey and Stefan Michalowski, "Nuclear Weapons Safety and Trident: Issues and Options," *A Report of the Center for International Security and Arms Control*, Stanford University, August 1993, pp. 4-7.

more freedom of warhead choice. With Trident II, unlike the cases of Poseidon and Trident I, SSPO was not likely to succeed in preventing the option of high yield warheads in the face of pressures to provide them from OSD and OPNAV.

Finally, the politics of accurate SLBMs were affected by the prospect of stellar-inertial guidance. The Kearfott corporation lobbied vigorously, and in the end, successfully in favor of this technology with SSPO.[53] After launch, a stellar update to a missile's inertial guidance system could correct for errors both in knowledge of initial position and alignment and due to gyroscopic drift during the boost phase. These abilities could, in turn, be exploited to maximize the period that SSBNs could remain submerged between external updates to its SINS while on patrol, to maximize SLBM accuracy in the period immediately after such an update, or, assuming a good knowledge of error sources, both of these objectives. Advocates within both OSD and industry failed to convince SSPO to use stellar-inertial on Poseidon but succeeded

---

[53]. Stellar-inertial was another spinoff from early cruise missile programs that found its way onto SSBNs. The first was SINS. The first attempt to use stellar guidance on a ballistic missile involved Kearfott's contract on the land mobile missile originally contemplated for the MLF in Europe. When this was cancelled, Kearfott understood that their last hope was the Navy and promptly began lobbying to that effect. Mackenzie, Inventing Accuracy, p. 248.

with Trident I. Initially, this technology was used on Trident I to greatly extend the period between SINS resets by patrolling SSBNs, with the understanding that high accuracy would be pursued later after completion of the IAP in 1982. To the extent possible, SSPO agreed to "backfit" high accuracy onto Trident I at this point, while designing it into the Trident II from the outset if so directed.[54]

OSD, NAVLEX, Lincoln Lab, and Improved SSBN Communications.

Just as SSPO had an established track record of emphasizing countervalue over counterforce missions in SLBM design, it, along with the SSBN operational community, also had an established record of emphasizing dedicated SSBN communication systems and procedures that maximized the survivability of SSBNs on patrol over communication systems designed to be survivable themselves.[55] The

---

[54]. This effort succeeded in spades, making Trident I at least as accurate as the most accurate versions of Minuteman. Furthermore, given the statistical understanding of error budgets now possible due to the IAP, stellar updates are now probably used for both purposes described above.

[55]. "An Unclassified Version of a Classified Report Entitled 'The Navy's Strategic Communication Systems - Need For Management Attention and Decisionmaking,'" *General Accounting Office PSAD-79-48A*, May 1979. This report criticizes the Navy for its focus

heart of the SSBN communication system was the Navy's VLF broadcast which was transmitted by a small number of soft, fixed sites providing continuous global coverage.[56] VLF radio allowed SSBNs to copy the broadcast without exposing an antenna, thus minimizing their the probability of detection, but the large, fixed transmitters made the communication system vulnerable to the smallest attack. VLF broadcasts were backed up by LF and HF broadcasts from other sites which were also vulnerable to attack.[57] When SSBNs were first deployed, the Navy planned to use HF relays from surviving shore transmitters to SSBNs via deployed Navy ships as a means of survivable, post attack communication of execution orders. During the 1960s, a more robust alternative for survivable, post attack communication was developed by deploying VLF transmitters on special C-130 aircraft. As originally planned, TACAMO (Take Charge And Move Out) aircraft would be kept on airborne alert on each coast, ready to receive orders from the NCA

---

on investments in peacetime communication assets designed to constantly reduce the detectability of the already invulnerable deployed SSBN force.

[56]. There are six sites altogether, any two optimally located ones being sufficient for global coverage. Ibid., p. 33.

[57]. There are 21 LF stations and 24 HF stations worldwide, a subset of which are devoted to duplicating the VLF broadcast. Ibid., p. 34.

and relay them to SSBN patrol areas. TACAMO remained less than optimal as a solution to the post attack communication needs of the far flung Polaris and Poseidon force. A tradeoff existed, particularly in the Pacific, between orbit locations which maximized the probability of TACAMO's reception of NCA orders and those which maximized the probability of SSBN reception of TACAMO retransmissions of these orders via VLF.[58]

From SSPO's and the SSBN operators' perspectives, these drawbacks were not terribly significant given the minimal communication needs associated with ordering SSBNs to execute countervalue missions in a post attack environment. Countervalue missions could be preplanned, there was no need for them to be executed promptly, nor was their any particular need for them to be executed simultaneously or in coordinated fashion. In technical terms, post attack SSBN communications needed only to have narrow band, one way circuits with a high probability of eventual as opposed to immediate connectivity.

For reasons having to do with their counterforce orientation and with their very different means of surviving attack, land based forces were also served by communication links that were not

---

[58]. Blair, Strategic Command and Control, pp. 198-201.

optimized for post attack communication, but this was due to their overwhelming operational emphasis on immediately launching on warning or on confirmation of attack. Thus, these land line and terrestrial radio communication circuits were also based on one way, narrow band links with similar functional capabilities to the Navy's peacetime VLF broadcast, i.e. continuous wide area connectivity with little emphasis on survivability.[59] As with the SSBNs, the Air Force also deployed radio relay aircraft as a more survivable backup to the terrestrial systems described above. Organized into the Post Attack Command and Control System (PACCS), they like TACAMO offered a more survivable means of eventually engaging in one way, narrow band communications with surviving land based forces which remained within range of their transmissions.

Coincident with the concerns about ICBM vulnerability and counterforce capabilities that gathered momentum during the 1970s, were concerns about both force and command system vulnerabilties and the risk of accidental or inadvertent escalation. These concerns identified both new threats to and new demands on command

---

[59]. The difference of course was that the Air Force was able to use a variety of such systems in redundant fashion. In the late 1970s, there were terrestrial LF, HF, and land line links connecting forces to higher authority. Land lines provided a means of communication not available to deployed SSBNs, but like the other terrestrial systems, were also highly vulnerable.

system performance. Planners demanded survivable command systems which would allow the NCA to avoid the choice between immediate and eventual use. They also demanded that these command systems be capable of ordering and controlling responses tailored to the attack. At the same time, survivable command system design became complicated by the emergence or recognition of new threats to their performance. Aside from the well understood problem of making transmitters and receivers survivable in the face of direct attack, communication circuits needed to be protected against indirect nuclear effects, enemy jamming, and, in the case of stealthy systems like SSBNs and MX/MPS, detection and location by radio direction finding systems. Thus, two way wide band links with deployed forces needed to be made immune to jamming, EMP, ionospheric blackout and scintillation, and interception. These new capabilities were needed in order to allow command systems to retarget forces after an attack, in the absence of pre-planning, with good time on target control, and with good responsiveness and reliability.

The key difference between ICBMs and SSBNs under this new set of command system requirements lay in the degree to which the existing airborne communication relays could meet these demands. Airborne relays could serve each force equally well when the demand

was for a survivable means of sending one way, narrow band communications to deployed forces without compromising their survivability.[60] The problem lay in the need for survivable, two way communication with mobile platforms. Such links could be established with land based forces more easily than with sea based forces when the circuits were formed using existing airborne relays.[61] Land based forces were more concentrated in their deployment patterns and closer to the location of the NCA. Circuits linking these elements could operate over shorter distances than those linking more widely dispersed and distant SSBNs to the NCA. Because they could operate over shorter distances, these circuits could use radio frequencies that did not compromise the location of the deployed land based forces in the

---

[60]. Owen Cote, "The Trident and the Triad: Collecting the D-5 Dividend," *International Security*, Vol. 16, No. 2 (Fall 1991) p. 137.

[61]. Just because these links were easier to establish does not mean that they were in fact implemented. For years, the Air Force had a program to establish two way UHF links between Airborne LCCs and actual Minuteman silos, as opposed to ground based LCCs. This program was always described as near deployment during the late 1970s and early 1980s. See Anon. "Minuteman Upgrades Hinge on Funding," *Aviation Week & Space Technology*, June 16, 1980, pp. 172-173. The program was never funded, making two way, post attack communication with surviving missile silos impossible unless ground LCCs also survived intact. Carter, Managing Nuclear Operations, p. 578.

same way that other longer range frequencies might compromise the location of deployed SSBNs. For similar reasons, these circuits were therefore harder to jam. Because they could generally use line-of-sight links, they were also relatively immune to blackout and scintillation effects in the ionosphere. Thus, the command system planned for the MX/MPS system included a medium frequency (MF) circuit linking an airborne command post with buried antennae at MX shelters for post attack two way communication.[62]

A similar system using airborne relays like TACAMO could not be designed for deployed SSBNs. Two way circuits between deployed SSBNs and TACAMO needed to span thousands rather than tens of miles. At such distances, the relevant radio frequencies could not be made immune to long range detection and location.[63] Other command system needs not directly related to communications with deployed forces presented similar problems. To return to the case of MX/MPS, two way links between airborne launch control center and command post aircraft separated by several thousand miles were difficult to establish and maintain in a post attack environment, as were communications to support warning assessment and decision

---

62. MX Missile Basing, pp. 52-55.

63. In the late 1970s, these circuits employed UHF SatCom and HF. "An Unclassified Version of a Classified Report," p. 38.

making conferences between the NCA and the various nuclear CINCs. The key to meeting these demands for survivable, covert, two way communication over long distances lay in satellite communications using extremely high frequencies (EHF SATCOM).[64]

Regardless of frequency, a single satellite could support communications between platforms without regard to their distance from each other as long as they remained within the same hemisphere. Thus satellite communications had always been attractive for long range communication. By exploiting the EHF band of the radio spectrum, satellite communications could also provide in one package the other command system requirements described above. Their wide bandwidths allowed high jam resistance and low detectability, their high frequencies eliminated vulnerabilities to blackout and scintillation effects, and their small wavelength allowed for small terminals deployable on essentially any platform.

SSPO and the SSBN operational community were wary of any scheme involving two way communication with deployed SSBNs.[65] Faced

---

[64]. Kurt Gottfried and Bruce Blair (eds), Crisis Stability and Nuclear War (New York: Oxford University Press, 1988) pp. 102-103.

[65] I am particularly indebted to Admiral William J. Holland, Jr. USN (RET) for his perspective on this point from an

with the clear need to deploy more survivable one way communications with deployed SSBNs, they also preferred a new hardened terrestrial ELF communication system over a modernized airborne VLF system. ELF radio would allow SSBNs to remain deeply submerged while receiving a continuous broadcast, albeit at very low data rates.[66] Unlike EHF SATCOM, such a system represented an evolution and improvement on existing SSBN command system capabilities, rather than a radical shift toward new capabilities designed to support new missions. Nevertheless, EHF SATCOM development attracted powerful support among civilian executives in OSD, in the DOD labs, and within other branches of the Navy.

The strongest and earliest interest in EHF SATCOM grew out of ongoing research, development, and prototyping activities involving satellite communications at MIT's Lincoln Laboratory. Lincoln Lab had been intimately involved in DOD's earlier development of SHF and UHF satellite communication systems. The SHF Defense Satellite

---

operator's view. Private communication to the author.

[66]. Throughout the 1970s, the Navy pursued ELF at the expense of modernizing its TACAMO fleet. Even when it became clear that ELF could not be made survivable, the Navy still pushed for its development for peacetime purposes. The same vigor in refurbishing the TACAMO fleet was lacking, even though it continued to provide the most reliable means of post attack communication. "An Unclassified Version of a Classified Report," pp. 8-10.

Communication System (DSCS) provided wide band point to point links similar to those provided on a commercial basis by INTELSAT. DSCS was useful for long range trunk communications and could provide some resistance to jamming, blackout, and scintillation. The main drawback of SATCOMs in the SHF band was their requirement for large, sophisticated, and expensive earth terminals. These terminals, with antennae 30 to 60 feet in diameter, were too expensive to deploy in large numbers and were too large to deploy on platforms which depended for their survivability on mobility or stealth. The UHF Fleet Satellite Communications (FLTSATCOM) System was designed from the outset to provide narrow band, low data rate communications to a large number of small, mobile platforms. On the other hand, UHF SATCOM systems were vulnerable to scintillation and blackout, and their low gain antennas made them vulnerable to detection and jamming. Despite their drawbacks, COMSATs at these frequencies provided greatly superior capability to the long haul HF nets which they replaced. As DSCS and FLTSATCOM were deployed during the 1960s and 70s respectively, attention turned to different bands of the electromagnetic spectrum for new capabilities.

Lincoln Lab's interest in EHF derived from the potential this band offered of combining the advantages of SHF and UHF while

eliminating their respective drawbacks.[67] EHF SATCOM could provide bandwidth superior to SHF SATCOM with earth terminals that could be deployed on as wide a range of platforms as those supporting UHF SATCOM. Lincoln Lab sought and received support from DOD for the development and deployment of a pair of experimental EHF satellites (LES 8 & 9). Launched in 1976, communication links using LES 8 & 9 were tested and proven. These links allowed essentially unjammable communication between widely dispersed mobile platforms deploying small antennas whose transmissions were undetectable unless the intercept receiver happened to be in the narrow path formed by the highly collimated uplink beam linking the transmitting platform and the satellite. Because of their extremely high frequencies, these transmissions were also much less vulnerable to blackout and scintillation effects in the ionosphere caused by high altitude nuclear bursts. The successful program of LES 8 & 9 tests led to a DOD decision to pursue an operational EHF SATCOM system. This decision provoked an intense debate over how

---

[67]. Lincoln Lab also had an interest in new frequencies as an opportunity to continue its tradition of prototyping new satellite communication technologies prior to their transfer to industry. Lincoln Lab's original interest in EHF lay in its potential to provide very high jam resistance to satellites supporting small, mobile platforms. Other operational attributes were discovered or developed later. Interviews by author with Lincoln Lab personnel.

best to deploy EHF SATCOM so as to provide near term capabilities while also ensuring against longer term threats.

The debate pitted advocates of EHF SATCOM against each other over the best means of deployment, and was influenced by congressional concerns over past problems in DOD's military satellite communications programs.[68] On one side, the Air Force proposed a Survivable Satellite System (SSS) which exploited deep space orbits to maximize the survivability of individual satellites to as yet undeveloped Soviet ASAT systems. The SSS would be dedicated to supporting nuclear forces and would constitute the addition of a third DOD satellite system beyond the already existing DSCS and FLTSAT systems.[69] An alternative was proposed by civilians in OSD and on the Defense Science Board whereby EHF transponders would be piggybacked on existing military satellites, much as the Air Force's ongoing UHF AFSATCOM system was piggybacked on FLTSATCOM and SDS satellites. In particular, this proposal

---

[68] See Strategic Command, Control, and Communications: Alternative Approaches For Modernization (Washington D.C.: Congressional Budget Office, October 1981) pp. 26-29.

[69]. The key aspect of the Air Force's position on SSS was the need for deep space orbits to protect against exotic ASAT measures, including space mines. These orbits essentially precluded a role for SSS in support of other communication needs, thus eliminating the possibility for a more versatile satellite not solely dedicated to the nuclear command mission.

focussed on the option of deploying EHF packages on NAVSTAR satellites supporting the Global Positioning System (GPS) which, when fully deployed, would provide a birdcage constellation of 18-24 medium altitude satellites providing global coverage.[70] This system would also be resistant to ASAT countermeasures, although the individual satellites making up the system might themselves be somewhat more vulnerable than SSS satellites.[71] The Naval Electronics Command (NAVLEX) tended to support the OSD position. The OSD position was also supported in Congress by committee staffers who opposed an entirely new satellite program like SSS due to the problems encountered with the intial development and deployment of DSCS and FLTSATCOM.[72]

---

[70]. These transponders, their capabilities, and the option for deploying them on a subset of the NAVSTAR constellation are described in "GPS Secondary Payloads Executive Summary Report," Rockwell International Space Systems Group, June 1980. I am indebted to Ashton Carter for providing me a copy of this document.

[71]. For a discussion of the vulnerability of different orbital constellations to ASATs, see Ashton Carter, "Satellites and Anti-Satellites," *International Security*, Vol. 10, No. 4 (Spring 1986) pp. 46-98.

[72]. The DSCS program was plagued by launch failures and a warehouse fire which destroyed several satellites. The FLTSATCOM program encountered serious technical problems and was considerably delayed. DOD resorted to the stopgap measure of leasing space on commercial satellites provided by Hughes as a "Gapfiller" until FLTSATS were ready. This precedent boomeranged

Despite these controversies, EHF SATCOM seemed destined to move ahead with dispatch. Furthermore, despite the reticence of SPO and the SSBN operational community about two way communications with deployed SSBNs, other powerful actors discovered and promoted the potential that EHF SATCOM had of providing these and other links in covert fashion. Communications to and from submarines had played an important part of the successful LES 8 & 9 testing program and would be an important operational capability provided by any follow on EHF SATCOM program, even if that program were delayed somewhat and designed primarily for utilization by other forces.[73]

The Political and Technical Obstacles Facing Land Based Modernization Programs.

The origins of Trident II lay in the politics of negotiating SALT I. The origins of technologies capable of transforming Trident II

---

in that Congress has questioned ever since the need for dedicated military satellites. SSS came along at the peak of these concerns in the late 1970s.

[73]. By the late 1970s, the Navy had an official program called Clarinet Omen designed to provide EHF SATCOM to SSBNs by the mid 1980s. "An Unclassified Version of a Classified Report," p. 38.

into a counterforce system with improved communications over previous SLBM systems derived from the efforts of powerful actors outside of SPO and the SSBN operational community. The MX ICBM and the B-1 bomber had different origins. Pressure to develop and deploy a new ICBM and a new manned bomber had emanated from the relevant communities within the Air Force throughout the 1960s. These pressures had been suppressed by McNamara. Furthermore, these pressures were not sufficient to convince civilians in the White House and OSD to support such programs during the negotiation of SALT I. Only when the political imperatives of ratifying SALT I in the senate came to dominate White House and OSD agendas did these programs appear as line items in the defense budget, and then only as advanced rather than full scale development programs. This initially lukewarm civilian support for MX and B-1 within the executive branch of government was counterbalanced by the total support for these programs shown by the Air Force once they were begun.

Despite this intraservice support, each program suffered from fundamental vulnerabilities in the larger political process throughout their development. Technical and political uncertainties plagued any scheme for developing a survivable basing mode for MX ICBMs when thay faced a large, accurate MIRV'd Soviet

ICBM force. Technical uncertainties also plagued any scheme for developing a penetrating bomber that needed to operate against Soviet surface and air defenses using radars exploiting doppler signal processing.[74] These challenges facing MX and B-1 were exacerbated by the existence of alternatives which seemed to better address the challenges presented by modern Soviet forces.

One set of alternatives substituted other means of modernizing the ICBM and Bomber legs of the triad. Thus, many proponents of ICBM modernization opposed MX because it was too large for truly mobile basing. Out of these concerns came calls for a smaller, road mobile, single warhead missile that would be easier to make survivable.[75] Likewise, many proponents of modernizing the bomber force advocated an aggressive air launched cruise missile (ALCM) program rather than the B-1. ALCMs would preserve the

---

[74] Doppler signal processing uses the relative motion between a tracking radar and a fast moving aircraft to separate the latter from ground clutter. It is the basic technical response to the kind of low level penetration tactics adopted by SAC in the early 1960s. Doppler radars deployed on large Airborne Warning and Control System (AWACS) aircraft and on new interceptors revolutionized U.S. air defense capabilities in the 1970s. Therefore, new manned bomber programs in the United States had to contend with the prospect of similar defenses in the Soviet Union.

[75]. This option was finally pursued after the Scowcroft Commission recommended the development of a small, single warhead, road mobile SICBM.

effectiveness of the B-52 force by allowing standoff delivery of many small, accurate, and hard to detect weapons. Further along in the late 1970s, other bomber modernization advocates called for the development of a new manned bomber designed from the outset to exploit emerging technologies that radically lowered radar cross sections.[76] These alternatives made the MX and the B-1 controversial even among advocates of ICBM and Bomber modernization programs.[77]

Another alternative was to eschew one or both modernization efforts altogether. Advocates of this approach began from the premise that SSBNs would remain competely survivable in the presence of any conceivable future Soviet countermeasures, while the survivability of ICBMs and air breathing weapons would increasingly depend on tactical warning or the continuation and expansion of the existing SALT process. Thus, many opponents of the second major cold war strategic modernization program called

---

76. The range of bomber modernization options and the sources of their political support are described in Michael Brown, Flying Blind: The Politics of the U.S. Strategic Bomber Program (Ithaca, N.Y: Cornell University Press, 1992) pp. 275-280. See also, Nick Kotz, Wild Blue Yonder: Money, Politics, and the B-1 Bomber (New York, N.Y.: Pantheon, 1988) pp. 200-218.

77 For the intraservice politics of bomber modernization in the Air Force prior to the 1980 election, see Ben Rich, *Skunk Works* (Boston: Little Brown, 1994) pp. 302-313.

instead for a "dyad" or even a "monad" of strategic forces which would be centered upon a modernized SSBN/SLBM force.[78] Thus, once the Trident SSBN entered full scale development in the early 1970s, the Trident II SLBM became the only strategic modernization program of the late 1970s with essentially unanimous support by OSD civilians, by the service responsible for its development, and in Congress.[79] The Air Force programs described above met substantial resistance in all or at least one of these sectors of the political arena.

The civilian and intraservice support for Trident II, combined with the controversy sourrounding new ICBMs and air breathing weapons, made the interservice politics of Trident II look even more attractive than the interservice politics of Polaris had appeared twenty years before. Trident was likely to provide even better survivability than its predecessors, while proponents of the MX and B-1 programs had a difficult time showing similar progress

---

[78] For one of the earliest discussions of some of these arguments, see Jack Ruina, "The Triad and U.S. Strategic Policy," in Kosta Tsipis, Anne Cahn, and Bernard Feld (eds) The Future of the Sea-Based Deterrent (Cambridge, MA.: M.I.T. University Press, 1973) pp. 28-32.

[79]. Some isolated cases of opposition to Trident II could be found in Congress. See Thomas Downey, "Against Trident II," *New York Times*, July 13, 1982, p. C1.

compared to the Minuteman and the B-52. At the same time, the traditional advantages in counterforce and command and control capabilities normally enjoyed by ICBMs and Bombers were threatened by emerging technologies in missile guidance, test range instrumentation, and EHF SATCOM that enjoyed the support of powerful actors external to the Navy's Fleet Ballistic Missile development and operational communities. The integration of these new guidance and communication technologies with a new more survivable SSBN could produce a system that met all the demands of national policy makers without any of the vast expense of continued land based strategic nuclear modernization. By making the case for such a sea based modernization program, civilian and naval advocates could also argue that the defense monies therby saved could be reinvested in other important DOD programs concerned with the balance of general purpose forces on land and at sea. This constellation of civilian and service interests had led to the implementation of Flexible Response in the early 1960s, and the same constellation of interests could have used Trident II as the centerpiece of an effort to reinvigorate Flexible Response beginning in the late 1970s.

The Politics of Modernizing the Triad Between 1976 and 1983.

With the election of the Carter administration in 1976, the Trident SSBN and Trident I SLBM remained the only strategic nuclear systems under full scale development. These programs did not address the modernization demands generated by the emerging window of vulnerability. The B-1, MX, and Trident II remained in various stages of advanced development. Decisions about which of these programs to continue into full scale development needed to be made. The Carter administration chose to cancel the B-1, delay the Trident II, and accelerate the MX.

The B-1 was cancelled because of doubts about its long term ability to penetrate Soviet defenses. Instead, the Carter administration ordered full scale development of ALCMs to preserve the effectiveness of the B-52 force. Research into stealthy aircraft was also begun at this time, with the prospect of the eventual development of a stealth bomber to replace the B-52. This decision was bitterly opposed by the Air Force, even though it did still call for an extensive modernization program of the air breathing leg of the triad.

The Carter administration's rationale for delaying Trident II and accelerating MX had two components. First, the MX missile itself was perceived to be further along its advanced development

cycle than was Trident II.[80] Second, and more importantly, the technology of survivable ICBM basing was argued to be more managable than the technologies of accurate SLBMs and advanced SSBN communications.[81] For both reasons, civilians in OSD argued, MX provided a more timely and less risky means of closing the window of vulnerability. The acceleration of MX led to the choice of the MPS system as its basing mode. Simple in concept, MPS' expense and huge appetite for land created new problems. In the years between 1976 and 1980, MPS encountered a steadily rising coalition of opposing interests. This opposition prevented approval for MX's full scale development and its IOC slipped with each passing year.

---

[80]. In one case, this reflected not any difference in the pace of authorized funding for the two systems, but a difference in the basic attitude towards the need for counterforce on the part of the Air Force and the Navy. When Congress refused to authorize development funds for improved ballistic missile accuracy in the late 1960s, the Navy stopped development of stellar-inertial guidance. The Air Force, which was than in the initial stages of developing the Advanced Inertial Reference Sphere (AIRS) guidance system that was eventually used for MX, chose to continue development of this system as a means of measuring test range performance more accurately. Thus, AIRS became the Missile Position Measurement System (MPMS) and funding continued. AIRS first flew as a monitor onboard a Minuteman in 1976. At that point, the Navy's IAP was underway but the first results did not come in until 1978. On AIRS and MPMS, see Mackenzie, Inventing Accuracy, pp. 223-224.

[81]. *FY80 DOD Annual Report*, p. 118

These problems led the Carter Administration in 1979 to attempt to delink funding for the MX missile and its basing mode in recognition of the fact that the latter was in serious trouble.[82] This strategy was not successful, and MX remained in limbo when the Reagan adminstration took office. Throughout this period, the Carter administration, and later the Reagan administration, chose at several crucial points not to accelerate development of the Trident II as a hedge against MX's possible failure.

The first crucial point in Trident II's non-development, as it were, came in 1979 when the Carter administration chose to seek full scale development funding for MX without an agreed basing mode. Here was a significant and very obvious warning indicator that MX's basing mode was a serious problem. Until this point, the diameter of the MX had not been defined. The choices were between 92" (the maximum diameter that could fit in existing Minuteman silos) and 83" (the maximum diameter that could fit in Trident SSBN launch tubes). A number of important advisers, including Secretaries Brown and Perry, supported the 83" missile because it would be compatible with an accelerated D-5 program that could serve as insurance against MX's failure. This option was opposed

---

[82]. John Edwards, <u>Superweapon: The Making of MX</u> (New York: W.W. Norton & Co., 1982) p. 170.

by both the Air Force ballistic missile office and by SPO. The then leaders of these two organizations called in their more illustrious predecessors, General Phillips and Admiral Smith, to review the proposal for a common 83" missile. Admiral Smith agreed with his Air Force counterpart that such a program would not save money while introducing technical complexity. Admiral Smith took this position, with the support of the current leaders of SPO, despite the fact that it would lead to a delay in D-5 development.[83]

The second crucial point came in 1981 at the beginning of the Reagan administration. The incoming administration cancelled the MPS basing mode, causing Congress to withhold funding for the missile. The Townes commission was appointed to recommend a new basing mode. Agreement on such a basing mode proved impossible and the commission recommended instead that the administration accelerate D-5 as an equally capable alternative pending eventual resolution of the MX basing issue.[84] The administration chose instead to accelerate development of the B-1 and B-2 bombers, leaving D-5 in advanced development for two more years. Only in 1983, after the Scowcroft commission convinced Congress to fund MX

[83]. Ibid., pp. 161, 201-202.

[84]. Ibid., pp. 234-235.

without a new basing mode, did the Reagan administration allow D-5 to enter full scale development.[85]

Below the surface of these political battles, component level development programs necessary to MX and Trident II moved ahead at varying rates. A prototype of MX's guidance system was first tested on a Minuteman in 1976 and its development continued throughout the late 1970s. The Navy's IAP also continued during the 1970s. By the end of the 1970s, the hitherto unknown sources of error in existing SLBMs had been determined and measured and development programs for eliminating them begun. In anticipation of the Threshhold Test Ban Treaty, the weapons labs had already designed and tested at full yield several modern heavy warheads compatible with either the MX or the Trident II.[86] On the other hand, EHF SATCOM continued in the political limbo created by the Air Force's support for a dedicated satellite system and DOD's desire for a distributed set of transponders on NAVSTAR navigation satellites and other already existing DOD satellite systems. This debate remained unresolved throughout the late 1970s, despite the successful completion of the LES 8 & 9 test program.

---

85. Ibid., pp. 244, 249.

86. Spinardi, From Polaris to Trident, p. 152, fn. 50.

The Scowcroft compromise called for an interim deployment of 100 MX missiles in existing Minuteman silos. Thus, it abandoned the search for an ICBM basing mode which survived attack independently and in the absence of warning. Instead it called for two new development programs concerned with longer term ICBM modernization. Continued study of MX basing with better survivability characteristics was one program, while the new single warhead, road mobile Small ICBM (SICBM or Midgetman) was another. In addition, the Commission also recommended the rapid development of an accurate Trident II and of those communication systems with particular relevance to SSBN communications, including EHF SATCOM.[87]

During the same year, DOD reached a compromise with Congress over the future of EHF SATCOM. First, in return for a new dedicated military satellite system, DOD abandoned the deep space orbits of SSS and chose more traditional geosynchronous orbits. Second, this new satellite, called MILSTAR, would combine EHF and UHF circuits, making it compatible with the large body of existing AFSATCOM and FLTSATCOM users. MILSTAR was extremely ambitious technologically, and was scheduled for IOC in the late 1980s. It was organized as a joint program managed for the other services by

---

87. "The Scowcroft Commission," pp. 10-11, 15-20.

the Air Force.[88]

The resolution of the MX basing issue released production money for interim silo deployment beginning in 1986. Once this decision was made, Trident II finally entered full scale development in 1983 with a scheduled IOC in 1989 on the ninth Trident SSBN. The decision to commence full scale development of MILSTAR led to a further decision to deploy interim EHF transponders on two FLTSATCOM satellites beginning in 1986. Managed by the Navy, the Fleet EHF Program (FEP) would allow advanced testing of MILSTAR terminals and provide an early operational EHF SATCOM capability.[89] For all intents and purposes, the FEP was the program that OSD, the Defense Science Board, and NAVLEX had advocated during the Carter administration as a precursor to a dedicated system like MILSTAR. The politics of getting approval for MILSTAR kept FEP in the background until the mid 1980s, much as the politics of getting approval for MX kept Trident II back.

Even after the Scowcroft Commission, the Reagan strategic

---

[88]. "Strategic Command, Control, and Communications," *CBO*, p. 29.

[89]. W. Ward and F. Floyd, "Thirty Years of Research and Development," *The Lincoln Laboratory Journal*, pp. 27-30.

modernization program remained plagued by controversy and technical problems. The Air Force chose a rail mobile basing mode that depended upon strategic warning for survival as the long term solution to the MX basing problem. Congress rejected this approach and limited MX silo deployments to 50 missiles pending a better alternative. At the same time, Congress was a strong supporter of the SICBM program, while the Air Force resisted it as a competitor of MX. Thus, both prongs of the Scowcroft Commission's recommended ICBM modernization program foundered at the outset.[90]

Independent of these problems with the ICBM modernization program, the Air Force's bomber programs also encountered opposition after a strong start in the early years of the Reagan administration. The B-1 began deployment in 1986 with major flaws in the defensive avionics systems without which it could not reliably penetrate Soviet air defenses. Soon after, the B-2 emerged from its status as a classified development program with a unit cost so large that strong opposition formed in the path of its continuation even before problems with its performance were

---

[90]. On the continuing travails of the Reagan strategic modernization effort, see "Policy Focus: The ICBM Land-Basing Controversy," *International Security*, Vol. 12, No. 2 (Fall 1987) pp. 152-202; and Cindy Williams, "Strategic Spending Choices," *International Security*, Vol. 13, No. 4 (Spring 1989) pp. 25-35.

discovered during initial testing. Furthermore, neither of these bomber programs provided the capabilities necessary to close the window of vulnerability as it had been defined at the outset of the second strategic modernization program.[91]

The Scowcroft Commission's rationale for recommending interim MX deployment in silos rather than solely relying upon Trident II was different from the earlier Carter administration decision to accelerate MX/MPS at the expense of Trident II. In both cases, presumed advantages in accuracy and in communications capability were cited in favor of ICBM modernization. In the first case, these alleged advantages were often described as inherent to the ICBM force. In the second case, these advantages of the ICBM force were considered to be more temporary, and were accompanied by an admission that there were intrinsic vulnerabilities to attack associated with politically feasible ICBM basing modes. The Commission anticipated that Trident II would combine survivability and endurance in the absence of tactical warning with accuracy and reliable communications. The argument for deploying MX was that Trident II would not be available until 1989, and MX provided

---

[91]. From 1976 onward, the Window of Vulnerability was defined as being a result of asymmetries in survivable prompt counterforce capabilities only available from large modern ICBMs like the SS-18, SS-19, and MX.

interim counterforce capabilities to cover the period between 1986 and 1989.[92] Of course, the 1989 IOC for Trident II was itself a function of how long its full scale development had been delayed. If it had entered full scale development at the end of the Carter administration, something approaching a 1986 IOC could have been achieved.[93] As we have seen, this decision was made because decision makers were still professing concern about allegedly inherent uncertainties regarding SLBM accuracy and SSBN communications. Somehow, between 1979 and 1983, these concerns evaporated.

The level of technical risk associated with counterforce SLBMs and improved SSBN communications proved quite low, once programs to develop these capabilities were put in place in 1983. After entering full scale development, Trident II rapidly crystallized into the counterforce system it was always capable of becoming. A

---

92. "The Scowcroft Commission Report," pp. 14,16.

93. In April 1978, then SSPO director Admiral Wertheim testified, "Well, obviously if we were provided with the funds we could start (Trident II) development tomorrow...I don't think there are any laws of nature that would prevent us from starting immediately." *SASC FY 79*, p. 6700. The next year Assistant Secretary of Defense William Perry testified that only a year separated the IOC of MX and Trident II and that, if anything, the latter option posed more of a counterforce threat than the former one. *SASC FY 80*, pp. 1426-1434.

heavy high yield warhead design was taken off the shelf by OSD and SPO was directed to use it on Trident II. An accuracy requirement for Trident II was established that was twice as good as the accuracy level of Trident I after the results of the IAP had been backfitted in the early 1980s, and four times as good as the original accuracy requirement of both Poseidon and Trident I when they were first deployed. This requirement for Trident II was essentially the same as the CEPs achieved during the MX test program.[94] Minimal hardware changes to the Trident II's navigation, fire control, and guidance systems were necessary to meet this goal and it was achieved without the peacetime reliability problems that were experienced by the MX's AIRS guidance system.[95] Finally, EHF SATCOM proved eminently feasible once a decision was finally made to move beyond the LES 8 & 9 experiments. Though the MILSTAR program encountered serious technical difficulty and its IOC slipped well into the 1990s, the Navy's FEP program successfully deployed operational EHF transponders on FLTSATCOMs 7 & 8 in 1986 and 1989 respectively, and the Navy EHF terminal buying program

---

[94]. For the relevant CEPs, see Mackenzie, Inventing Accuracy, pp. 428-429.

[95]. "A Review of Major Strategic Weapon Systems," *HASC and GAO*, pp. 29-115.

surged ahead of the Army and the Air Force.[96]

The political drive to eliminate these technical risks, once the decision to do so was made, was also powerful. Despite continued reticence about improved accuracy, large yield warheads, and two way communications on the part of SSPO and the SSBN operational community, other actors in OSD and OPNAV overwhelmed this underlying opposition to doctrinal change after 1983 and brought programs to rapid fruition which had been languishing on the shelf for years. The change in the politics of Trident II was particularly marked in the area of warhead choice and in the EHF SATCOM program.

From the late 1970s onward, SSPO had presented Trident II options. These options contained high accuracy, high yield payloads but these were not emphasized at the expense of more traditional options which sought to hold the payload and accuracy of the C-4 constant over extended ranges. This doctrinal proclivity dated at least to the period when Poseidon's capabilities were defined in the mid 1960s. With Poseidon, SSPO also faced pressure to improve accuracy and yield. As describe above, SSPO avoided high yield warheads by promising greatly

[96]. *SASC FY 85*, pp. 2506, 2510.

improved accuracy using stellar-inertial guidance. Once the heavy warheads were killed in this fashion, the accuracy goals were relaxed to allow retention of the existing all-inertial guidance system. This political bait and switch by SSPO allowed it to defuse the demands of civilians in OSD and naval officers in OPNAV for a counterforce system equal or superior to the Air Force's ICBM force.[97] The opposite dynamic occurred with Trident II, once it was cleared for full scale development. Initially, Trident II had a slightly lower accuracy requirement than MX. OSD civilians and officers in OPNAV used this as an excuse to argue for a larger warhead for deployment on Trident II, so as to equalize its counterforce capabilities with MX.[98] They won this argument, which was actually an argument about how to use a scarce stockpile of U-

---

97. Greenwood, Making the MIRV, pp. 70-71; Mackenzie, Inventing Accuracy, pp. 264-270; and Spinardi, From Polaris to Trident, pp. 95-101.

98. Here the Air Force's "CEP optimism" and SSPO's conservatism produced the opposite outcome intended by those seeking to maximize the perceived counterforce advantages of the MX versus Trident II. On the Air Force's optimism about CEPs and its origins in a desire to look better than the Navy, see Mackenzie, *Inventing Accuracy*, pp 367-368. On the pressure from OSD civilians and OPNAV for the larger yield W-88 warhead, the author has benefited by discussions with Ted Postol. See also Spinardi, *From Polaris to Trident*, pp. 151-154.

235 useful for boosting weapon yields via substitution for U-238.[99] Once the 475 kiloton W-88 program for D-5 was secure, these same actors put pressure on SSPO to raise D-5's accuracy requirement to a level equal to MX's.[100] This improvement was based on the greater than expected performance of the C-4 in a series of tests in 1982 which showed it to be twice as accurate as its original specification, and as accurate as the Air Force's Minuteman III.[101] Thus, in the short space of time between 1979 and 1983, the politics of improved accuracy for Trident II shifted drastically. Once the future of the MX was assured, decision makers suddenly became interested in making Trident II as competitive as possible with the ICBM force. A similar, if less noted process transformed the politics of EHF SATCOM for SSBN communications.

The Navy as a whole had a strong interest in EHF SATCOM

---

99. U-235, when substituted for U-238 in the blanket or "pusher" sourrounding the secondary of a thermonuclear weapon, adds approximately 50% to the resulting yield. Hansen, U.S. Nuclear Weapons, p. 24.

100. One casualty of this pressure was the original 6000 mile requirement for Trident II. OSD civilians drove SSPO to accept an accuracy requirement so close to MX's that SSPO could only guarantee that accuracy over the same 4000 mile range of the C-4. Spinardi, From Polaris to Trident, p. 158, n. 78.

101. *SASC FY 83*, p. 4025 and William Arkin, "Sleight of Hand with Trident II," *Bulletin of the Atomic Scientists*, December 1984, pp. 5-6.

because it added jam resistance and covertness to the attributes already provided by the UHF FLTSATCOM system.[102] The SSBN operational community was not the dominant source of this interest due to their traditional focus on peacetime communications for which EHF SATCOM was not necessary.[103] Nevertheless, an EHF program for SSBNs called Clarinet Omen was begun in the late 1970s. In the aftermath of the successful LES 8&9 test program, the Navy aligned with DOD in favor of a near term EHF program using small transponder packages deployed on existing satellites. As was described above, the Air Force opposed this approach and sought instead a dedicated satellite system. This debate continued throughout the late 1970s and Congress refused to appropriate any money to support EHF SATCOM as long as it remained unresolved. Finally, two years into the Reagan administration, the MILSTAR system was proposed as a compromise and Congress approved its full scale development. As soon as MILSTAR was approved, the Navy won approval for its Fleet EHF Program (FEP). FEP involved the development and deployment of EHF transponder packages on existing

---

[102]. Clyde Bell and Robert Conley, Navy Communications Overview," *IEEE Transactions on Communications*, COM-28 (September 1980) pp. 1573-1579.

[103]. EHF SATCOM ranked third in priority after the ELF and TACAMO modernization programs. *SASC FY 82*, pp. 4094-4095.

FLTSATCOM satellites and was described as a component of the overall MILSTAR program. Prior to the deployment of the very sophisticated MILSTAR satellites in the late 1980s (1994 as it turned out), FEP packages would be deployed beginning in 1986 to allow terminal testing. In all but name, the FEP was the original Navy/DOD proposal for a near term EHF system, delayed some six years because of the threat it posed to the Air Force's MILSTAR program. During those years, Navy EHF advocates stayed out of the debate over MILSTAR.[104] Once that debate was resolved this reticence evaporated. Despite its original depiction as an experimental program for testing MILSTAR terminals, the Navy's FEP will continue with transponders also being deployed on the next generation UHF Follow On (UFO) satellites.[105]

At least from the time that the Trident SSBN entered full scale development after SALT I, a clear option existed to shift the Navy's FBM program away from its sole preoccupation with optimizing

---

[104]. As described above, the priorities of the SSBN operational community was ELF and TACAMO. The larger Navy C2 technical community, mostly centered around NAVALEX, withdrew from the EHF SATCOM debate once DOD decided to abandon a distributed transponder system in favor of what became MILSTAR.

[105]. *SASC FY 91*, pp. 146, 152-153. The first FEP package was launched in early 1995 on UFO 4. See "Science/Scope," *Aviation Week & Space Technology*, June 5, 1995, p. 20.

SLBMs for countervalue missions and SSBN communications for the maximization of stealth in peacetime. This shift did not preclude in any way the performance of the traditional mission. Accurate Trident II SLBMs were developed to be compatible both with the new heavy W-88 warhead and a larger number of the lighter Trident I warheads.[106] Likewise, the existence of a two way EHF SATCOM capability did not mandate the constant peacetime use of that system if such use might compromise the location of the deployed SSBN. Its prime value came in the post attack environent when the threat of radio direction finding was already greatly reduced. Particularly after 1976, the delay in putting in place the programs necessary to cause this shift had little to do with technical risks. Compared to the risks attendant upon MX basing, Trident II should have appeared as an attractive alternative. Likewise, these delays did not occur for want of sources of political power external to SSPO and the SSBN operational community that were in favor of them. As the cases of the W-88 and the FEP show, these patrons did exist and were successful in promoting their agenda in the early 1980s once the opportunity presented itself.

Trident II was not pushed by the Navy with the same vigor that

---

[106]. Trident II can deploy as many as 12 of the lighter W-76 warheads designed for the C-4.

Polaris was for several reasons. Unlike Polaris, a Trident II SLBM of some sort or another became all but inevitable with the decision to go ahead with the Trident SSBN. From SPO's perspective, improved accuracy and SSBN communications were not the key to gaining acceptance for Trident II. An effort to push these capabilities and identify their combination with Trident II as the solution to the window of vulnerability would have led to pressures to accelerate its development and to a public confrontation with the Air Force if MX suffered as a result. This outcome would have increased both the technical and political risks of what would otherwise be a deliberate and uncontroversial development program.

SPO's reluctance to push Trident II as an alternative to MX could have been overruled by the senior leadership of the Navy. It was not because the other branches of the Navy had little or no interest in challenging SPO's preferred development strategy. They also feared the kind of public confrontation that a Trident II - MX battle would have caused. Here, the concern was not so much with the fate of Trident II as it was with the fate of the general purpose submarine, surface, and air modernization programs then being sought by the Navy's main platform sponsors. Just as the concept of the triad served the bureaucratic purpose of making peace among advocates of ICBM, Bomber, and SLBM modernization,

Flexible Response had served the larger bureaucratic purpose of helping to keep the peace among the services. Interservice peace - or collusion - made it very difficult for civilian executives to use divide and conquer tactics where one service was used as an ally to kill or reorient another service's programs. Successful collusion allowed the services to negotiate mutually acceptable shares of the budget in which their most important programs had first funding priority, and to present a united front in defense of those programs as the minimum essential air, ground, and naval forces necessary to meeting the demands of Flexible Response. Such a united front minimized the leverage of civilian executives and avoided the fratricidal effects of overt interservice role and mission battles.

SPO's technical and political caution and the Navy's aversion to a general role and mission fight with the Air Force explain the reticence towards Trident II of these two actors during the period 1976-1983. Throughout this period, advocates of ICBM and Bomber modernization claimed unique advantages for these systems compared to SLBMs. They argued that SLBMs could never provide the accuracy or the communications capabilities provided by land based forces. Even when land based forces clearly suffered from other compensating vulnerabilities that SLBMs were immune to, the Air

Force successfully argued that accuracy and communications advantages justified programs like the B-1 and MX. Neither SPO nor the Navy challenged these claims during the period when the future of these Air Force modernization programs were pending within DOD and before Congress. Once their future had been resolved in the early 1980s, Trident II entered full scale development. Only at this point did SPO and the Navy commit to providing an SLBM with MX-like counterforce capabilities that combined high accuracy with high yield warheads. During this same period, the debate over EHF SATCOM finally was resolved in favor of the Air Force's desire for a new satellite system which became MILSTAR. Once this decision was made, the Navy was able to justify its FEP program which provided an initial operational capability at this frequency in 1986 after a much delayed start.

Aggressive Air Force efforts to portray SLBMs as lacking in important capabilities were also not challenged by civilian executives in OSD. During both the Carter and Reagan administrations, civilians in OSD focussed on finding ways to justify, not replace or find competition for MX. These justifications often echoed Air Force arguments about the uniqueness of the ICBM force's advantages in accuracy and communications. The at least tacit agreement by OSD civilians with

this line of argument is hard to explain since these same civilians were, in many cases, instrumental in supporting the technology development programs in the FBM program which made these Air Force arguments entirely obsolete. Both the Improved Accuracy Program and the EHF SatCom program required a substantial degree of OSD support and intervention in order to get started, and they were protected by OSD until completion. Nevertheless, OSD civilians supported and funded these programs while simultaneously arguing for MX in ways that implied that these programs would not succeed. Once MX's full scale development was secure, these same civilians then rapidly shifted gears and ensured the development of a counterforce Trident II with greatly improved communications.

SSPO's technical and political caution, the larger Navy's reluctance to get into a messy role and mission fight with the Air Force, the Air Force's overwhelming commitment to new ICBMs and new Bombers, and OSD's overwhelming desire for an ICBM solution to the Window of Vulnerability all explain the curious case of Trident II's delayed and stunted development. The interservice log rolling that led the Navy as a whole to cede preeminence in defining the terms of the modernization program to the Air Force was the decisive factor.

SSPO's technical and political caution dated from the post

Polaris period of the mid-1960s when it lost priority status within the Navy's budget. From that point onward, SSPO perceived that it would be judged like other programs on the basis of meeting cost, schedule, and performance goals and it naturally became more conservative in setting those goals. This loss of status also reduced SSPO's independence and made it less able to resist external pressure. When necessary, either from the Navy's or from OSD's point of view, SSPO could be overruled. Trident II's development after 1983 provides excellent examples of intraservice and civilian interventions designed to overcome SSPO's innate conservatism. At other points earlier in the story, particularly in the case of the Trident SSBN design, SSPO's desires were overwhelmed by a combination of intraservice and civilian pressure. Thus, SSPO's understandable caution on Trident II is not a sufficient explanation for the delay in its development between 1976 and 1983.

But if the decisive explanation is that the services cooperated during this period to protect MX from Trident II, with either tacit or explicit civilian approval, than one needs a more basic explanation of the sources of interservice cooperation and competition. After all, the services competed quite vigorously with each other in the late 1950s despite open and sustained

civilian efforts to stop that competition. Given the vastly different outcomes in the two cases, and given that the difference covaries with the presence and absence of open interservice conflict, the next and last chapter will explore the sources of these different patterns of interservice relations.

CHAPTER 6: Conclusions

> "The consequent erratic and changable patterns of personnel administration found expression in France through heated debates over tactics. Rival groupings of officers embraced rival doctrines, and used those doctrines as tools in their struggle for places in the military hierarchy. But claim and counter claim could be settled only by experimental field maneuvers or by test firings and the like. Debate, fueled by clique rivalries for promotion, therefore, had the remarkable effect in France of opening the door on systematic testing of new material (especially field artillery) and tactics. Under these pressures, the fixity of Old Regime military practices had begun to crumble even before the French Revolution came along to accelerate and magnify what rivalry among professionals had already begun."[1]

Presidents, prime ministers, and premiers lead states that wish to survive under conditions of anarchy in the international security environment. The internal tools that contribute to national security take the form of a series of functionally specialized, semi-autonomous, bureaucratic organizations. Thus, there are both system level and domestic pressures constraining the freedom with which national leaders can pursue security for their states. In one direction, the systemic pressures created by the urge for national security under conditions of international anarchy often drive leaders to mobilize and manipulate the internal organs of

---

[1] William McNeill, *The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000* (Chicago: University of Chicago Press, 1982) p. 160.

state power. In the other direction, the bureaucracies that comprise the organs of state power seek to impose their habits of operation or doctrines on their bureaucratic neighbors and on the larger international security environment. Rather than allow external, systemic pressures to bear down on them and cause them to change, these organizations seek autonomy and the accompanying ability to insulate themselves from pressures for change. The battle between these two opposing influences on state behavior in the international security environment is joined at or near the apex of national power where presidents, prime ministers, and premiers live and operate.

Theories of International Relations

Different theories of international relations predict different outcomes of such battles over who and what shall determine state behavior. In Waltz's Third Image of international politics, the system level pressures defeat the domestic pressures:

> "If security is something the state wants, then this desire, together with the conditions [of anarchy] in which all states exist, imposes certain requirements on a foreign policy that pretends to be rational. The requirements are *imposed* by an automatic sanction: Departure from the rational model imperils the survival

of the state."[2]

In this model, national leaders, driven by systemic pressures, manipulate the tools of state power in order to maintain the balance of power that produces national security in the anarchical international state system.

In contrast to system level theories where states respond to external pressure and act to balance power, organization theories explain state behavior as the result of autonomous organizational outputs or bureaucratic political compromises. In Model II of Allison's theory of international politics, "Governmental behavior can...be understood...less as deliberate choices and more as *outputs* of large organizations functioning according to standard patterns of behavior."[3] In Model III:

> "The Governmental (or Bureaucratic) Politics Model sees no unitary actor but rather many actors as players - players who focus not on a single strategic issue but on many diverse intra-national problems as well; players who act in terms of no consistent set of strategic objectives but rather according to various conceptions of national, organizational, and personal goals; players who make governmental decisions not by a single, rational choice

---

[2] Kenneth Waltz, *Man, the State and War: A Theoretical Analysis* (New York: Columbia University Press, 1959) p. 201.

[3] Graham Allison, *Essence of Decision: Explaining the Cuban Missile Crisis* (Boston: Little, Brown and Co., 1971) p. 67.

but by the pulling and hauling that is politics."[4]

Models II and III differ from each other in some important respects but are united in their rejection of Waltz's Third Image (and Allison's Model 1). Organizational and bureaucratic politics are alike in the degree to which they substitute an internal, domestic engine for state behavior for an external, systemic one. In Allison's world, states are not acting to create or preserve an international balance of power as much as the domestic components of state power are acting to preserve their autonomy within the state. In this world, the power of national leaders to manipulate the organs of state power is constrained by the autonomy of bureaucratic organizations.

Theory and the Sources of Innovative Military Doctrine

In *The Sources of Military Doctrine*, Barry Posen developed a system level theory of the sources of innovative military doctrine. In *Winning the Next War*, Stephen Rosen developed a domestic level theory of the sources of innovative military doctrine. In Posen's theory, innovative military doctrines result when external systemic

---

[4] *Ibid.*, p. 144.

pressures are retransmitted by civilian leaders onto military organizations.[5] In the "audits" of military doctrine which result, these doctrines are often found wanting and civilians sometimes then intervene to change them. This can result in innovation and the re-integration of military doctrine with the demands of the external, system level pressures facing the state. Though not by any means perfect, Posen argues that this image of system level pressures causing national leaders to audit and change military doctrines explains state behavior more often than not, and especially during periods of crisis. Thus, Posen explicitly places his theory of the sources of military doctrine in the tradition of Waltz's Third Image of international politics.

Rosen's theory of the sources of military doctrine is very different. It argues that modern professional military organizations are largely successful in maintaining their immunity to civilian interventions in the details of their doctrine.[6] In this, Rosen's theory falls explicitly in the tradition of American

---

[5] See, for example, Barry Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Ithaca, N.Y.: Cornell University Press, 1984) p. 234.

[6] Stephen Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca, N.Y.: Cornell University Press, 1991) p. 256.

civil-military relations described by Samuel Huntington, in which professional military organizations gain autonomy from civilian intervention in purely military matters by refusing to take sides in civilian domestic political disputes.[7] It also implicitly reinforces the Allisonian Model II image of state behavior as autonomous organizational output.

On the other hand, unlike most organizational theorists, Rosen develops a theory in which there are domestic sources of innovative military doctrine internal to military organizations themselves. The different branches of those military organizations engage in intraservice conflict, and out of the pulling and hauling of that conflict can emerge innovative new doctrines.[8] Thus, even though military organizations are autonomous, they still innovate because their internal structure is bureaucratically complex enough to allow Allisonian Model III political dynamics to unfold over time. Thus, though the theoretical link is not explicit, Rosen develops a theory of the sources of military doctrine that partakes of domestic, organizational and bureaucratic political explanations of

---

[7] Samuel Huntington, *The Soldier and the State: The Theory and Politics of Civil-Military Relations* (Cambridge, MA.: Harvard University Press, 1957) pp. 80-85.

[8] *Ibid.*, pp. 19-22.

international politics.

Posen and Rosen clash in their explanations of the sources of military doctrine. Most importantly, they clash in their assessments of the degree to which the rate and scope of change in military doctrine is a manipulable variable. In Posen's theory, civilians have the power to cause radical, innovative change in military doctrine. In Rosen's theory, they do not. In fact, using Hobbes' definition of power as "the capacity to produce an intended effect,"[9] no single actor possesses the power to cause innovative military doctrine according to Rosen. Rather, innovation is, to use Allisonian language, a "political resultant," the product of the bureaucratic political pulling and hauling of distinct groups leading to outcomes which no one individual or group intended.[10]

This debate over the causes of innovative military doctrine falls within the larger frame of debate between Waltz and Allison on the nature of international politics. In this thesis, I develop a third theory of the sources of innovative military doctrine using interservice conflict and cooperation as the independent, causal variable. I hypothesize that interservice conflict should cause

---

[9] As cited in Waltz, *Man, the State and War*, p. 205.

[10] Allison, *Essence of Decision*, p. 145.

radically innovative military doctrine via the same bureaucratic political dynamics that occur when intraservice conflict occurs. On the other hand, because interservice competition occurs under more anarchical conditions than does intraservice competition, I hypothesize that it can cause change more quickly than intraservice conflict. Here, in its effects, it more closely resembles the kind of organizational innovation predicted by Posen when civilian intervention occurs.

My theory attributing independent causal significance to interservice competition as a source of innovative military doctrine also needs to be situated in the debate between systemic and domestic theories of international politics. As in any situation in which a group of actors need to divide their labor and allocate a reasonably fixed set of resources among themselves, there is an incentive structure which determines whether they will do this in competitive or cooperative fashion. Likewise, in the Defense Departments or Ministries of Defense of a modern state, there is an incentive structure which structures relations between the separate military services of that state. Did national leaders in the United States during the Cold War control this incentive structure or were interservice relations as immune to external manipulation as intraservice relations? This is the main question

I address in this chapter.

Theory and the Sources of Interservice Conflict and Cooperation

The late 1950s saw a high degree of interservice competition. By the early 1960s, this competition began to be replaced by a guarded cooperation which, from the mid-1960s onward, was institutionalized. This shift from competition to cooperation was caused by changes in three areas: in the means of determining and the methods of justifying overall levels of defense spending; in the methods used to allocate defense budget shares amongst the three services; and in both the content and the means of disseminating defense policy guidance. In each of these three areas, either the President or his senior civilian appointees in OSD are in control. These civilian leaders determine defense policies and their means of dissemination, they determine overall levels of defense spending, and they determine the methods that will be used to allocate individual service budget shares.

As I will show below, choices made or not made in these three areas by civilian leaders have largely determined the nature of interservice relations. The services have not chosen to compete or cooperate as much as they have been driven to these two extremes by

changing incentive structures largely out of their control. On the other hand, civilian control over the incentives that determine whether the services compete or cooperate has not always translated into intentional manipulation of these incentives in order to produce the desired pattern of interservice relations. In particular, civilians have not intentionally caused interservice conflict. Such conflict was an apparently inadvertent byproduct of Eisenhower's management style. Under McNamara, who did plan on exploiting such conflict, a new management style was introduced which drove the services toward cooperation. Only with Laird and his successors have civilians intentionally and successfully caused a specific pattern of interservice relations, and this has consistently been a cooperative rather than a competitive one.

In a more speculative vein, I will present some hypotheses as to why civilians have encouraged interservice cooperation rather than competition since the 1960s. Civilians in OSD have encouraged interservice cooperation because they believed that interservice competition would undermine their control over defense policy both within the executive branch and in executive-congressional relations. Civilians in OSD have had to struggle for control over defense policy since the late 1960s because Presidents have neither supported them with strong policy guidance like Eisenhower did, nor

empowered them with strong delegated executive authority in the way Kennedy did for McNamara. Thus, just as the services cooperate with each other to maximize their collective influence, OSD and the services cooperate in order to maximize the power of DOD in an often fractious interagency defense policy environment and before Congress. This cooperation encourages stagnant rather than innovative military doctrine, but it limits the ability of external actors to intervene in DOD affairs, eliminating or reducing the salience of political conflicts over defense policy.

The bureaucratic circumstances which encouraged civilians in OSD to cooperate with the military were created by Presidents, just as Presidents enabled or caused the civil-military conflict of the 1960s and the interservice conflict of the 1950s. Presidents did not, in causing these different patterns of interservice relations, evince any understanding of how they, in turn, caused innovative or stagnant military doctrine. Eisenhower caused interservice conflict but then belatedly sought to suppress it, giving it no credit for the innovative doctrine which it produced. McNamara's OSD anticipated exploiting interservice conflict even as it implemented a new system of civil-military relations which systematically suppressed that conflict and eliminated a major source of doctrinal innovation. Secretaries of Defense since

McNamara have intentionally sustained bureaucratic conditions that institutionalize interservice cooperation and, unlike their predecessors, they seem to have been aware of the dampening effect on doctrinal innovation resulting from this management regime. This management style resulted from an international security environment that placed less emphasis on narrow military concerns, and increasingly included diplomatic and arms control issues. This lessening of the salience of military policies seems, paradoxically, to have increased the collective influence of the military in determining those policies.

This concluding chapter has four sections. First, I summarize the effects of interservice competition and cooperation in the cases discussed in chapters four and five. Then, I outline the management styles adopted by civilian leaders in the White House and in the Defense Department during the Cold War. Then, I show how these different management styles inadvertently or intentionally caused different patterns of interservice relations. Finally, I summarize the results of my comparison of the three theories of military doctrinal innovation and relate those results to the larger debate between Waltzian and Allisonian theories of state behavior.

The Effects of Interservice Competition and Cooperation

A military service develops doctrine primarily to help organize itself for war, but doctrine also plays a role in prosecuting peacetime battles over budgets, roles, and missions. Doctrine can be used as a weapon in such peacetime battles, and it can also be used as a means of defusing such battles. When viewed through this domestic political lense, some doctrines appear defensive in that they are designed to carve out an independent, operational niche to justify a service's current position. Other doctrines appear more offensive in that they seek to change the status quo, often by attacking another service's doctrine and seeking to expropriate its budget and its mission. Thus, doctrines can be said to be competitive or complementary in their relationships to one another.

Polaris, Poseidon, Trident I, and Trident II are all specific, technical manifestations of the U.S. Navy's nuclear doctrine as it evolved during the Cold War. More importantly, they are manifestations of political strategies adopted by the Navy to protect the forces and the doctrine that it really cares about, the more traditional fleets of submarines, ships, and aircraft needed to destroy opposing naval forces and project power ashore, thereby gaining and exploiting command of the seas in true Mahanian

fashion. Throughout the Cold War, the Navy perceived many threats to this traditional naval doctrine. Navy nuclear doctrine underwent several changes corresponding to the Navy's perception of these threats. For the most part, the Navy took an active interest in its nuclear doctrine when that doctrine could play a role in protecting its general purpose forces from attack. When those general purpose forces were not under attack, or when nuclear doctrine had no role in protecting them, the Navy lost interest in nuclear doctrine. During the Cold War, the Navy percieved threats to its core doctrine on three axes: from civilian executives, from within its own branches or platform communities, and from the other services.

Civilian leaders did not always see the value of a traditional Navy in a struggle with a continental power that did not need the sea and that was essentially invulnerable to conventional attack from the sea. Thus, civilians in OSD and elsewhere in the Executive and in Congress sometimes challenged aspects of the Navy's core doctrine for its general purpose forces. Likewise, younger generations of submariners, aviators, and surface warfare officers did not always see the value of traditional naval platforms organized into naval task forces of traditional structure in the pursuit of traditional missions. Thus, new ways of fighting

and new kinds of ships, submarines, and aircraft were sometimes proposed from within the service. In short, there were a number of civil-military and intraservice conflicts during the Cold War over traditional naval doctrine, and the Navy as a whole developed strategies to deal with these conflicts. For the most part, these conflicts did not drive the Navy to change or manipulate its nuclear doctrine as a component of a larger strategy designed to protect its core, general purpose doctrine. The Navy's nuclear doctrine was largely irrelevant to the resolution of these civil-military and intraservice battles.

On the other hand, Navy nuclear doctrine was quite relevant to the prosecution and resolution of interservice disputes, particularly those between the Navy and the Air Force. Furthermore, the Navy perceived these interservice disputes as the most serious of all the threats posed to its core doctrine. From 1944 to 1964, interservice battles over budgets, roles, and missions between the Navy and the Air Force were the source of the most serious threats to traditional Navy doctrine. After 1964 and onward into the first years of the post Cold War era, the avoidance of such interservice battles with the Air Force has been the preeminent tactic used by the Navy to protect its traditional doctrine. Thus, when Navy nuclear forces like Trident II had the

potential for reigniting such interservice conflict, the Navy acted to prevent that outcome.

When the Navy felt seriously threatened by Air Force attempts to use doctrines of strategic bombing or of strategic nuclear bombing as a weapon in battles for budgets, roles, and missions, it fought back. It developed forces and doctrines for their use which were designed to discredit Air Force doctrine, undermine the case for new Air Force weapons, and strengthen the case for new Navy weapons. Polaris and the new nuclear doctrine of Finite Deterrence were both caused by and were the cause of such an interservice battle in the late 1950s. Polaris and Finite Deterrence were successful enough to, in turn, threaten the Air Force. Minuteman and the Air Force's adoption of the RAND Corporation's counterforce doctrine resulted. Thus, by the early 1960s, each service had developed a distinct, innovative alternative to what had been the established nuclear force structure and doctrine of the Eisenhower administration. Obsolete Air Force weapons and the Massive Retaliation doctrine which had justified them would be abandoned. The new Kennedy administration would replace them with cheaper Polaris and Minuteman missiles and a new Flexible Response doctrine that was a complicated amalgam of Navy finite deterrence and RAND counterforce doctrines. More importantly, the new administration

would shift the money saved on nuclear forces into conventional, general purpose forces including, among other items, Navy submarines, ships, and aircraft.[11]

After 1964, open conflict between the services was suppressed. Potentially tendentious budget, role, and mission disputes would now be resolved by the services in private. Instead of offering choices and alternatives to civilian leaders, the services would now unite and broker among themselves a single, unanimous position on any particular issue that would be presented to OSD and the White House by the JCS Chairman. Once this became the established way of doing business, each service gained the support of the other services for its core programs. In return, each service agreed to negotiate with the other services any changes to the brokered budgetary, role, and mission environment that might threaten another service's core programs. No longer would the services be each other's own worst enemies. This new environment changed the

---

[11] In constant 1996 dollars, defense spending rose between 1960 and 1964 from $275 to $295 billion, but spending on strategic forces declined from $73 to $59 billion. This overall decline in strategic nuclear spending occurred even as the Navy component of that spending grew with the massive initial Polaris deployments. During the same period, the Army's budget grew from $63 to $74 billion, the Navy's budget grew from $80 to $86 billion, and the Air Force's budget fell from $121 to $118 billion. These numbers are derived from tables cited above in Chapter 5, note 38.

Navy's attitude toward the successors to Polaris.

In return for Air Force support or, at an absolute minimum, lack of opposition to new carrier, submarine, and surface ship construction, the Navy stopped using its Fleet Ballistic Missile program as a hammer to nail competing Air Force Bomber and ICBM programs. Thus, Poseidon and Trident I were designed in ways that prevented them from threatening the Air Force's dominance of the nuclear counterforce mission, a core mission for the Air Force and a peripheral one for the Navy. For the Navy, this was a very small price to pay for the elimination of the greatest potential threat to its core mission and doctrine - i.e. the always latent possibility of a rerun of the B-36-Supercarrier controversy of the late 1940s.

The Navy continued this tactic into the 1970s and 1980s even as the Air Force began a major and very expensive strategic nuclear modernization program. The slow pace of Trident II's development stemmed from the Navy's desire to keep it from undermining the case for new Air Force systems like MX, the B-1, Midgetman, and the B-2. In return, there was no Air Force opposition to the Navy's plans for a 600 ship Navy. The preservation of interservice cooperation also suppressed any possibility that the Navy would adopt a new, alternative nuclear doctrine that exploited Trident II's unique

capability to combine the survivability and withholdability of the existing SSBN force with the counterforce and C2 capabilities normally associated with Bombers and ICBMs. Finally, the preservation of interservice cooperation also suppressed any pressures on the Air Force to make its new Bomber and ICBM programs match the capabilities of Trident II, and to fashion new doctrine that eliminated the existing land based force structure's total dependence upon tactical warning for survival.

Thus, in the late 1950s, first the Navy and then the Air Force developed radically innovative nuclear delivery systems and nuclear doctrines for their use and used them as weapons in a larger interservice battle over budgets, roles, and missions. Each service was trying to put the other service, or a considerable part of it, out of business and nuclear doctrines played a key role in these battles. The Air Force sought to justify its nuclear doctrine as an alternative to the outmoded conventional land and sea doctrines of the Army and the Navy. This nuclear doctrine, whether one called it massive retaliation, counterforce, or no cities, would deter conventional and nuclear wars and eliminate the need for traditional land armies and naval fleets. The Navy responded with a nuclear doctrine that deterred only nuclear war and that did so very cheaply with survivable fleet ballistic

missiles. Vulnerable land based nuclear forces could be discarded and the money saved could be spent building up the conventional forces needed to deter conventional wars. In this way, each service used nuclear doctrine as a means to justify and pay for the expansion of its core programs at the expense of the other service. In the process, radically innovative nuclear forces and doctrines were developed.

After 1964, the Navy and the Air Force continued to use nuclear doctrine as a means of justifying or protecting their core programs, but during this latter period the doctrines were complementary rather than competitive. The Air Force interpreted flexible response as requiring massive second strike nuclear counterforce capabilities that could be provided by new manned Bombers and ICBMs. The Navy interpreted flexible response to require global, conventional power projection capabilities. Neither service disputed the other's interpretation of Flexible Response, and neither service developed programs that were competitive with the other's core programs. Thus, the Air Force refrained from developing the conventional power projection capabilities of its bomber force, and the Navy refrained from developing the always latent counterforce capabilities of its fleet ballistic missiles. By giving up a little in areas that were not

important to it, each service gained a lot in areas that were. Both services became much more secure and each service's nuclear doctrine became stagnant as a result.

Civilian Defense Management Styles during the Cold War

Interservice competition produced a revolution in the survivability of U.S. nuclear forces in the late 1950s. Interservice cooperation suppressed such a revolution in the late 1970s and early 1980s. Given the explanatory power of different patterns of interservice relations, one needs to understand their sources. Why was there intense interservice competition in the late 1950s, and why did such competition all but disappear from the public arena in the years that followed? Or to put it in more specific terms, why in the late 1950s did the Navy feel driven to develop Polaris at the expense of Air Force nuclear programs, while in the late 1970s and early 1980s it felt the need to avoid threatening Air Force nuclear programs as it developed Trident II? The answer to these question begins with different civilian management styles, particularly with regard to the process for allocating budget shares to the individual services.

Early Polaris supporters, along with later advocates of more

competition with the Air Force for the nuclear mission, explicitly or implicitly believed in what has been called "the variable budget theory," while their opponents during both periods acted according to the "fixed budget theory." An important naval participant in these decisions described these two budget theories as follows:

> "The (fixed budget theory) holds that the total Defense budget for a year is more or less fixed in advance at the highest levels of government and that the Defense Department then divides this amount up among the Services according to some predetermined and relatively constant proportion...The (variable budget) theory holds that each service makes up its own budget, based on its own image of its operational requirements, and submits this to the Secretary of Defense who then approves or disapproves programs according to his own criteria."[12]

Clearly, these two theories predict different types of service behavior. If the allocation of budget shares to the three services is not fixed, new programs need not come at the expense of existing ones within a single service's budget. Instead, they can come at the expense of another service's programs. Under such circumstances, the potential for interservice conflict should be high. Likewise, when service budget shares are or appear fixed,

---

[12]. Capt. Dominic Paolucci USN (RET), "The Development of Navy Strategic Offensive and Defensive Systems," *U.S. Naval Institute Proceedings*, Vol. 96, No. 5/807 (May 1970) pp. 205-223.

new programs do come at the expense of other programs within a single service's budget. When, these conditions apply, the services should have little to argue about concerning each other's budgets.

Since the early 1960s, peacetime service budget shares have been both fixed and reasonably equal.[13] In other words, the Army, the Air Force, and the Navy each generally receive about 30% of the budget, regardless of the overall size of the budget.[14] This three way split has even been continued reasonably intact into the post Cold War security environment. With only minor exceptions, this has also been a period of interservice peace. Each service has been happy to cooperate with its counterparts in sacraficing some freedom to engage in budget politics for the sake of maintaining a united front towards the DOD and Congress.[15] Thus, when role and

---

[13]. In wartime, the Army's budget share grows at the expense of the other services. For Cold War trends in service budget shares, see Kevin Lewis, *The U.S. Air Force Budget and Posture Over Time*, R-3807 (Santa Monica: Rand Corporation, 1989).

[14]. In practice, the Army's share is usually a little less than the other two services', and a larger and larger poportion of the overall budget is taken up with non-service expenditures.

[15]. Robert Komer described this cooperatio as the result of the JCS' self imposed "rule of unanimity." See Robert Komer, "Strategymaking in the Pentagon," in Robert Art, Vincent Davis, and Samuel Huntington (eds), *Reorganizing America's Defense: Leadership in War and Peace* (McLean, VA.: Pergamon-Brassey's,

mission disputes arise, they are settled by the services behind closed doors. The long term stability of this political compromise among the services, along with the high turnover and great variety among civilian executives responsible for managing the services, might suggest that the initiative for different patterns of interservice relations lies with the services themselves. A review of the different patterns of civil-military relations during the period in question suggests instead that, whether they realize it or not, Presidents and Secretaries of Defense control the incentives that determine whether the services compete or cooperate.

Defense Budgeting during the Eisenhower Years.

Eisenhower's style of defense budgeting had three elements. First, he established each year an overall defense budget ceiling by the "remainder method." The Bureau of the Budget estimated government revenues, subtracted non-discretionary government expenses, and gave the defense department the remainder. Eisenhower imposed annual budget ceilings on DOD to maintain a balanced overall

---

1985) p. 213.

federal budget. This approach to defense budgeting ran in direct opposition to democratic pressures to plan for "years of maximum danger" in the near term and build up to meet the demands of such imagined threats. Eisenhower believed that elevated levels of deficit spending would ruin the economy, and it was primarily for economic reasons that he continued to justify his defense budget ceilings.

Second, in addition to a budget ceiling, Eisenhower also created and maintained written policy guidance providing planners information regarding the span of U.S. interests, and the military means available to protect those interests under various poitical circumstances. This written guidance took the form of NSC papers, written and periodically updated by that body with assistance from the elevant agencies. The first such policy statement was NSC 162/2.[16] This policy statement was, at points, quite decisive. For example,in it and in all its successors was a sentence that read, "In the event of hostilities, the United States will consider nuclear weapons to be as available for use as other munitions" in

---

[16]. See, "A Report to the National Security Council by the Executive Secretary on Basic National Security Policy, October 30, 1953," as reproduced in Marc Tractenberg (ed), *The Development of American Strategic Thought: Basic Documents from the Eisenhower and Kennedy Periods, Including the Basic National Security Papers from 1953 to 1959* (New York: Garland, 1988).

a war with the communist bloc.[17] Here, clearly stated, was the essence of Eisenhower's policy of Massive Retaliation.

Third, with a budget ceiling and policy guidance firmly in place, Eisenhower adopted an extremely laissez-faire attitude about how the services chose to invest their funds as long as they could agree on a unified program.[18] Thus, if the overall budget was 30 billion dollars, and if the services agreed on a three way split of 10 illion each, that was the end of the annual defense budgeting process. When such service aggreements were not forthcoming, Eisenhower sought to remain aloof from their resolution by depending first on his Defense Secretaries as interservice arbiters. Only when such intermediate arbitration failed would annual defense budget issues find their way into the oval office. When such issues did find their way to the oval office, they came in the guise of controversial and expensive programs, strongly opposed by one or two services and strongly supported by the others, whose fate the JCS transferred from their own

---

[17] *Ibid.*, p. 60

[18]. Kennedy's Secretary of Defense Robert McNamara explicitly contrasted his activist management style with Eisenhower's more passive style. For a discussion of their decentralized and centralized management styles, see Wiliam Kaufmann, The McNamara Strategy (New York, N.Y.: Harper & Row Publishers, 1964) pp. 168-173.

responsibility into the President's hands for a decision.

Defense Budgeting during the McNamara Years.

Nearly everything about the Kennedy Administration's defense policy was fashioned, at least for public consumption, in explicit contradiction to what had transpired during the Eisenhower administration. This was especially true of the defense budgeting process, and of the role of the Secretary of Defense in that process. First, McNamara forcefully abandoned overall budget ceilings, declaring instead that defense needs would determine defense investments. Thus, the politics of determining overall defense spending levels migrated out of the White House and into the Defense Department.

Second, Kennedy abandoned many of the formal NSC consultative mechanisms characteristic of the Eisenhower years, including the annual defense policy guidance. McNamara chose explicitly not to replace this formal guidance with any DOD instrument, preferring instead to maintain the flexibility that was perceived to exist in its absence.[19] Those with a need to know administration policy on

---

19. This outcome was ironic in that one of the criticisms of Eisenhower's BNSP was that it was vague. After arguing that

a given issue were instructed to read the public speeches and testimony of the Secretary. There they would find descriptions of a policy called Flexible Response which contained discussions of the threat of limited as well as general war, of the role and design of general purpose as well as nuclear forces, but little in the way of when one form of force would be used as opposed to the other. Where Eisenhower's policy statements left unclear what wars would be fought without nuclear weapons, Kennedy's left doubts about which wars would be fought with nuclear weapons.

Third, having abandoned budget ceilings and formal policy guidance, McNamara introduced and sought to institutionalize analysis performed by OSD as the primary instrument of budgetary control and policy enforcement. McNamara's Planning, Programming, and Budgeting System (PPBS) was designed to intervene deeply in the details of individual service programs, creating, cancelling, or modifying where necessary. Unlike in the Eisenhower years, when programs were reviewed only when they foundered, PPBS' span of control was designed to be total and constant. All programs would be reviewed by OSD civilians, particularly in the new Systems

---

NSC 162/2 and its successors were vague, McNamara and his advisors chose to issue no guidance at all, making their program decisions manifestations of a simple (and potentially endless) search for options. Ibid., pp. 22-27, 87-88.

Analysis (SA) office, every year before their inclusion in the budget. Even if under budget and enjoying unanimous service support, such programs might encounter opposition within SA, which was enough to threaten them with cancellation should the Secretary agree. Likewise, SA also aspired to be an independent source of new and innovative programs that had little chance of making it into service budgets.

Defense Budgeting since McNamara.

Compared to the changes instituted during the transition from Eisenhower to Kennedy, the changes in defense bdgeting since McNamara appear less substantial. First, Presidents and Secretaries of Defense have chosen to continue the Kennedy-McNamara tradition of pretending not to have a defense budget ceiling. Instead, Secretaries of Defense have often been most concerned with protecting a floor below which they argued the nation's security would be threatened. Thus, the politics of determining overall defense spending remained very much a DOD issue, at least for public consumption.

Second, McNamara's successors did institute a more formal, annual DOD defense policy guidance process. On the other hand,

this annual guidance continued to reiterate the same Flexible Response policies originally begun in the early 1960s. Basic questions concerning the likely course of a possible war with the Soviet Union central to the construction of a defense budget often had two very different answers under Flexible Response, depending upon whether the U.S. used nuclear weapons or not. No President or Secretary of Defense ever chose to publicly renounce any of these "options." In this way, the question of how the U.S. would fight remained fluid and subject to multiple interpretation by allies, potential enemies, and internal bureaucratic constituencies.

Third, and most importantly, McNamara's attempt to use SA and PPBS to institutionalize a role for OSD civilians as the final arbiter of individual service programs failed. Here, the post McNamara record is mixed enough that it needs to be discussed in terms of specific Secretaries of Defense. The most important step was taken by Laird[20], who made an explicit deal with the JCS about

---

[20]. Laird was not McNamara's immediate successor but he was the first to make substantial changes in the PPBS system. McNamara's immediate successor, Clark Clifford, had his hands full with Vietnam during his year as Johnson's Secretary of Defense in 1968. References to Laird's "treaty" with the JCS abound. See, Douglas Kinnard, <u>The Secretary of Defense</u> (Lexington, KY.: University of Kentucky Press, 1980) pp. 121-125; Lawrence Korb, <u>The Joint Chiefs of Staff: The First Twenty-Five Years</u> (Bloomigton, IN.: Indiana University Press, 1976) pp. 121-128; and Lawrence

the division of labor between them and OSD. The key to this agreement lay in his promise to significantly reduce the power of SA in exchange for a promise from the individual service chiefs to accept lower budgets without resorting to special pleading for their particular programs at the expense of others on Capital Hill. Instead, they and the Secretary would strive in unison to raise, or reduce the rate of decline in defense spending.

Since Laird, no serious attempt has been made to institutionalize a dominant, interventionary role for OSD civilians in reviewing service programs during the budget process. This did not prevent Schlesinger from taking an activist's role on many issues during his tenure, but it did mean that he and his staff operated in a bargaining mode rather than in an authoritarian one. Schlesinger and his staff were more involved in the details of the defense budget (unlike Laird), but changes were made by cutting "deals" with the military rather than by imposing the results of analysis on them.[21]

Korb, The Fall and Rise of the Pentagon (Westport, CT.: Greenwood Press, 1979) pp. 83-96.

[21]. Of course, a classic example of such a deal involves the establishment of the Navy's Improved Accuracy Program for Trident. See Mackenzie, Inventing Accuracy, pp. 283-285. Another was the "hand shake" deal between Schlesinger and Army Chief of Staff Creighton Abrams after Vietnam that led the Army

During the Carter Administration, there was a partial return of the rule of analysis and of civilian systems analysts in Harold Brown's OSD, but the results of this experiment in McNamara style management did not always go well for its authors. Brown's experience with the B-1 echoed in some respects McNamara's with the B-70, although Brown was forced to put up with far more serious Air Force efforts to undermine his decision than McNamara would ever have tolerated.[22] Both Secretaries cancelled a new Air Force strategic bomber, but McNamara was more successful than Brown in making his decision stick. The B-70 stayed dead because "McNamara determined, not just how much money was spent on the program, but how available funds were allocated; he spent what he wanted, when he wanted, and how he wanted."[23] By contrast, Brown and the Carter Administration embraced a large cruise missile program and then a Stealth bomber program to compensate for their cancellation of the B-1A.[24] On SALT II, Brown's OSD found itself threatened with the

---

to increase the number of its divisions within a constant manpower ceiling. Personal communication to the author by William Kaufmann.

[22]. See Kotz, Wild Blue Yonder, pp. 186-198.

[23] Michael Brown, Flying Blind: The Politics of the U.S. Strategic Bomber Program (Ithaca: Cornell University Press, 1992) p. 242.

[24] *Ibid.*, pp. 268-272.

unanimous and public opposition of the JCS, which often translated into Congressional opposition as well. This led the Carter administration to embrace the MX program as a solution to the Window of Vulnerability, with an eye to the politics of ratifying SALT II in the Senate.[25]

Under Reagan, Weinberger returned the initiative for program review back to the services to a degree that exceeded even Laird's approach. Unlike previous Secretaries, Weinberger demanded nothing in return from the services and perceived his primary role to be fund raising. Weinberger ceded so much autonomy to the individual services even as defense spending skyrocketed that Congress became concerned at the lack of central management in DOD. Since OSD had no desire to introduce more centralization, Congress responded to calls to centralize the JCS instead.[26] Over time, these Goldwater-

---

[25] The politics of both negotiating and ratifying SALT II made unanimous JCS support important, and the Carter administration was excruciatingly aware of the risks it ran by not locking in such support by buying the services off. See Steven Miller, "Politics over Promise: Domestic Impediments to Arms Control," *International Security*, Vol. 8, No. 4, Spring 1984, pp. 81-84. See also, Jimmy Carter, *Keeping Faith* (New York: Bantam Books, 1982) p. 218.

[26] For some lightly veiled criticisms of Weinberger's OSD n this context, see James Schlesinger, "The Office of the Secretary of Defense," p. 265 and David Jones, Edward Meyer, and Thor Hanson, "Comment's on Smith's Proposals," pp. 338-339 in Robert Art, Vincent Davis, and Samuel Huntington (eds), *Reorganizing*

Nichols reforms may gradually succeed in institutionalizing the power of the Chairman of the JCS and his personal staff at the expense both of the services and of OSD.

Thus, in broad terms, there were three relatively distinct styles of defense budgeting and management during the cold war, corresponding to the years when Eisenhower was President, when McNamara was Secretary of Defense, and since Laird was Secretary of Defense. These determined different patterns of interservice relations.

Different Patterns of Interservice Relations during the Cold War

Different civilian management styles led to three distinct patterns of interservice relations, one of which proved relatively short-lived. Thus, the services were generally competitive under Truman and Eisenhower, they were driven to cooperate under McNamara, and they have been encouraged by changes institutionalized by Laird to continue cooperating ever since.

The Sources of Interservice Conflict

America's Defense: Leadership in War and Peace (Washington, D.C.: Pergamon-Brassey's, 1985).

The Eisenhower administration, in documents like NSC 162/2, clearly stated a policy that eschewed fighting limited conventional wars like the recently completed Korean War. If a war was worth fighting, it was worth using nuclear weapons, the prime example here obviously being a war between NATO and the Warsaw Pact. A good example of a war not worth joining was the war between imperial France and Vietnam which reached a peak during the Dien Bien Phu crisis of 1954. This policy clearly favored the Air Force and was a direct rejection of existing Army doctrine. For the Navy, it had ambiguous consequences, generally favoring the newer carrier and submarine branches at the expense of the more traditional surface fleet. Various accounts have noted this characteristic of Massive Retaliation, calling it a one-dimensional or asymmetrical strategy favoring nuclear airpower at the expense of more balanced general purpose forces.[27] Not surprisingly, the Air Force favored and the Army opposed Massive Retaliation.

---

[27]. The classic statement of this view is Maxwell Taylor, *The Uncertain Trumpet* (New York: Harper and Brothers, 1960). For an example of Taylor's attempts to impress this view upon Eisenhower while he was still on active duty, see "Memorandum of a Conference With the President, May 24, 1956," *Foreign Relations of the United States, 1955-1957, Volume XIX, National Security Policy* (Washington DC: U.S. Government Printing Office, 1990) pp. 311-315.

Total service programs could not exceed the overall budget ceiling for DOD established by the Bureau of the Budget, but no sub-ceilings were attached by OSD or any other body to the individual services. The three services routinely presented individual budgets that together exceeded the DOD ceiling. Each year, the total budget ceiling had to be met by pruning individual service programs. Under Eisenhower, OSD civilians generally refrained from initiating this pruning process. Instead, major service programs were put to a vote in the JCS. During the early Eisenhower years, this consistently resulted in a somewhat lopsided budget in which the Air Force received 50%, the Navy 30%, and the Army 20%. The process which produced these results occurred in two stages. First, important Air Force and Navy programs that could be associated in some way with the delivery of nuclear weapons received 2 out of 3 votes in the JCS and were kept in the budget, while other more traditional Army programs were voted down by the same two services. Second, the Army had recourse to a hearing by the Secretary or the President if they were unhappy with their budget, but this rarely did any good since Massive Retaliation was the President's own policy and it had little room for a large Army.

Because the budget ceiling for DOD was fixed, and because it was determined according to non-military criteria, it was hard for

one or all of the services to argue for a higher DOD budget topline. Here Eisenhower stood on firm ground when, as the President, he declared that a balanced budget was vital to the national security. This was fundamentally an economic issue in which the services carried no weight. Democrats in Congress could and did attack Eisenhower for his fiscal conservatism, but professional military officers could hardly argue that their training and expertise prepared them for this debate. In this way, the overall level of defense spending was largely removed as a topic of debate within the executive branch. Instead, the services sought increased funds out of the budgets of their rivals.[28] During Eisenhower's first term, his Massive Retaliation policies, by design, made the Army weak vis a vis the other services because it lacked a prominent nuclear weapons role and the Air Force and the Navy exploited this weakness ruthlessly. During Eisenhower's second term, the ballistic missile revolution created the potential

---

[28] This political dynamic is revealed in a series of memos to the President on the Fy 1958 budget from Secretary of Defense Wilson and Chairman of the Joint Chiefs of Staff Radford. These memos show a budget ceiling in then year dollars of $38 billion, service programs costing $40.25 billion, and various proposals to "re-distribute expenditures between military departments" in order to tailor the service programs to the budget constraint. *Foreign Relations of the United States*, 1955-1957, Volume XIX (Washington, D.C.: U.S. Government Printing Office, 1990) pp. 540-553.

for a further realignment of budget shares amongst the services.[29] Here the Navy, initially lacking a ballistic missile program of its own, feared that its tacit alliance with Massive Retaliation would come to an end and that it, like the Army had earlier, would lose budget share to the Air Force as the latter service's ballistic missile programs consumed a greater and greater portion of the fixed overall budget.[30] In both cases, interservice conflict broke out between autonomous organizations competing on a somewhat uneven playing field for a fixed amount of overall resources.

The Sources of Interservice Collusion.

Just as the services were driven to compete under Eisenhower in order to protect budgets, roles and missions, McNamara's new style of civil-military relations eventually drove the services to

---

[29] For a description of the case for such a realignment, see George Lowe, *The Age of Deterrence* (Boston: Little, Brown and Company, 1964) pp. 167-186.

[30]. This was Admiral Arleigh Burke's view, not shared by his predecessor Admiral Carney who believed that the budget politics of Eisenhower's Massive Retaliation policies would continue to favor the Navy and that a Navy ballistic missile program would threaten that favored position. See Vincent Davis, *The Politics of Innovation: Patterns in Navy Cases*, University of Denver Graduate School of International Studies Monograph Series in World Affairs, Vol. 4, No. 3, 1966-1967, pp. 24-27.

cooperate with each other in pursuit of the same goals. The three elements of this new style of civil-military relations were described above: a "balanced" national strategy; an absence of fiscal budget ceilings; and a new administrative activism in the form of Systems Analysis and the PPBS.

The new Flexible Response strategy, vague as it was, eliminated the political weakness under which the Army had struggled throughout the Eisenhower years. It was now acceptable to do budget planning for conventional as well as nuclear wars. This put the three services on more of a level playing field with respect to their continuing relevance to the nation's security.

The absence of overt budget ceilings changed the politics of defense budgeting by eliminating the powerful presidential leverage gained by Eisenhower when he argued for restraint in defense spending on economic grounds. This tool for restraint was substituted, under Kennedy, by the Keynesian tool of deficit spending which, if anything, favored defense largesse rather than restraint.

Finally, SA and PPBS attempted a fundamental change in the way service budget shares were allocated. Rather than being the outcome of interservice give and take, they would now be the direct outcome of a myriad of individual program decisions made by

civilians concerning the future of various service programs. This last change by McNamara was by far the most important in that it radically changed the nature of civil-military relations in the Defense Department.

The new management style exposed all service programs to close review. No longer would programs be protected by majority or unanimous support within the JCS. Under such a regime, the value of tacit alliances between two services against a third in particular program areas evaporated, since the locus of decision making authority had shifted into OSD. Indeed, McNamara used the existence of such open competition between the services as evidence of the overwhelming need for a centralized authority such as OSD unaffected by parochial service biases. Thus, McNamara practically forced the services into a cooperative relationship by using their competitive behavior as an excuse for denuding them of all programming responsibility.

Faced with this challenge, the services quickly learned to keep their differences to themselves. For example, despite strong Army and Navy opposition to the B-70, those services ceased to testify against that program on Capital Hill as they had under

Eisenhower.[31] In this and in other civil-military battles of the early 1960s, McNamara emerged victorious. These victories and the seemingly all powerful application of civilian analysis to areas of traditional military authority forced the services to band together in an attempt to preserve as much autonomy for themselves as possible.[32] A casualty of this process was the longstanding tendency the services to view interservice politics as a zero sum game. Instead, McNamara, to use a game theoretic analogy, taught the services the solution to the prisoner's dilemma by forcing them to discover the powers of cooperation.

The Sources of Civil-Military Cooperation

Under Eisenhower's seemingly laissez-faire style of management, the services were driven into open competition over defense budget shares but this competition only manifested itself in program areas such as ballistic missile development where there were serious role

---

[31]. Lawrence Korb, "Admiral McDonald," in Robert Love (ed), *The Chiefs of Naval Operations* (Annapolis, MD.: Naval Institute Press, 1980) pp. 325-326.

[32] See Lawrence Korb, "Robert McNamara's Impact on the Budget Strategies of the Joint Chiefs of Staff," *Aerospace Historian*, Vol. 17, No. 4, Winter 1970, pp. 132-136.

and mission issues at stake. The stalemates that resulted could only be resolved by civilian leaders and the services understood that by not agreeing amongst themselves they invited such intervention. Under the circumstances civilians were not criticized for meddling in areas best left to the military. Rather, Eisenhower's management style was criticized for not being interventionary and active enough. McNamara, one of the most forceful of Eisenhower's critics on this score, reversed the division of labor between OSD and the services. Using SA and PPBS, all issues and programs became a subject of civilian concern and the services could no longer assure their autonomy by agreeing amongst themselves.

Initially, McNamara's new management style was hailed as the solution to the major problems that had allegedly been left untended during the Eisenhower years. For some, the new management style would eliminate duplication where service programs overlapped. For others, it would allow OSD civilians to provoke activity and innovation in unexplored technologies promoted by none of the services. These and other claimed advantages of a centralized civilian management role were contrasted with the dangers of allowing interservice conflict to run unabated. The more the services allowed their differences to spill out into the

open, the more these arguments gained strength and the more autonomy was lost to McNamara and SA.[33]

Soon the services began to moderate their public disputes and by 1964, with a new set of service leaders in place in the JCS, a formal agreement was established whereby internal splits within the JCS would not be carried onward by the Chairman for resolution by OSD.[34] Instead, such issues would remain under internal and private consideration by the JCS until they could be resolved in a consensual and unanimous fashion. Over time, this practice greatly increased the political power of the JCS at the expense even of a powerful Defense Secretary like McNamara. By the end of his tenure, he began losing major policy battles with the JCS on issues where the President chose the path supported by unanimous military advice rather than his own Secretary.

The classic policy defeat for McNamara came on the ABM issue at the hands of a JCS that had finally developed a unanimous

---

[33] Colonel Robert Ginsgurgh, "The Challenge to Military Professionalism," *Foreign Affairs*, Vol. 42, No. 2, January 1964, pp. 263-264.

[34]. This occurred with the departure from the JCS of Generals Curtis Lemay and Maxwell Taylor and the arrival of a new Chairman, General Earl Wheeler. See Lawrence Korb, *The Joint Chiefs of Staff: The First Twenty-Five Years* (Bloomington, IN.: Indiana University Press, 1976) pp. 115-116.

position on this issue.[35] In a contemporary analysis of McNamara's plight, Henry Kissinger explained:

> "I feel that Secretary McNamara gained control over procurement and over procurement-type decisions in the Pentagon at the eventual cost of losing control over major policy decisions. He lost control ...[because] he managed to unify the military services in a common dislike of the sort of control he was exercising, so that for the first time the civilians were confronted with unified JCS views on most policy issues."[36]

This gradual migration of power away from McNamara and to the Chiefs provided a powerful lesson for succeeding administrations.

Secretaries of Defense since Laird onward have sustained the bargain originally made by Laird with the JCS. Under this bargain, the services regained a considerable degree of the autonomy lost to McNamara's reforms in return for their unanimous support of the major elements of the Nixon administration's defense policy. Thus, to name one example under Laird, the Air Force finally gained the freedom to invest in a replacement for the B-52 while it and the

---

[35] See Morton Halperin, "The Decision to Deploy the ABM: Bureaucratic and Domestic Politics in the Johnson Administration," *World Politics*, Vol. 25, 1972, pp. 62-95.

[36] Henry Kissinger, "Bureaucracy and Policy Making: The Effect of Insiders and Outsiders on the Policy Process," in *Bureaucracy, Politics, and Strategy*, Security Studies Paper Number 17, University of California, Los Angeles, 1968, p. 7.

other services supported the move to an all volunteer force and to negotiated nuclear arms agreements with the Soviet Union. This consensual management style did not preclude civil-military conflict, it simply constrained the parties to such conflicts by forcing them to keep their disputes internal to the Defense Department. In this regard, Laird consciously institutionalized a consensual and cooperative style of civil-military relations that mirrored and reinforced the cooperative style of interservice relations that had inadvertently developed under McNamara. In order to preserve their declining power against a unified JCS, Secretaries of Defense have had to strike bargains and cooperate rather than confront. In Schlesinger's words, they have been armed only with a "license to persuade."[37]

Initially, under Laird, the rationale behind such appeasement by the Secretary was not hard to see. Compared to McNamara, Laird lacked the uncompromising support of his President. Furthermore, in important areas of concern to the Defense Department, Laird faced formidable competition in the realms of policy formation and implementation in the person of Henry Kissinger. A third challenge to Laird's authority lay in a newly restive and interventionary

---

[37] Schlesinger, "The Office of the Secretary of Defense," p. 261.

Congress that had been galvanized by Vietnam into adopting a uniformly suspicious and often hostile attitude toward defense programs. For these and other reasons, Laird did not possess a high degree of political capital to spend on long, debilitating battles with the services and the JCS over the details of their military programs. He was forced to focus on several vital policy initiatives - the all volunteer force, the Vietnam drawdown, the SALT negotiations - and defer the initiative on all other matters to the services.

Laird's successors have, for the most part, faced a similarly hostile environment. Even Casper Weinberger, arguably the most powerful Cabinet member in the Reagan administration and the most independent Secretary of Defense since McNamara, acted within the Defense Department as if he felt bound by the same need to seek consensus among his military advisors that had so constrained his predecessors. Weinberger's determination not to intervene in the details of service decision making and to support any consensus position emanating from the JCS produced deep frustration in Congress and helped lead to passage of Goldwater-Nichols.[38]

---

[38]. A good example was the total failure of Weinberger's restoration initiative for special operations forces designed in the wake of such disasters as Desert I. See Noel Koch, "Objecting to Reality: The Struggle to Restore U.S. Special

The Inadvertent Sources of Different Patterns of Interservice Relations.

The substantial changes in interservice relations described above were not the result of autonomous decisions by the individual services to compete or cooperate. The services were driven to compete for budget share, roles and missions by Eisenhower's Massive Retaliation policies, by his DOD wide budget ceilings, and by his laissez-faire attitude toward determining individual service budget shares. McNamara eliminated incentives to compete by introducing Flexible Response and by eliminating DOD wide budget ceilings, and introduced an overwhelming incentive to cooperate by abrogating unto himself and his staff the initiative in planning service budgets. Having learned the value of cooperation during the 1960s, the services have refrained from public competition ever since. In this they have been heartily encouraged by their civilian masters in OSD who, from Laird onward, have sought public unanimity by the services in support of their major policy initiatives. In return, civilian leaders delegated budget planning

---

Operations Forces," in Loren Thompson (ed) *Low-Intensity Conflict: The Pattern of Warfare in the Modern World* (Lexington, MA.: Lexington Books, 1989) pp. 51-76.

back to the services, retained inclusive Flexible Response policies, and eschewed the imposition of explicit, DOD-wide budget ceilings.

Even though civilians have historically controlled the incentive structure determining different patterns of interservice relations, the effects of their different policies and budgeting procedures have often been inadvertent. Under Eisenhower, the services were given wide leeway in determining their own budgets within the overall DOD ceilings. Eisenhower chose this decentralized approach as a means of encouraging interservice cooperation. Given the means of collectively determining their own budgets, he believed it would be easier for them to produce a defense program in line with his Massive Retaliation policies that they could unanimously support. Instead, this decentralized approach played a dominant role in spurring the very conflict that Eisenhower had sought to avoid, and his administration was frought with annual interservice battles over the budget that the White House was forced to resolve.[39] Here also, the extent to which Eisenhower's power over the budget was enhanced by his inadvertent divide and conquer tactics went unappreciated at the time, and has

---

[39] See, for example, *Foreign Relations*, 1955-1957, Volume XIX, p. 559.

been largely unnoted since.

These were years characterized by major, often near hysterical political crises over alleged Nuclear Bomber and Missile gaps in capability between the United States and the Soviet Union. These gaps energized the Democratic Party opposition in Congress which sought military confirmation of neglect and budgetary miserliness by the Republican administration. Often, the services chose in their testimony to attack each other's budgets rather than the level of overall defense spending, frustrating Congressional efforts to develop alternative programs and raise the overall level of defense spending. Because the services were always publicly divided, they invited intervention by the White House and rendered congressional intervention relatively impotent. Rather than celebrate this tremendous enhancement of Presidential power, Eisenhower reviled the interservice conflict which was its major cause. During his last term, legislation was passed at his behest granting greater power to the Secretary of Defense. When these powers were finally exploited several years later by McNamara under a new administration, the antidote for interservice conflict was finally discovered, though the consequences of eliminating it were not foreseen.

McNamara used the new powers of his office as a means of

taking the intiative in service budget planning, while abandoning the policy discipline imposed by Eisenhower's budget ceilings and Massive Retaliation policies. During the transition, McNamara and his assistants relished the prospect of using their new powers to generate new military options for the President out of the welter of choices presented by the competing services. They were certain that interservice competition would continue to allow the divide and conquer tactics that Eisenhower had unwillingly exerised during the late 1950s. Again, McNamara and his assistants could not have been more wrong about the effects of their new management style on interservice relations.[40]

Flexible Response gave all three services a major role, either in a major war with the Warsaw Pact, or a more limited war against Soviet proxies in the Third World. The lack of a budget ceiling reduced the intensity of zero-sum budget politics amongst the services. Finally, the presence of a highly interventionary and centralized civilian bureaucracy within OSD eliminated the other services as the chief threat to major programs such as the manned bomber and the aircraft carrier. Well before the end of the first term of the new administration, the major public interservice

---

[40]. Arnold Kantor, Budget Politics: A Budgetary Perspective (Chicago, IL.: University of Chicago Press, 1979) pp. 89-94.

battles of the Eisenhower years had disappeared to be replaced by intense civil-military conflict between OSD and a united JCS. McNamara sought to keep his disagreements with the JCS out of the public eye, but this became increasingly difficult. The White House grew increasingly leery of supporting the Secretary in the face of unanimous and often vocal opposition by the JCS, and Congress roundly criticized McNamara for attempting to suppress that opposition. In strengthening and centralizing his own office and setting out on an aggressive path of change, McNamara forced his opponents to do likewise. In so doing, he taught the JCS how to cooperate and strengthened their position as well.

It is the civilian Secretaries and Administrations since McNamara whose behavior seems least plagued by the kind of inadvertent results characterizing the 1950s and 1960s. Laird, Schlesinger, Brown, and Weinberger all sought to create or preserve a consensus of JCS support behind their policies, and therefore sought to preserve harmonious and cooperative relations amongst the services themselves. They wanted the services to collude because they perceived that vocal interservice conflict would undermine the case for various defense programs and invite intervention by unwanted actors in Congress and the executive branch. Not all of these Secretaries were always willing to pay what it cost to buy

service collusion and unanaimity in support of all their policies, but none of the Secretaries mentioned above was willing to run the risk of unanimous JCS opposition of the type that McNamara generated, nor was it within their power to provoke and exploit the sort of interservice fighting which occurred under Eisenhower. Thus, from McNamara onward, civilian secretaries sought to limit their political liability by reigning in their ambitions and were successful at achieving more limited policy goals while avoiding the pursuit of more grandiose and risky objectives with more unpredictable outcomes.[41]

Theories of Doctrinal Innovation and Patterns of Civil-Military, Intraservice, and Interservice Relations.

This thesis began with a discussion of two theories of the sources of radical innovation in military doctrine. These two theories specified conditions under which certain patterns of intraservice and civil-military relations could produce radical doctrinal innovation. A third theory of the sources of doctrinal innovation

[41] This is the clear subtext of discussions by former secretaries when they discuss their experiences in office. See Schlesinger, "The Office of the Secretary of Defense, " pp. 255-274.

was then introduced for both deductive and inductive reasons which looked at interservice relations as an indepedent variable. Tests of the explanatory power for this new independent variable were constructed and performed. Interservice conflict and competition was shown to be a potent source of doctrinal innovation and interservice collusion and cooperation, a source of doctrinal stagnation. These results held even in cases where the other two theories would both have predicted the opposite outcome. This concluding chapter has looked at how actual administrations of civilian leaders sought to manage the Defense department during the Cold war with an eye to illuminating the effects of these management styles on different patterns of interservice relations.

Clearly, civilian leaders control the incentive structures which determine these patterns. Unfortunately, civilians have often misunderstood the effects of their management behavior, and inadvertence has plagued efforts by various administrations to estabish their preferrred policy making environment. Eisenhower sought interservice consensus and cooperation and provoked competition instead. McNamara anticipated more interservice competition and prepared to exploit it, but was soon met instead by a united front on the part of the individual services. These cases of inadvertence frustrated and sidetracked otherwise powerful

actors in their quest for particular policy making environments.

Later, a different problem emerged. Civilian leaders in OSD perhaps developed a better understanding of the consequences of their behavior, but that behavior became highly constrained as political power drained from OSD into other parts of the executive branch and, more importantly, into Congress. Thus, Secretaries like Laird developed sophisticated understandings of the interservice politics of their every move, but were unable or unwilling to exploit the power of this knowledge due to their fundamental weakness vis a vis other powerful defense policy actors.

Civilian leaders need a better understanding of the different paths to follow toward radical doctrinal innovation. Choosing these paths requires an understanding both of the mechanism that causes innovation, and of how power must be distributed in order for that mechanism to be activated.

Rosen, Intraservice Politics, and Innovation.

Rosen's theory of the sources of military doctrinal innovation depends upon the existence and maintenance of certain patterns of civil-military, interservice, and intraservice relationships. It

argues that doctrinal innovation results from the pulling and hauling between competing internal branches of a military service. These intraservice conflicts pit new combat arms against more traditional ones. When the new wins the battle against the old, innovation occurs. Because these battles occur within a service between members who have other organizational ties that bind them, and because they occur between combatants occupying different positions on a vertically defined hierarchy, resolution often occurs at a generational pace rather than in quick and decisive fashion.

Rosen notes that this particular pattern of intraservice politics can easily be destroyed as a source of doctrinal innovation. Of particular concern to Rosen are civilians who intervene in the details of intraservice conflicts. Rosen argues that such interventions cause the services to suppress those internal advocates for change who produced the conflict which led to the unwanted intervention. In order to deprive civilians of the information needed to intervene, organizations muzzle and suppress their most effective critics. Thus, Rosen argues that civil-military conflicts over military doctrine will inhibit rather than encourage innovation.

Rosen's argument is silent on the question of interservice

politics. Cases which for him are purely examples of intraservice conflict clearly had a component of interservice conflict as well.[42] In the cases described above, interservice competition acted independently to cause totally new doctrine without any significant, prior intraservice struggle. Later, interservice cooperation successfully suppressed already existing intraservice movements towards doctrinal innovation. Furthermore, in those cases where competition caused inovation, the innovation occurred rapidly and decisively, in contradiction to the more stately, generational transformations described by Rosen.

In other words, the world of Melvin Laird and his successors appears to be the world in which Rosen's theory of doctrinal innovation thrives at the expense of the others. In this world, which has spilled over into the post Cold War era, civil-military and interservice cooperation reign, and the only source of political conflict over military doctrine occurs at the intraservice level. The path towards doctrinal innovation under

---

[42]. The obvious example is the development of carrier aviation. To portray this issue solely in terms of its intraservice politics is almost certainly to miss an important element of causality resulting from competition with the Army Air Corps. See Thomas Hone and Mark Mandeles, "Interwar Innovation in Three Navies: U.S. Navy, Royal Navy, Imperial Japanese Navy," *Naval War College Review*, Spring 1987, p. 73.

these circumstances is the one described by Rosen. Innovation is largely the responsibility of the individual services, it occurs gradually, at unpredictable times, and in unpredictable places, and too much external "assistance" is likely to be counterproductive. Finally, there is no reason, within the confines of Rosen's theory, to believe that forceful interventions emanating from the newly empowered, post Goldwater-Nichols JCS will fare better than civilian interventions by OSD in causing rapid and decisive doctrinal innovation by the services.[43]

Posen, Civil-Military Politics, and Innovation.

Posen's theory of the sources of military doctrinal innovation also depends on certain patterns of civil-military, interservice, and intraservice relations. At its heart, the theory assumes the existence of civil-military conflict between civilian executives and service leaders over military doctrine. It also assumes the existence of some intraservice support and assistance for external civilian intervention on the part of internal advocates for change

[43] Here, the politics of the newly empowered Joint Requirements Oversight Council (JROC) shows that the services reject interventions by any source - military or civilian. See "Brothers in Arms," *Inside the Pentagon*, June 29, 1995, p. 23.

within the service. Under these circumstances, civilians can invade a military service's doctrine and change it for a more innovative one that they prefer. Their allies within the service are rewarded, and their opponents put out to pasture. The doctrinal change that results is sudden and decisive, and is usually a direct response to a serious miitary challenge to the state's security. Like Rosen, Posen avoids any specific discussion of interservice competition as a cause of doctrinal innovation other than to note that such competition may have contributed to the growth of the nuclear triad in the U.S. during the Cold War[44].

Posen's theory depends primarily upon civilian intervention. Thus, in the real world populated by real civilians, it becomes vulnerable on several flanks. First, Posen notes that civilians will not intervene in the details of military doctrine without seeing a clear and present danger. Thus, in peacetime when crises are not looming, this source of innovation often dries up as civilian executives focus on other problems. The theory also assumes that civilian executives both have access to the information and wield the political clout that they need to successfully intervene in the details of a service's military

---

[44] Posen, *Sources*, p. 57.

doctrine. The nature of intraservice and interservice politics affect these variables.

Intraservice and interservice conflicts are a major source of information that is otherwise hard to get about military doctrine. After all, these are public arguments between military professionals over competing ways of performing the same mission, or over the value of new missions. Such conflicts also produce political leverage for civilian leaders that would not exist when a military service or services are able to present a unified front. Also, when the services or branches within a service openly compete, they invite intervention to resolve their dispute. When there is competition, a civilian executive can usually find some military support for his position. It may not be unanimous support, but it is also not unanimous opposition.

Cooperation, both at the intraservice and interservice levels, eliminate this potent soure of political leverage. When civilians intervene under these circumstances, they do so in the face of powerful opposition. Paradoxically, some evidence indicates that civilian intervention can itself be a potent cause of interservice and intraservice cooperation, especially when civilian intervention in the details of military doctrine is institutionalized as it was

under McNamara. Thus, as a source of innovative doctrine, civilian intervention practiced without restraint may bear within itself the seeds of its own defeat. This self-defeating aspect of the politics of civilian intervention should be particularly evident when the international security environment is relatively benign. When threats are low, civilians will be even less inclined to spend political capital over civil-military confrontations that are likely to increase not decrease the cohesion of the military services.

Certainly McNamara's successors have behaved as if they feared a similar fate should they intervene too closely in the details of service doctrines. The endurance of the "Laird" management style can be attributed to the fear civilian leaders have of the consequences of such interventions. Implementing Posen's theory certainly does not depend upon an imitation of the entire McNamara effort to institutionalize OSD control over the defense budget. However, service toleration for even an episodic degree of civilian involvement in their doctrines remains low. This means that any future efforts to implement Posen's theory as a means of causing doctrinal innovation demand a very powerful Secretary and a fully supportive President. Unfortunately, as Posen himself notes, these circumstances are least likely to apply in a benign security

environent like that facing the United States after the Cold War.

Interservice Politics and Inovation.

From the outset, the attraction of a theory of doctrinal innovation based on interservice conflict was that it might lead to policy prescriptions that were not bound by the "good news...bad news" aspect of the two prior theories. A policy based on Rosen's theory has the advantage of being politically feasible for the average civilian leader, but there is little control or initiative available, and the pace of even a successful innovation is such as to reach fruition during someone else's tenure. A policy based on Posen's theory reverses the sign of these characteristics. Innovation, if it occurs, is swift and decisive, but the effort might also fail and the interventionist civilian leader or leaders in question would suffer the full blame. A policy designed to exploit interservice conflict might offer the initiative and control provided by direct intervention without the political risks. Such a plan requires that future civilian leaders be capable of intentionally causing the kind of interservice conflict that Eisenhower inadvertently provoked and that McNmamara inadvertently suppressed, that they have the patience and

discipline to exploit this conflict without suppressing it, and that they are willing to live with the political consequences.

One obstacle in the path of such a policy is that civilians don't recognize interservice conflict anymore.

> "While strong criticism of destructive and disruptive interservice rivalry is frequently voiced, DOD suffers more from interservice logrolling. The intensity of the postwar rivalry among the services was so great that its continued existence has been assumed. It is true that interservice secretiveness, duplication, lack of understanding, and inconsistencies continue to exist. These are found at lower levels of organizational activity where they continue to undermine coordination and cooperation. However, over the past twenty years, the services have logrolled on the central issues of concern to them in order to provide a united front to the Secretary of Defense and other senior civilian authorities. The natural consequence of this logrolling has been a heightening of civil-military disagreement, an isolation of OSD, a loss of information critical to effective decision-making, and, most importantly, a political weakening of the Secretary of Defense. The overall result of interservice logrolling has been a highly undesirable lessening of civilian control of the military."[45]

Throughout the growing debate over JCS reorganization during the 1980s, the case for reform was often couched in terms of the need to eliminate the kind of interservice rivalry that had been absent

---

[45]. *The Goldwater-Nunn Defense Organization Staff Study, Executive Summary*, as reproduced in David Kozak and James Keagle (eds) Bureaucratic Politics and National Security (Boulder, CO.: Lynne Rienner Publishers, 1988) p.492.

from Washington since the McNamara years. Informed commentators noted that the problem lay more with the interservice cooperation and collusion that resulted from the JCS' "rule of unanimity."[46]

Given an understanding of the differences between interservice conflict and collusion, civilian leaders would need a strategy for causing competition in the face of the now overwhelming inclination toward cooperation that rules the joint service arena. Such a strategy would in all liklihood require the introduction of something akin to the Eisenhower style of management - economically derived budget ceilings, clear presidential defense guidance that tacitly favors one or two services at the expense of the others, and a hands off attitude toward service programming.

Economically derived defense budget ceilings now exist in all but name for deficit reduction purposes. Nevertheless, it is important for the President to publicly link excessive defense spending with national insecurity as Eisenhower did. Likewise, civilians in OSD before and since McNamara have often, though certainly not always, adopted a relatively hands off attitude toward service programming. Thus, in these two areas, the management style required is not entirely unfamiliar. Most

---

[46]. Komer, "Strategymaking in the Pentagon," p. 213

important, a policy designed to provoke interservice competition would require a reversal in the longstanding presidential and OSD inclination toward vague declaratory defense policies.

The importance of clear, public, Presidential guidance in forming the incentive structure that determines different patterns of interservice relations is a little studied form of domestic political power. The cases above demonstrate that this form of civilian control over different patterns of interservice relations is, if inadvertently in the past, a powerful means of causing or suppressing innovative military doctrine. Using this and other easily manipulable instruments such as budget policy where civilian authority is unchallenged, state leaders can follow an alternative route to causing doctrinal innovation than the one described by Posen. As in Posen's theory, this alternative form of civilian activity also provides a means by which external systemic security pressures felt by state leaders can come to affect and change the internal institutions of power that protect the modern state. In this respect, the use of strategy to cause and exploit interservice conflict leads to state behavior that contradicts the predictions of organizational and bureaucratic politics theories like Rosen's, which assume that state behavior has overwhelmingly domestic sources. Thus, in providing an alternative theory of the sources

of doctrinal innovation to Posen's, my theory also reinforces Posen's more basic theoretic approach and rejects Rosen's by providing further evidence that state behavior need not be simply the output of autonomous organizations and brokered bureacratic political struggles. Rather, I show that national leaders hold the reins of state power and of the institutions that comprise that power, and that through direct or indirect means these leaders are capable of making state behavior correspond to the demands of the international security environment.