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STRATEGY, TECHNOLOGY AND THE MAKING OF UNITED STATES STRATEGIC DOCTRINES 1945-1972

by

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ABSTRACT

The purpose of this thesis is to examine and analyze the nature of the relationship between the technological developments in nuclear weapons systems and the evolution of the strategic doctrine of the United States 1945-1972. Because of the dynamic nature of weapons development in the status-conscious system, there is a need to evaluate the impact of weapons technology and momentum upon strategic doctrine.

There is a plethora of literature which is founded on the almost a priori assumption and analytical leap that technology is the dominating factor in the formulation of strategic doctrine. Although this extremely deterministic, technocratic theory has great popular appeal, it may serve only to obscure other equally important dimensions of defense policy and national security strategy.

It is my belief that there are indeed other dimensions to strategic policy-making in addition to purely technological momentum. These additional components are the more subjective and intuitive aspects involved in the machinations of domestic and international politics of technological and strategic choice. The necessities of economics, the powerful bureaucratic pressures, and a sensitivity to a potentially vocal domestic audience were all vital factors in the making of strategic doctrine. An examination of

these other variables will provide a more complete understanding of the nature of the technological-strategic relationship in the United States.

Exact calendar dates delineating either technological or strategic periods are somewhat artificial; they are an inescapable necessity which will be used with caution.

Structurally, the thesis will be divided into five parts: four chapters of text and one section of assorted materials.

Chapter One contains a general discussion of the complexities and dynamics of defense planning in the system of nuclear deterrence.

Chapter Two is devoted to the various developments and directions of nuclear technology and strategic doctrine during the period 1945-1960.

Chapter Three contains a similarly styled discussion of the period 1960-1972.

Chapter Four is devoted to drawing conclusions about the nature of the technological-strategic relationship in the United States.

There is also a "quick-fix" section following the text which contains a glossary and various appendices. These pages will be most beneficial if perused prior to reading the text.

The subject matter is profound, highly complex, and ultimately, very subjective. Because of these characteristics, a state of intellectual alertness and emotional calm is the author's analytical and stylistic objective.

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CHAPTER ONE

"The Strategist's Dilemma"

> Those of us who do this work are beset by all kinds of limitations including limitations in talent and in knowledge. Where the object is to predict the future, for the sake of appropriate action, we simply cannot wait until all the relevant facts are in. Besides, we can make progress only as we cut off and treat in isolation a small portion of the total universe of data and of problems that confront us, and every research project is to that extent, 'out of context.' In addition, we are dealing always with large admixtures of pure chance. These are sometimes difficult to take into full account without seeming to stultify our results, and that human beings are naturally loath to do. The same is true of the large range of variables which deal with enemy intentions and capabilities. Finally, we are immersed in bias, our own and that of our clients or readers. With our audience, in spite of our strong efforts to be objective, we cannot avoid being influenced by what we know it likes to hear.[1]

Deterrence as an element in national strategy is nothing new. To persuade an opponent to desist from particular action by threatening deleterious retaliation has always been a function of interstate political communication. However, the present position of deterrence in relation to all-out war is markedly different than the non-nuclear predecessor.

Prior to the nuclear age, strategy was devoted to discovering how the resources of a nation, both human and material, could be developed and utilized for maximizing

the total effectiveness of the nation both in peace and in war. If deterrence did fail and war resulted, nations could "road-test" their strategic doctrines without fear of annihilation. If deterrence failed prior to 1945, a "win-the-war" strategy could possibly produce victory in the traditional context of the term.

However, we can no longer enjoy the "luxury" of all-out war which was at least an available option in the non-nuclear period. Because of the quantum leap in both the destructive power and the speed of delivery of nuclear weapons, there can be no breakdown in the system of nuclear deterrence. Strategy must now anticipate the trials of war and by anticipating them, seek where possible to increase one's advantage without unduly jeopardizing the maintenance of peace or the pursuit of other values.[2]

The psychological aspects of political-military communications are of paramount importance in the system of nuclear deterrence. The crux of the matter is the creation of a "state of mind of deterrence." In order to create this "state of mind," strategic intentions and technological capabilities must be clearly and unambiguously communicated to ourselves, our allies, and our enemies.[3] This is rarely an easy undertaking.

The United States has responded to the psychological necessities of deterrence with a penchant for problem-solving techniques. This approach has produced the

overquantification of strategic issues, an academic numbers game, and the theoretical "derivation" of simple solutions to complex strategic questions. When these techniques experienced failure, the remaining recourse was the simple leap of faith in which conclusions tended to be accepted long before they were substantiated. The offense-defense interaction is a case in point with the former being seen as the simple solution.

The entire process of national security policy requires a healthy empathy for the often unsophisticated emotions which shape the public and private conduct of men and nations of men. Strategy is a very "soft" area of analysis; in fact, it is messy. Strategic matters do not lend themselves to "scientific" analysis simply because they are so laden with value judgments.[4] But can a "state of mind" offer any alternative? Probably not.

Furthermore, and as Bernard Brodie has stated, "surely there is something unreal about all this;"[5] he is surely more right than wrong. "Thinking about the unthinkable" is always an imaginative exercise, and the psychological investment in deterrence is probably immeasurable. In short, we have come to expect the nuclear system to be constantly coiled; but never do we expect it to be sprung. Nor can we prove if it works!

While nuclear weapons may deter only a narrow range of threats, they are an ever-present variable in the national security calculus. Power in the international system is

measured in its grossest form, not by refined analyses. Strategic forces do have political utility. The amount of influence they wield is again dependent on the "state of mind," but generally,

> we are concerned here with the impact of large hardware systems of somewhat nebulous net technical characteristics on delicate psychological matters of highly nebulous character. The general direction of this impact is clear, but it is not possible to quantify its magnitude in terms that admit direct comparison with other relevant factors.[6]

and as common sense reminds us about the "state of mind,"

> Large forces look more impressive than small ones--for reasons which are by no means entirely irrational-- . . . Human beings . . . generally have in common the fact that they make their most momentous decisions by what is fundamentally intuition.[7]

Because of the unscientific and non-deterministic nature of strategic persuasion, a numbers game is played which seeks to rationalize, "how much is enough?" Again, the answer lies ultimately in the "state of mind." The effective operation of deterrence over the long term requires that the other party be willing to live with our possession of the capability upon which it rests.[8] The present system of deterrence is committed to the survival of retaliatory forces of "adequate" size after an enemy attack,[9] and this means numbers and performance characteristics of weapons systems become important assumptions in planning the national security. But again, these assumptions are not scientific.

> The argument is not about the truth or falsity of some scientific law, it is about the plausibility of the assumptions on which calculations are based . . . These are not questions of Science, they are matters of judgment based on experience.[10]

And experience tells us that because of a competitive nation-state international system, the formulation of national security policy is going to be based on "conservative" estimates of enemy intentions and capabilities. The prudent course is to plan for the "greater-than-expected threat;" this is the medium to upper range estimate of the quantity and quality of the enemy's forces and their strategic motivation.[11] Because of the uncertainty in planning national security policy, it is prudent to buy more insurance than to buy too little. Insurance is a healthy inventory of weapons systems. No one really <u>knows</u> "how much is enough?"

But the one-way psychological investment in deterrence, that is, the absolute belief that deterrence must not fail, is a very anxious road to travel. On the one hand, great faith is placed upon the adversaries being "rational" in recognizing reciprocal intentions and capabilities. Yet, on the other hand, security policy must be planned with the assumption that a "gap" in intentions and relative strengths could develop and upset the credibility of a nation's strategic forces,[12] thereby upsetting the system of deterrence. Therefore, the only recourse is

conservative planning. As former Secretary of Defense Melvin R. Laird has testified:

> Speakers Rayburn and McCormack cautioned me, that if I were to make any mistakes while I was on that committee (Defense Appropriations) that I err on the side of the national security of this country. I thought that was pretty good advice . . . I have always tried to follow that advice and I think it is pretty good advice in this whole area of national security and defense planning. I do not like to gamble with the national security of this country.[13]

Laird's testimony represents the archetypal national security planning perspective. But to hedge one's bets in planning national security requires the defense managers to grapple with the concurrent development of technology and strategy in uncertain future environments.

> The problems of selecting strategies and choosing weapons systems today are quite unlike anything that existed before World War II . . . Before World War II we did not plan on technological change; we merely adjusted to it. Now we are planning on it. We are debating whether inventions can be scheduled.[14]

A weapons system on which research and development is started today will have its useful life in the environment of two to four technological revolutions hence.[15] To project two or four technological revolutions into the future is a classic example of operating in a fog.[16] As Albert Wohlstetter has stated, we are not very good at predicting either our own technological advances or those of the adversary; the future is intrinsically uncertain.[17]

One of the many uncertainties is that there can be many a slip between the acceptance of an idea in principle and the implementation of it through appropriately selected plans and actions. As Dr. John Foster, Director of Defense Research and Engineering has stated:

> A weapons system is a complex integration of hundreds of technologies. It is defined by objectives and by threats, and there are many substitutions to the technologies and to the threats during the development and during the operation of a weapons system.[18]

Weapons systems can be outraced by changes in the technological and/or political environment long before they are ever deployed.

However, some technologies will survive the ordeals and roadblocks in development. Of particular concern to the defense planner are exactly which ones will be deployed in the strategic force. Because of the short intelligence lead-time available between the discovery of an adversary's technological breakthrough in its late development stages and the deployment of the weapon system based on these technological advances, there is a pressing need for a vigorous research and development program of our own. This program is designed to discover what we don't know[19] and what is technologically possible so we will be in a ready position to exploit the technology before our adversaries.[20]

Additionally, by pursuing a vigorous research and development program, it is possible to extrapolate what

the adversary's technological developments may be. When one of our own weapons systems reaches the later development stages, the conservative defense planner must assume that the enemy also has the system in a near comparable state-of-the-art.[21]

There are dangers, however, in extrapolating the enemy's strategies and technologies from our own. The tendency to mirror-image the enemy, while it may be ego-satisfying, may also be a perversion of reality. The enemy may have different strategic requirements and may have no need to emulate our doctrine or technology. Another danger is that we may not extrapolate accurately enough the enemy's development in a given field of technology. Many official United States estimates of Soviet nuclear development come qjickly to mind.[22]

Ideally, though, technological surprises are few and decisions for weapons development are made which provide all reasonable hedges against possible new needs or changes in threats. As security is a relative "state of mind,"

> What we have got to do is to have the best security we can on a calculated basis of our own intelligence and our efficiency and on our looking forward at any one time.[23]

But even taking reasonable hedges against the future technological and strategic environments involves elements of choice. Although hindsight is usually a more accurate analytical perspective than foresight, defense

planning must attempt to ask the "right" questions in the present, about the uncertain future. Even when formulating these questions, planners do not possess intellectual carte blanche. For as Comte has said, "C'est l'ancien qui nous empeche de connaitre le nouveau," (It is the old that prevents us from recognizing the new). We are to a large degree, molded by the past. As Bernard Brodie has stated:

> we should not deceive ourselves that we have the ability to start from scratch with completely fresh ideas, and guided merely by logic, to fashion a strategy according to the needs of the time.[24]

Prevalent military strategy tends to favor inventions that fit, and tends to resist ideas that clash with it and require revision; the temptation is to evaluate new ideas in terms of old practices.[25] This is understandable given the kind of evolutionary process by which new weapons systems "grow" out of old ones,[26] the natural limits of technology,[27] and the military's bureaucratic interests involved.

In an ideal technological-strategic relationship, Science invents while defense planners innovate. Frequently, these roles have not always been observed and the result has been the politicization of Science.

Scientists have become most-favored participants in the defense policy process. Because defense matters are

so uncertain, "scientific authority" presents an inviting rationale on which to base difficult development decisions. In many weapons systems controversies, Science becomes a pawn in the process.[28]

However, the (mis?) use of Science in the policy process is also a function of an eager scientific community. Because of the need for military and industrial coordination, scientists are natural weapons systems lobbyists, who tend to have enthusiasm only for vogue, deployable systems which their respective industries also favor. If a weapons system, after a costly investment in research and development, does not receive authorization for deployment, Science and industry move on to other systems which promise a better track record.[29]

The defense planner's frequent cynicism then toward the "revolutionary" technological solution to complex strategic problems, is not always philosophically reactionary. An overreliance on the technical solution can obscure the political realities of the strategic environment. Scientists enjoy the luxury of moving on to new areas of research should old ones prove fruitless; defense planners may not always enjoy the luxury of dead-end policy. The defense planner must attempt to cope with concurrent strategic and technological developments and must at least appear to be in control of them. This position is not easy to

maintain. Any device which will attempt to bring the two together looks promising to the defense planner.

In addition to a philosophical commitment to the past, defense planners tend to rely on economic variables when making decisions. Along with the quantum leap in destructive power, speed of delivery, etc., weapons systems have experienced quantum leaps in research and development, procurement, and operating costs. Each successive generation of a system seems to get more complex and more costly. Strategy, not surprisingly, wears a dollar sign and is conceptually similar to economic theory.[30] Indeed, the absence of a deep and constant concern for the economic aspects of defense planning would be grossly incompetent and irresponsible.

In general, there are two ways in which the problem of balancing defense needs against fiscal restraints can be approached.[31] The first way is the budget ceiling, a pre-determined fiscal limit. The second way is the defense requirements approach which ascertains essential defense needs and seeks appropriate funding. Defense planning utilizes both of those approaches; especially, when two weapons systems can accomplish the same purpose.[32]

Economic considerations tend to have great impact on the policy process; however, even though there are these many "non-technological" variables affecting weapons

choice, the commitment to the past and economic restraints, there is some truth in the "mad momentum" deterministic interpretations of the technological-strategic interaction. Again, it is a question of degree.

Although weapons programs and strategies are incremental in nature, a point is reached when whole communities become linked to particular programs and concepts. When major engineering development is reached, the strategic rationale becomes stronger, and "it is the hardest thing in the world to stop a weapons program."[33] Or as former Secretary of Defense Robert S. McNamara has stated, there is a "mad momentum" to it all.

> There is a kind of mad momentum intrinsic to the development of all new nuclear weaponry. If a weapons system works . . . there is strong pressure from many directions to produce and deploy the weapon out of all proportion to the prudent level required.[34]

While "planned" and "unplanned" technological developments provide "momentum" to the planning of defense policy, their impetus remains for the most part, psychologically determined. Technological developments are more than scientific principles; they are questions of attitude in the "state of mind of deterrence."[35] The apparent impact of technological change on the international system is frequently deceptive, always unmeasurable,[36] and all too often apolitical.

But because of the incremental nature of defense planning, "there seems to be a law governing defense policy

in all countries that the more fundamental the question, the less attention it is likely to receive."[37] Technological refinement does possess the potential to call into question certain sacrosanct planning assumptions and in many instances, by-pass incrementalism and lay open the basic assumptions. It is usually at this point that technology is seen as being deterministic. However, the danger in allowing technology too strong an influence in designing national strategy may result in a lack of overall balance of forces in terms of their political context,[38] but one need only recall Brodie's "The Strategist's Dilemma,"[39] which stated defense policy wasn't easy.

The following account of the technological-strategic behavior of the United States 1945-1972 will analyze many of the strategist's "dilemmas" and demonstrate that the interaction between technology and strategy, while not entirely fatalistic, is certainly complex and possesses vague and ambivalent linkages.

CHAPTER TWO

"The Atom is Split"

Despite the popularly "Gadzooks! I think I've got it!" perception of scientific discovery,[40] $E=mc^2$ was the product of intense inquiry and not the culminating revelation of a nocturnal dream. As early as 1905, Einstein did clearly state that mass and energy were equivalent, and his famous equation could well be the most important formula of this century.[41] But Einstein's theoretical knowledge was far ahead of the practical state-of-the art of nuclear physics, and the first nuclear explosion did not occur until July 16, 1945 at Alamogordo, New Mexico. Nuclear energy was developed through a long, arduous process of trial and error in which many answers had to be found to many uncertain areas of particle physics.[42]

Although nuclear weapons had been utilized in the Pacific theatre of World War II demonstrating a quantum leap in destructive power over any previously known weapon,[43] their technological and strategic impacts were immediately engulfed in much uncertainty. Science still had a long process of nuclear trial and error with which to contend. And despite the nuclear explosions at Hiroshima and Nagasaki, the atomic bomb was <u>not</u> militarily instrumental

in the subsequent Japanese surrender.[44] Also, the future role of strategic bombing was ambiguous as the European strategic bombing campaign provided inconclusive evidence to prove unequivocally, the effects of strategic bombing. Nevertheless, "it was right at the time to stress the drastic nature of the change in military power, atomic weapons produced." The doctrine of strategic bombing would eventually emerge as the dominant strategy of war[45] although not without patterns of technological uncertainty, intense interservice rivalry over missions and roles and writing the next war's scenario, and nuclear developments in the Soviet Union.

Technologically speaking, despite the destructive power of nuclear weapons, fission bombs were still, circa 1950, sufficiently limited in power and numbers to make it appear necessary that a substantial stockpile would be required to win "command of the air," the over-riding priority of a doctrine of strategic bombing.[46] Furthermore, these bombs would achieve their maximum results if used against urban areas.

With an American monopoly on atomic weapons, attempts to control them through international supervision were understandably doomed to fail; the Soviet Union exploded its first nuclear device in August, 1949.[47] Until this time, the strategic relationship of the two superpowers was one of "primitive" or technologically dissimilar deterrence;

the United States' atomic monopoly was offset by Soviet conventional preponderance on the European continent.[48] In any event, no one "knew" how many bombs it would take to "knock-out" a country as large as either the United States or Soviet Union and the war scenario-writing process was filled with uncertainty. The natural tendency in a new technological environment is to formulate a strategy for war based on experience gleaned from the previous war.[49]

The "next war--last war" approach was chosen, but the choice of a "war of attrition" as official policy resulted in intense interservice rivalry in the United States military establishment.[50]

Because of a very rapid and across-the-board, post-war de-mobilization, the United States military found itself reeling under the weight of the more traditional American revulsion to the use of force in international politics. Faced with neo-isolationism, the military became more politicized; and despite the increase of international commitments, raw capabilities continued to be slashed. The military services scrambled for their budgetary lives. In this competitive process of winning missions and roles, there was little interservice coordination of strategic planning; in fact, it was discovered the services weren't even planning for the same war.[51] Interservice rivalry would continue to produce significant impact on future developments in technology and strategy.

The Korean War helped the military regain some of its lost influence in the policy process; it undermined the Truman Administration's defensive strategy of containment by exposing serious deficiencies in non-nuclear forces. Korea provided domestic political impetus for a national re-armament program and a full-time defense establishment.[52]

During the Korean quagmire, the United States acquired many foreign air bases for its new all-jet medium bomber, the B-47. This plane complemented the heavy long-range B-36 and provided the basic technology for a second-generation jet bomber, the B-52, which was America's first intercontinental jet bomber.[53] Bombers were the principal strategic deterrent; and because of the rejection of "preventive war," strategic warning and defense of the forces-in-being became the keys to not only the viability of the manned bomber, but also any future mix of strategic forces.[54] The Air Force naturally received the highest priority in strategic doctrine and mission and expressed little enthusiasm to share nuclear weapons with the other services.

Both strategic bombing as a doctrine of war and the future role of the ballistic missile received substantial technological impetus from the detonation of a thermonuclear device in 1952. Fusion produced a further quantum leap in nuclear power and proved beyond question that a warhead could be designed for ballistic missile delivery.[55] Indeed, without nuclear fusion, a missile's poor accuracy and a

limited payload would have given any missile system a very limited strategic value.[56] However, missile technology had its own course to run and the manned bomber would remain the principal deterrent for many years to come.

The "New Look" in strategy taken by the Eisenhower Administration in 1953 was a rejection of the defensive orientation of containment and a rejuvenation of the air-power advocate's more offensive spirit. Clearly, the key doctrine to emerge from the "New Look" was that of 'massive retaliation,' which rested upon the Free World communities deterring aggression by being willing and able to "respond vigorously" to it "at places and with means of its own choosing."[57] While containment apparently did little to deter Soviet probes into the Western alliance, 'massive retaliation' was expected to cover the whole spectrum of political-military contingencies. General Curtis Lemay stated:

> I do not understand why a force that will deter a big war will not deter a small one if we want it to and say it will ... I think we are going to have to build for the worst case and then use it for all the others.[58]

In 1954, building for even the "worst case" of the doctrine of 'massive retaliation' was no easy matter, and certain technological realities did not seem to influence the more subtle political aspects of 'massive retaliation.' Despite the fact that the United States would not "air drop"

a hydrogen bomb until 1956 and the uncertainties of hydrogen miniaturization; and despite the Soviet Union's possession of a comparable technological knowledge of fusion, the "New Look" would demonstrate that:

> Mental conflicts end either in a new and higher synthesis ... or else in a reversion to more primitive ideas which have been outgrown but to which we drop when jolted out of our attained position.[59]

While more sophisticated strategic insights would emanate from the Eisenhower Administration, the "New Look's" 'massive retaliation' was not one of them.

It must also be said that the purposes of the "New Look's" substitution of firepower for manpower were as much economic as they were strategic. As Secretary of Defense Wilson explained:

> We can't afford to fight limited wars. We can only afford a big war and if there is one, that is the kind it will be.[60]

With this frugal perspective, a strong Air Force was synonymous with the "national security." The status of the Air Force is evident in the defense budgeting formula of 46% Air Force, 28% Navy, and 23% Army; these figures fluctuated very little throughout the years of the Eisenhower Administration.[61]

Deterrence, however, is neither assured or impossible but is the product of "sustained intelligent choices."[62] During the "New Look" period, many decisions were made in an effort to build and maintain a viable deterrent.

Some of these decisions reflected intelligent assumptions, others did not.

The decision to proceed with a continental air defense program was an example of the latter and reflected a clear example of technological-strategic incongruity.[63] The power of thermonuclear weapons was so great that even a high rate of attrition against incoming bombers would prove more likely to be an academic calculus, yet many billions were invested in a grossly misconceived and technically deficient air defense system.

The decision to proceed with a bomber-rebasing, hardening, and alert program was without oversimplification, an example of good common strategic sense.[64] Indeed, even though there were many bombers in the American inventory, launching a nuclear surprise attack on the entire American retaliatory force was perhaps, somewhat less difficult that the Japanese attack on Pearl Harbor. The American bombers were vulnerable and needed dispersal, hardening, and more warning to insure their strategic value.

The Eisenhower Administration was also faced with the always difficult force-level question: "How much is enough?" The procurement decisions made during the "New Look" period proved to be prudent although at the time emotions were running high and were not as calm as strategic planning should dictate them to be.

The difficulties in interpreting an adversary's intentions are uncertain enough without the added complication of a state of ignorance of his raw capabilities. Despite some very rapid advances in military technology during the "New Look," there remained serious deficiencies in intelligence gathering capabilities; and because of this lack of technological competence, the Eisenhower Administration had to cope with one endemic phenomena of arms competitions known as "gap prediction."[65]

The first of these dilemmas of "gap prediction" involved estimating Soviet heavy bomber production, and the ensuing intense domestic political debate of the so-called 'bomber gap' period had far-reaching implications in the future exercises in "gap prediction."

The May, 1954 "fly-bys" of Soviet aircraft gave the first hard evidence that the Soviets had a long-range bomber in production. Many airpower advocates believed that Department of Defense production and procurement schedules were not adequate to meet the Soviet program.[66]

Intense Congressional pressure was brought against the Eisenhower Administration during 1955-1956. The Administration remained calm in the light of these events but incrementally authorized three production accelerations in the B-52 building program and an increase in the number of bombers on ground alert status.[67] Although these measures

were taken, the Eisenhower Administration emphasized the rather sophisticated strategic logic that the adequacy of a deterrent is more a function of its possessing "sufficiency" than a gross numerical advantage vis a vis the adversary. "Sufficiency" was a yardstick of strength relative to that of the adversary's and in balance with rational national security goals. Still, without conclusive evidence of Soviet action, there was little choice but to increase the B-52 program.[68]

In the summer 1956, flights of the U-2 spy-plane overflew the Soviet Union; and by early fall, it was known that there was indeed no 'bomber gap' as was originally perceived. In fact, the United States was outproducing the Soviet Union in heavy bombers; and to this day, the United States possesses a substantially larger heavy bomber force.

The 'bomber gap' demonstrated: a future American sensitivity to many of the qualitative aspects of arms competitions, to the principle of marginal utility (the law of diminishing returns); and a gradual acceptance of a state of mutual deterrence. But while these more sophisticated insights were being verbalized, the manned bomber of the 1950's represented a deployed technology which was already being outraced by another developing technology, that of the missile.[69]

Because of both the intrinsically simultaneous and the uncertain development of technology and strategy, no sooner had the so-called 'bomber gap' disappeared when another potential dilemma appeared with full force, the missile revolution.

The ballistic missile threatened to drastically upset the future strategic environment because it made the manned bomber highly vulnerable to a disarming first-strike. And because of the nature of first-generation ballistic missiles, slow reaction times due to liquid fuel, and soft base configurations, whichever side possessed the new system would likely feel as insecure as the side without. A side with a highly vulnerable force of manned bombers could not "ride out" a missile attack; and in any international crisis, both sides could become involved in a serious pre-emptive spiral.

Furthermore, the logic of the missile had virtually destroyed the traditional basis for the military services' organization around land, sea, and air roles. From the beginning, missile development in the United States became a jurisdictional battlefield among the military services for control of the missile weapons systems. Each military service possessed unique research and development and industrial contracting procedures; the missile effort in the United States was anything but coordinated.[70] "The

Rockefeller Report" would later note that because of interservice rivalry the role of the Secretary of Defense had become a negative one:

> The Secretary of Defense is so burdened with the negative task of trying to arbitrate and control interservice disputes that he cannot play his full part in the initiation and development of high military policy.[71]

Throughout the missile's early beginnings, there were numerous Executive inspired defense and "missile committees" which gave a running, analytical monologue of United States missile and defense programs. The three most important of these were the second von Neumann, Killian, and Gaither Committees.

The second von Neumann Committee had projected in 1954 that the United States could possess an ICBM capability within five to six years if the proper program accelerations occurred. The von Neumann Committee also emphasized that the management of the ICBM program would be more important than specific technical necessities.[72] Scientific discovery and invention needed businesslike organization and management. In light of the report, the first-generation ATLAS ICBM was assigned the highest development priority in May, 1954.

The second significant defense and "missile committee" was the Killian Committee of 1955, which provided the vital impetus for the dual IRBM development programs. In light of the Killian Committee's forecast of Soviet missile

capabilities, the IRBM missile programs were awarded an equal development priority with the ICBM program. In subsequent testimony in the Hearings on "Airpower," Dr. Killian also placed emphasis on the management aspects of developing a technology:

> We need to strengthen the coordination of scientific activities at policy-making levels and thus increase the probability that more strength and skill in coordination and planning at the top will bring about more effective research and development all down the line.[73]

The Gaither Committee's report was "leaked" in 1957, and the report found that SAC was highly vulnerable to a surprise attack and that the United States must develop an invulnerable second-strike force as soon as possible.[74]

These three Committees had as much impact on the development of the missile as did any specific, timely technological development. These Committees gave the political impetus for the technological development of the missile.

Despite much effort, the United States "lost" the first round in the missile contest with the Soviet Union. The launching of SPUTNIK in the fall of 1957 produced in the United States a sharp outcry lamenting the loss of technological superiority and charges of incompetency in the national educational system and in the planning of the national security.

Because the Soviet Union did not series produce a heavy bomber, it was thus believed that they would do so

with an ICBM. With these uncertain matters at hand, the United States remained committed to the two simultaneous IRBM programs as a gap filler to the Soviet ICBM and a significant development step in the more complex United States ICBM. Much like the first generation B-47 jet bomber, with its range limitations, the IRBM's had to be deployed overseas. Needless to say, the IRBM's would likewise be vulnerable to a first strike in these forward deployments. It was hoped that an ultimate decision could be made on choosing a single IRBM: the decision was never made.[75]

While ambiguous intelligence data began to emerge postulating a reduction in Soviet ICBM production, the Eisenhower Administration nevertheless had to admit that the Soviets would probably enjoy a numerical ICBM advantage in the early 1960's.[76]

This "missile gap" controversy continued to remain a sensitive area in both United States strategic planning and domestic political debate. The lack of timely and reliable intelligence caused by a lack of technology, left unanswered the questions concerning Soviet operational ICBM's. Thus, it was believed that the United States was headed for another "transitional period" in which

> the most discouraging aspect of the missile gap is that we seem unable to escape it should the Soviets produce the number of ICBM's which they are believed capable.[77]

Events and photo reconnaissance ultimately demonstrated that there was indeed no "missile gap," but not before the Eisenhower Administration took prudent action by increasing the number of B-52 wings from eleven to fourteen, by dispersing these aircraft, and by improving their reaction time.[78] Furthermore, program accelerations were authorized for missile detection, satellite reconnaissance, the POLARIS submarine, and hardening for the first-generation liquid-fuel ICBM's. Of equal importance was the Administration's decision to defer full-scale deployment of an ICBM until the second-generation, solid-fuel MINUTEMAN was available; this force unlike the first-generation ICBM's, could "ride out" a surprise attack.[79]

However, as was the case in the Congressional elections of 1956, "gap thinking" became a key element in the Democratic Party's 1960 election platform; and the period was littered with many acrimonious charges and countercharges of who was to blame for the unfavorable missile balance.[80] The Democrats won the White House, and almost immediately the "missile gap" disappeared from their political consciences. Hanson Baldwin, the Military Editor of the New York Times, offered the following "missile gap" post-mortem:

> Indeed the 'missile gap'--its birth, growth, and early death--had an Alice-in-Wonderland quality about it which could flourish only in a democracy.[81]

The Eisenhower period in American politics was drawing to a close. While it had long been recognized that the military position of the United States had declined vis a vis that of the Soviet Union's,[82] the Kennedy Administration would inherit a rather dynamic technological and industrial base. This base would produce significant qualitative improvements in the already expanding fields of computer technology, warhead improvement, missile guidance, and extensions in range for both missiles and submarines.[83]

In the initial years of the next decade, the United States would come to enjoy a significant margin of strategic superiority, primarily by running a unilateral arms race; and then in later years, look on as the Soviet Union embarked on a more than comparable, massive building program.

The decade of the 1960's would also be subjected to a continuation of inter-service rivalry and the efforts of the services to maintain their "glamor" systems. Congress as a whole would slowly and painfully become a more active participant in the defense policy process, and likewise would the American public, by speaking out in a very important debate about strategic defenses.

Finally, the next decade would witness a reverent attempt by defense planners to provide "hard," quantifiable technological answers to "soft," intuitive, political-strategic problems. The Strategic Arms Limitation Talks

(SALT), beginning at the decade's end, would demonstrate that certain strategic myths do not easily succumb to new technological realities.

Strategy would continue to be a very inexact Science.

CHAPTER THREE

"Strategic Change"

Administrations come and go; ideally, national security is not as transient. Because of the long lead-times involved in weapons development, there is a certain continuity in defense planning. A newly innaugurated Administration remains committed to many decisions of previous Administrations. Technology and strategic doctrine out-distance many a political career.

The technological and strategic options available to the Kennedy Administration were antedated to the previous decade. The military revolutions in missiles, communications, and electronics were initiated long before the so-called "ship of state" changed hands in 1961. Furthermore, the "need" for the United States to move to a secure second-strike force was well-recognized during the period of the manned bomber; and "mutual assured destruction" was seen to be the keeper of superpower strategic stability as early as 1959 when The Washington Center of Foreign Policy Research reported:

> If and when both the US and USSR achieve relatively invulnerable strategic forces capable of devastating second-strike retaliation, the strategic equation will become more stable, though only as long as these capabilities are preserved.[84]

The test of a second-strike capability depends on whether "one can under nuclear attack, preserve vehicles, decision centers, and the flow of communications among them, whether one can and will transmit the order to retaliate, and whether one can penetrate adversary defenses."[85] And the adversary must <u>believe</u> that all of the above can and will be done.

The Eisenhower Administration had programmed the second-generation, solid-fuel MINUTEMAN ICBM and the first-generation, solid-fuel POLARIS IRBM to provide the technological basis for a second-strike force. The low firepower MINUTEMAN was celebrated as the real "economy" package in missilery; it was small, mobile, quick in reaction time, and easy to harden and handle,[86] while the POLARIS could be deployed in the vast oceans. Both forces could be withheld for retaliation, and these missile systems gave a sense of stability.[87] And until satellite reconnaissance became more sophisticated, the early targeting doctrine of MINUTEMAN and POLARIS would be population oriented.[88]

The Kennedy Administration, then, already possessed two good missiles in the arsenal. The Administration's immediate and most difficult decisions would be made over numbers. Despite the severe domestic political pressures of the "missile gap," the Eisenhower Department of Defense only authorized a MINUTEMAN force of 150. The Kennedy Administration could not be as restrained. Faced with a test of political will over Berlin in the summer crisis of

1961, restraint was difficult. The worsening of the international situation during this period was accompanied by a Soviet announcement of a one-third increase in military spending. These Soviet moves led to an extensive review of the United States' force structure.[89] The review confirmed the need for a rapid build-up of ballistic missile strength; subsequently, the American strategic arsenal grew from 63 ICBM's and 96 SLBM's in 1961, to 424 ICBM's and 224 SLBM's in 1963.[90] In addition to the build-up in strategic forces, general purpose forces were substantially increased and the combined force posture became inculcated with the doctrine, 'flexible response.'

The doctrine of 'flexible response' was an attempt to integrate and mutually reinforce conventional and strategic capabilities with foreign and defense policies. Each component would ideally, lend political credibility to the other. 'Flexible response' was a strategy designed to balance force structure with threat; it was the fine-tuning of military power to reflect political will in a wide spectrum of contingencies. The emphasis was on balance.

> The answer does not lie solely in any misguided attempt to eliminate conventional forces and rely solely upon retaliation. Such a course would be completely self-defeating.[91]

> If we have shown ourselves able and ready to engage in large-scale, non-nuclear warfare in response to a communist provocation, the Soviets can hardly misconstrue two things:

> first, that we regard this provocation as a challenge to our vital interests; and second, that we will use nuclear weapons to prevail if this becomes necessary.[92]

The McNamara Pentagon, in 1961, thus began to build balanced general purpose forces capable of short-notice global intervention. The added reach of American military power was a necessity for an ocean-bound nation which desired a larger and more forceful role in international affairs; "might was more likely to be right."

The 'flexible response' at the strategic level, enunciated in 1963 by Secretary of Defense Robert S. McNamara before the House Committee on Armed Services, promised an invulnerable second-strike capability with options for both damage-limitation and population destruction.

> What we are proposing is a capability to strike back after absorbing the first blow. This means we have to build and maintain a second-strike force. Such a force should have sufficient flexibility to permit a choice of strategies, particularly an ability to (1) strike back decisively at the entire Soviet target system simultaneously, or (2) strike back first at the Soviet bomber bases, missile sites, and other military installations ... and then if necessary, strike back at the Soviet urban and industrial complex in a controlled and deliberate way.[93]

As McNamara stated earlier, "our new policy gives us the flexibility to choose among several operational plans."[94] Targets were to be allocated to weapons on the basis of their urgency, importance, and physical characteristics. 'Flexible response' was, to a very

large extent, a function of American strategic superiority.

The concise claims of American strategic superiority were made in 1961 by Deputy Secretary of Defense Roswell Gilpatric, and these claims were designed to announce American predominance in world politics and the true nature of the so-called "missile gap."[95]

By building a strategic force structure which gave numerous options, "we may seek to terminate war on more favorable terms by using our forces as a bargaining weapon--by threatening further attack."[96] American nuclear forces, then, could also be used as an intra-war deterrent.

> . . . the Soviet leaders always say that they would strike at the entire complex of our military power . . . meaning our cities. If they were to do so, we would, of course, have no alternative but to retaliate in kind . . . It would certainly be in their interest as well as ours to try to limit the consequences of a nuclear exchange. By building into our forces a flexible capability, we at least eliminate the prospect that we could strike back in only one way, namely, against the entire Soviet targeting system including their cities. Such a prospect would give the Soviet Union no incentive to withhold attack against our cities in a first strike . . . Considering what is at stake, we believe it is worth the additional effort on our part to have this option.[97]

While the doctrine of 'flexible response' required the production of a hardened, dispersed, and concealed American strategic arsenal, 'flexible response' as an American strategic doctrine was largely an inverse function of a quantitative and qualitative weapons ratio

vis a vis the Soviet Union. 'Flexible response' was sensitive to changes in the Soviet arsenal.

> A very large increase in the number of fully hardened Soviet ICBM's and nuclear powered ballistic missile submarines would detract from our ability to destroy completely the Soviet's strategic nuclear forces.[98]

One must remember that a strategy of 'flexible response--damage limitation, that is, the destruction of the Soviet forces prior to their launch, must also contend with the availability of military targets. This is commonly referred to as "the empty-hole problem," and is a constant dilemma for a nation which has renounced preventive and pre-emptive war.[99]

For a period, though, it appeared that the United States would maintain strategic superiority vis a vis the Soviet Union. Sensitively and responsively, the McNamara Pentagon continued to build a large ICBM force. The momentum behind the program was political, not technological-strategic. A decision to freeze the ICBM force at 1,054 was made on November 5, 1964;[100] by this time, the Soviets themselves possessed sufficient numbers of hardened second-generation ICBM's and ballistic missile submarines to undermine a damage-limitation strategy.[101] Despite the numerical advantage and continuous qualitative improvement in the American strategic arsenal,[102] damage-limitation with an "offensive" emphasis was more an academic exercise

than a serious effort in strategic planning:

> Like popularity in politics, strategic superiority may be difficult to define, but when it shifts, those concerned are likely to be sensitive to the change;[103]

the doctrine of 'assured destruction' was approaching.

By 1967, 'assured destruction' was a sacred American strategic commitment,

> The cornerstone of our strategic policy continues to be to deter deliberate nuclear attack upon the United States, or its allies, by maintaining a highly reliable ability to inflict an unacceptable degree of damage upon any single aggressor, or combination of aggressors at any time during the course of a strategic nuclear exchange--even after absorbing a surprise first-strike ... This can be defined as our 'assured destruction' capability ... Now it is very imperative to understand that 'assured destruction' is the very essence of the whole deterrence concept.[104]

'Assured destruction' meant the United States could "destroy the aggressor to the point that his society simply was no longer viable in any meaningful twentieth century sense."[105] In more precise analytical terms, 'assured destruction' of the Soviet Union required the delivery of four hundred equivalent megatons on the USSR, enough to promptly destroy one-third of the population and one-half of the industry.[106]

The 'assured destruction' criteria was derived in the best analytical fashion of the McNamara Pentagon's cost-effective approach to defense planning. Given the demographic characteristics of the Soviet Union,[107] the delivery of fewer than four hundred equivalent megatons

was considered to be insufficient for deterrence while any number greater than the four hundred, would not produce significantly higher destruction returns for the added investment in strategic forces. Therefore, the number four hundred was the ideal cost-effective figure.[108]

Although the 'assured destruction' calculation was the result of the Department of Defense's Office of Systems Analysis' tendency to build clear-cut, high-confidence answers to strategic problems,[109] the calculation was, nonetheless, an explicit benchmark in an area of great uncertainty and it did serve as a front-line defense against pressures for more strategic weapons.[110]

According the the logic of 'assured destruction,'

> the most meaningful and realistic measurement of nuclear capability is neither gross megatonnage nor the number of available launchers, but rather, the number of separate warheads ... Furthermore, we will maintain a superiority by these same realistic criteria--over the USSR for as far ahead in the future as we can realistically plan.[111]

By the time the ICBM force reached its final deployment level in 1967, the development of the Multiple Individually Targetable Reentry Vehicle (MIRV) was sufficiently advanced for it to <u>fall</u> nicely into 'assured destruction' doctrine.[112] MIRV was a qualitative strategic offensive warhead improvement which would allow a single missile launcher to carry a number of individually targetable warheads. MIRV would lower substantially the ratio of offensive weapons needed to attack the defense.

A force of MIRVed missiles would enhance 'assured destruction.' However, other things being equal, in addition to being a potent counter-city weapon, MIRV's could be a significant counterforce weapon, depending on accuracy and payload. Because of its ambiguity, MIRV's were seen as being both stabilizing and destabilizing to the strategic balance.[113]

Concurrent with the quiet development of MIRV, there came many advances in Ballistic Missile Defense (BMD) technology. BMD would likewise have far-reaching and schizophrenic implications for the doctrine of 'assured destruction' and the superpower arms competition.[114]

To say that BMD was a politically and strategically tempestuous subject would, indeed, be an understatement. Ballistic Missile Defense had its technological beginnings with the development of the NIKE series of air defense missiles in 1944. The Army-Air Force bureaucratic battle was not late in following.[115] Defense against the ICBM was yet another step of an incremental technology "in the never-ending quest for national security."

With the potential threat of the Soviet ICBM program in the 1950's and the rejection of a preventive war solution, the United States "could not afford to put less effort into the defense than what was put into the offense."[116] Despite the many billions of dollars invested in the continental air defense, the conventional strategic fashion that "the best defense is a strong offense,"

would reign ultimate; and serious ballistic missile defense would remain a strategic aspersion.[117]

The bias toward the offense was further reinforced because offensive technology continued to advance ahead of defensive technology. Until the NIKE-X System, BMD could handle only the very "simple threats" an ICBM could impose.[118] With the development of the NIKE-X System with its phased array radar, vastly improved computers, and a small, high-acceleration interceptor missile, BMD became more technically sophisticated and offered a counter to the offense.[119]

In 1967, Secretary of Defense McNamara announced plans for a United States deployment of the SENTINEL ABM System. The SENTINEL was a "thin" deployment designed for an area defense of the United States against a technologically primitive Chinese nuclear attack.[120] The announcement sparked an intense technical and strategic debate on the merits of strategic defense.

At the technical end of the spectrum, opponents of SENTINEL argued that the Chinese could easily exhaust the interceptors at specific ABM sites, thereby maintaining their so-called "nuclear blackmail." In addition, the SENTINEL's radars were vulnerable and therefore, the soft electronics also required a defense. SENTINEL was further criticized on technical matters concerning the effects of exoatmospheric radiation on the highly-sensitive electronic components caused by the detonation

of nuclear warheads, the effects to urban areas caused by low-level SPRINT detonations, the "untestability" of an ABM system, and the dangers of nuclear accidents.

Proponents of SENTINEL responded by stating that the system was designed against a very primitive Chinese economy and technology; and, therefore, it could reduce significantly casualties should an attack occur.[121] Radar vulnerabilities admittedly, did exist, but were not technically insurmountable, while the effects of exo-atmospheric radiation, the "ionization phenomena" would pose no serious problems. Likewise, SPRINT interceptions would not produce deleterious low-level atomic effects.[122] As far as the "testability" of an ABM system, it was as testable as any strategic offensive weapon system on which deterrence rested.[123] And while nuclear accidents were possible, their probability was no greater than a nuclear accident occurring at numerous AEC power plants.

While SENTINEL ultimately, was not deployed due to the system's technical inability to offer a more diversified set of defensive options for its cost, the technological haggling over the ABM was actually specious to the real issue, that of strategic defense. The technological limitations of SENTINEL were used as a surrogate focal point, for the central debate concerned certain xenophobic strategic perceptions about nuclear deterrence.

To many academicians, Congressional leaders, and citizens, SENTINEL, while designed primarily against the

Chinese, deployment of the system would signal the first step in an inexorable offense/defense nuclear arms race with the Soviet Union.[124] The American proclivity for the "action-reaction" arms race interpretation was a rallying argument for those against ABM deployment. This syndrome was defectively reasoned as the possibility of an offense/defense arms race derived more from ill-founded American perceptions of strategic requirements and the all-too-common "anticipatory reaction" psychosis, than from any unreasonable Soviet view about strategic defense.[125]

While strategic defense was viewed as being quite provocative to the offense in the dubious context of 'assured destruction,'[126] strategic defense was also perceived to be politically destabilizing by creating a false sense of strategic confidence. This false confidence it was argued, would cause normally rational men to grow reckless and to engage in high-risk international behavior.[127] But to believe an ABM system would produce extreme political recklessness and games of nuclear brinksmanship,

> hardly seems logical ... To believe that better defense would encourage aggressive behavior on our part contradicts not only American history but even human nature.[128]

From 1969 to the present, SAFEGUARD has been the program designation for the United States ABM system. Still, the technology of strategic defense has been more

sophisticated[129] than most strategic thinking. Strategic defense, while offering a means to limit damage, provide a hedge against an accidental launch, and defend the land-based ICBM deterrent,[130] was persistently viewed as "not a good thing." As Albert Wohlstetter has so eloquently written in his article, "Good Guys, Bad Guys, and the ABM,"

> I would not, myself, have thought a few years ago that one could organized widespread popular indignation among Church groups and mothers on the basis of so extreme and far-fetched a dogma, one that suggests that it is all right to threaten to launch missiles at enemy civilians but peculiarly heinous to prepare to knock a missile down on its way to destroy millions of our civilians. 'Clergymen for Bombing Civilians Only?' 'Mothers for the Offense?' I'd have thought it would never fly. I was quite wrong.[131]

Despite the technological promise of defense and the logic behind defending people and MINUTEMAN, strategic doctrine continued to remain based on an anti-Maginot mentality.[132] With the signing of the Strategic Arms Limitation Talks' (SALT) Agreements in May of 1972, 'mutual assured destruction' has become institutionalized strategic doctrine for both the United States and the Soviet Union.[133]

A brief discussion of the dynamics of the SALT negotiations will expose many American strategic, policy-making short-comings and demonstrate that technological momentum is often a function of sanctimonious strategic doctrine.

Although the Nixon Administration has given verbal

homage to the criteria of 'strategic sufficiency' and the need for more strategic flexibility other than the indiscriminate slaughter of civilian hostages, the American approach to SALT reflected substantial allegiance to certain time-honored strategic offensive shibboleths[134] and a naive appreciation of the interaction between military force and political power.

The ABM Treaty, effective for an unlimited duration, restricts the United States and Soviet Union each to a token two-site ABM deployment.[135] In addition, there are further restrictions on radar configurations and the number of missile interceptors. These defensive limitations in light of the Interim Agreement on offensive weapons, will more than insure that "the missile will get through."[136] Strategic defense is forbidden fruit. In addition to leaving civilian populations exposed, as the hostages of "stable nuclear deterrence," the ABM Treaty restricts any significant defense of the land-based ICBM deterrent; an illogical and inconsistent deterrence policy. With the expected great increases in missile accuracy, defense of the deterrent should be a premium strategic objective.[137] While ABM research and development will continue, deployable strategic defense has little political momentum.

Furthermore, the American propensity to approach serious and substantive superpower politics as being an exercise in concilation has once again been made evident by the SALT proceedings. The results of conciliation have

been temporarily enshrined in the strategic balance negotiated at SALT I.[138] There was more than a liberal tendency on the part of the United States to dismiss the political utility of crude numbers in the superpower strategic balance, exemplified by Chief Negotiator G. Smith's statement, "There is no question that this agreement does not result in any inequality for the United States,"[139]

By emphasizing the technicalities of the negotiations and by conducting a one-way seminar on American strategic doctrine, the United States neglected the raw politics and images of power involved in SALT I. Numbers do matter in matters of strategy as well as in matters of international politics. The Interim Agreement gives the Soviet Union the quantitative advantage in every area controlled by the negotiated package.[140]

As an example of American strategic policy-making, SALT I reflected an extremely piecemeal methodology of "high" political negotiation[141] and a sophomoric failure to examine the substantive questions, "What doe we want our deterrent to do for us?"[142] And "Are we willing to assume the costs?" The American negotiating position shifted time after time with no clear policy ever emerging. The constant and vocal orchestration of the importance in reaching an agreement at the SALT I Summit, weakened any true hard bargaining position. The psychology of "we agree to agree" was more than evident.

In view of SALT I's potential technological aftermath, there is a need for a re-thinking of strategic policy. While defense of one's population will likely remain a strategic nonsequitur, the permissible across-the-board technological refinement of nuclear arsenals will continue.[143]

The American triad of ICBM's, manned bombers and missile submarines remain the symbols of the nation's virility,[144] and significant decisions affecting their future configurations and importance will be forthcoming.[145] National security planning dies not wait for the ink to dry from last year's "arms control" agreements. SALT II's bargaining positions will be constructed now.

CHAPTER FOUR

"The Dilemma Remains"

At the risk of sounding trite, the period 1945-1972 did not produce any unique strategic revelations per se; it couldn't because there haven't been any for countless years. What the period did demonstrate was the selective rediscovery and juxtaposition of old ideas with new technologies. The nuclear age has highlighted the ambivalent and multi-dimensional relationship between technology and strategy. Missiles, computers, and nuclear energy have not replaced any strategems; they have only made them more potentially dangerous.

The nuclear years have demonstrated most, if not all, of the "strategist's dilemmas" involved in the highly uncertain matters of national defense and psychological security within such a potentially destructive technological environment. Can any semblance of order be brought to the technological-strategic relationship? Perhaps, but the exposition reflects judgment, not fact.

On the one hand, it remains infinitely easier to predict what the technological developments will be. This is so largely because weapons systems tend to grow-out of already deployed machines. This "follow-on" process of

procurement is an integral part of the military services' reaffirmation of their raison d'etre. Furthermore, weapons technologies evolve around and develop along the "hard" laws of Science and are finite expressions of conventional wisdoms.

On the other hand, to predict what impact these technological developments will exert on the strategic environment is not so finite. It is an exercise in "soft" analysis and judgment which can be no better than the most basic assumptions. In some instances strategic doctrine has been profoundly affected by technological revolution; yet in others, doctrine has proven to be highly resistant to any change despite the wide range of technological possibilities.

Strategic paradigms then are very often resilient bastions of thought seeking to maintain an order in the uncertain minds of defense planners and strategists. Changes in strategic doctrine are quite similar to changes in anything, slow and hard-won.

Despite the often nebulous and amorphous impact of technology upon strategic doctrine, there has been a strong tendency to forget that weapons are tools of statesmen. The emphasis on the machines of strategy should be transferred to the machinations of strategy. All too often there has been no intellectual examination of the primary assumptions of national strategy but rather frequent pseudo-scientific exercises designed to extrapolate new

paradigms from old ones.

The intrinsic strategic debates over "How much is enough?" should have demonstrated that wepons systems, although mechnaical, inevitably reflect questions of attitude. Attitudes, unfortunately, are all too often mechanical. Here, plain common sense, good judgment, and political intuition are the prerequisites for any type of "analysis." Judgments, whether scientific or intuitive, are likely to be no better than the basic assumptions.

> In the security field we are thinking in terms not of certainty, which if demanded can only be paralyzing, but of high probabilities warranting high-confidence predictions.[146]

The questions about weapons systems and their relationship to strategic doctrine should be answered not in terms of technical capabilities, the horror scenarists don't need the help anyway, but in terms of their political purpose. Politics has often been neglected when examining hardware systems.[147] But in the final analysis, the strategic hardware mix, the virile pillars of American defense policy and the products of technology, remain matters of political opinion, circumstance, and compromise.

Still there have been frequent belabored attempts to "prove" that strategic doctrine is determined by the "hard" inevitable products of rapid technological advance. Technology was just one aspect among the many in the evolution of strategic doctrine.

'Massive retaliation,' 'flexible response,' and

'assured destruction' were the result of an evolving series of "soft" complex strategic mythologies and the complex interactions between nations and among various domestic participants. Unfortunately, these doctrines reflected a bias toward the total solution to multi-variate questions of strategy and power.

While not unduly denigrating the distinct pressures technologies can exert upon the strategic environment, the making of strategy remains a function of intellectual commitments to the past, reactions to psychological perceptions of threats in the international system, and much emotional political infighting.

'Massive retaliation' and the revitalization of the offensive spirit in American international politics reflected the belief that the threat of the massive use of American force could resolve all vital American international commitments. The substitution of nuclear firepower for conventional manpower was also heavily influenced by the era's conventional fiscal wisdom that an annually high defense budget would ruin the American economy. The reliance on 'massive retaliation' reflected the naive belief that America could play the part of a world power with little human and economic cost. Unfortunately, "the games nations play" frequently require the players to ante-up. 'Massive retaliation' was the wrong game at the wrong time; the doctrine was too steep to wager either national prestige or national survival. Technology, if

anything, should have made this very clear.

Equally important to the strategic doctrine and hardware procurement of the 1950's and well beyond, was the endemic phenomenon of "gap" prediction. The Cold War mythologies and the prudent requirements of defense planning in the uncertain environment, exerted strong pressures for hefty aircraft and missile procurement to complement the boisterous clamor of 'massive retaliation.' Only through long and hard political infighting did the Eisenhower Administration avert the extreme over-building of America's strategic forces.

While successful in curbing procurement appetites, the Eisenhower Administration could not manage to control serious interservice rivalry. Interservice rivalry and the battles for bureaucratic muscle were other endemic variables in defense planning and in many instances, the real danger to any arms spiral came from the "action-reaction" among the services themselves. Loose coordination of technological development allowed the individual services much political bargaining power and would allow them in some instances, the freedom to produce and deploy weapons systems which had very little to do with the strategic doctrine. The ultimate resolution of many jurisdictional and force level disputes was accomplished by "satisficing compromises" in which all services won concessions.

The doctrine 'massive retaliation' demonstrated a

deep philosophical commitment to the strategic offensive and the doctrine 'flexible response' was a quantum expansion of that bias. By expanding both strategic and conventional capabilities, the Kennedy Administration demonstrated a commitment to the threat and the use of force to resolve political situations. The procurement record of this Administration indicates not so much a juggernaut of technological mad momentum as it does little resistance to service demands for weapons systems and a greater willingness to compromise and satisfice at higher force levels. 'Flexible response' signaled a significantly larger defense budget and the running of a unilateral arms race. "The worst case" is not always the most prudent form of defense planning.

'Flexible response' although short-lived, produced the hardware for the epitome of the offensive bias, 'assured destruction.' 'Assured destruction' was really 'massive retaliation' of another degree. The changing strategic balance vis a vis the Soviet Union and the frustrating results produced by the use of American military force, produced the complete swing to the "all or nothing" psyche of American "stable deterrence."

The explicit criteria of 'assured destruction' were derived from pseudo-scientific analyses based on the erroneous assumption of a mirror-image adversary. Had more basic questions regarding the suicidal implications of 'assured destruction' been raised, the doctrine may

have been different.

The analytical and technical bias of 'assured destruction' abscured the political meaning of strategic forces. The habit for reasoning in absolutes and the devotion to the technicalities of strategic issues, rather than concern for the substantive matters of superpower politics, helped to produce the "it must not fail" system of nuclear deterrence. The technological establishments were the tools of doctrinal biases.

The making of strategy is a kaleidoscopic exercise involving many bits and pieces of technology, economics, pure chance, psychological pre-dispositions, and time-hallowed doctrinal beliefs. The plane upon which these fragments circulate is politics, both domestic and international. Deterrence is a state of mind,

> A foolish consistency is the hobgoblin of little minds, adored by little statesmen and philosophers and divines.[148]

FOOTNOTES

1 United States Congress, Senate, Hearings Before the Subcommittee on National Security and International Operations of the Committee on Government Operations, "Planning--Programming--Budgeting," 90th Congress, First Session (Washington: GPO, 1967), Dr. Alain Enthoven, p. 157.

2 Bernard Brodie, "Strategy As A Science," World Politics, July 1949, p. 477. See also Malcolm Hoag, "Some Complexities in Military Planning," World Politics, July 1959.

3 United States Congress, Senate, Hearings Before the Preparedness Investigating Subcommittee of the Committee on Armed Services,"Status of U.S. Strategic Power," 90th Congress, 2nd Session (Washington: GPO, 1968), Part I p. 13. See also Klaus Knorr and Oskar Morgenstern, "Science and Defense: Some Critical Thoughts on Military Research and Development," Policy Memorandum 32, The Center of International Studies, Princeton University, 1965, p. 45.

4 Bernard Brodie, Strategy In The Missile Age, p. 388. On page 21, Brodie states, "Military strategy, while one of the most ancient of the human Sciences, is at the same time, one of the least developed."

5 Ibid., p. 272. Brodie adds on page 351 that "Over the long term, a policy of deterrence threatens to founder on the fact that too few people are sufficiently rational or sufficiently wise, with respect to either diplomacy or strategy to make it work." For a further critique of deterrence, see Philip Green's, Deadly Logic.

6 Donald Brennan and J. J. Holst, "Ballistic Missile Defense: Two Views," Adelphi Paper #43, London: ISS, November 1967, p. 17.

7
Brodie, Strategy In The Missile Age, p. 277. In other words, numbers do matter. Gross numbers, while not a sophisticated measure, are the denominations in which power is perceived. See also, Hearings, "Planning--Programming--Budgeting," 1967, p. 131, "No set of calculations alone can logically imply that we should follow a given strategy. No responsible Defense official believes that it is possible to calculate the answers to major national security policy questions." According to Senator Henry Jackson, P. 118, " . . . there is no substitute in government for generalists with good judgment." One often wonders, "where have they gone?"

8
Brodie, Strategy In The Missile Age, p. 397.

9
Ibid., p. 283. However, with a limited ABM deployment, the commitment to a surviving land-based retaliatory force may be more a psychological one than an actual hardware commitment. See footnote 137.

10
Operations Research, January/February 1972, p. 241.

11
Statement By Secretary of Defense Clark M. Clifford, The 1970 Defense Budget and Defense Program For Fiscal Years 1970-74, (Washington: GPO, 1969).

12
Colin S. Gray, "'Gap' Prediction and America's Defense: Arms Race Behavior in the Eisenhower Years," Orbis, Spring 1972, p. 258. However, 'gap' prediction and subsequent behavior "could set into motion the self-fulfilling prophecy--the opponent's reaction to the originally anticipated reaction."

13
United States Congress, Senate, Hearings Before the Committee on Foreign Relations, "Intelligence and the ABM," 91st Congress, 2nd Session (Washington: GPO, 1969), p. 63.

14
A statement made by Dr. Alain Enthoven cited in William W. Kaufmann, The McNamara Strategy, pp. 241-242. However, according to Sir Solly Zuckerman, "What we all need to learn is that the consequences of scientific activity also cannot be commanded any more than . . . the layman can command a scientist to make a breakthrough in this or that problem." p. ix of Scientists and War. These are matters of degree.

15
A technological revolution would be a significant breakthrough in an area of research and development. The quantum jump in the "state-of-the-art would have great impact on the strategic environment.

16
Herman Kahn, On Thermonuclear War, p. 316.

17
United States Congress, Senate, Committee Print Submitted by the Subcommittee on National Security and International Operations of the Committee on Government Operations, "Defense Analysis: Two Examples," 91st Congress, 1st Session (Washington: GPO, 1969), p. 7.

18
United States Congress, Hearings Before the Subcommittee on Military Applications of Atomic Energy of the Joint Committee on Atomic Energy, "Scope, Magnitude, and Implications of the US ABM Program," 90th Congress, 1st Session (Washington: GPO, 1967), p. 142. The waiting for technology to develop was one variable in both the MINUTEMAN and POLARIS programs; see United States Congress, Senate, Hearings Before the Preparedness Investigating Subcommittee of the Committee on Armed Services, "Inquiry Into Satellite and Missile Programs," 85th Congress, 1st Session and 2nd Session (Washington: GPO, 1957 and 1958), p. 1735. For a current perspective of the changing technological and political environments, see United States Congress, Senate, Hearings Before the Committee on Armed Services, "Weapon Systems Acquisition Process," 92nd Congress, 1st Session (Washington: GPO, 1971).

19
Hearings, "Inquiry Into Satellite and Missile Programs," 1957 and 1958, p. 389. See also, United States Congress, Senate, Report of the Subcommittee on the Air Force of the Committee on Armed Services, "Airpower," 84th Congress, (Washington: GPO, 1957), pp. 40-41.

20
Hearings, "Scope, Magnitude, and Implications of the US ABM Program," 1967, Dr. John Foster, p. 142. See also, Hearings, "Status of US Strategic Power," 1968, Part I, p. 49.

21
James Kurth, "A Widening Gyre: The Logic of American Weapons Procurement," Public Policy, Summer 1971, p. 396.

22
Among them were the A-bomb, the H-bomb, and bomber development. The recent Soviet build-up of strategic forces prior to SALT I was not recognized to be a drive for numerical superiority until the Soviets actually stockpiled the large quantities. Even then, Soviet intentions remained ambiguous. Throughout the nuclear age, there has been a distinct tendency to "mirror-image" the Soviet Union, i. e. to expect the Soviets to emulate our strategic behavior.

23
United States Congress, Senate, Hearings Before the Subcommittee on the Air Force of the Committee on Armed Services, "Study of Airpower," 84th Congress, 2nd Session (Washington: GPO, 1956), p. 1527.

24
Brodie, Strategy In The Missile Age, p. 20.

25
Knorr and Morgenstern, "Science and Defense: . . . ," p. 24. See also, Benjamin S. Lambeth, "Deterrence in the MIRV Era," World Politics, January 1972, p. 240.

26
United States Congress, House, Eleventh Report by the Committee on Government Operations, "Organization and Management of Missile Programs," 86th Congress, 1st Session (Washington: GPO, 1959), p. 149. See also, Knorr and Morgenstern, loc. cit. pp. 12-13.

27
United States Congress, House, Hearings Before the Subcommittee on National Security Policy and Scientific Developments of the Committee on Foreign Affairs, "Strategy and Science: Toward A National Security Policy for the 1970's" 91st Congress, 1st Session (Washington: GPO, 1969), p. 41.

28
Committee on Government Operations Print, "Defense Analysis: Two Examples," 1969, p. 9.

29
Hearings, "Strategy and Science," 1969, p. 148.

30
Brodie, Strategy In The Missile Age, p. 361.

31
Report, "Study of Airpower," 1957, p. 9.

32
Brodie, Strategy In The Missile Age, p. 359. As for the budget ceiling, Brodie writes, "We do not have and probably never will have enough money to buy all of the things we could effectively use for our defense."

"Strategy in peacetime is expressed largely in choices among weapons systems." p. 361. However, procurement of systems is not always purely a function of strategic requirements. For a good discussion of the budgetary process, see Aaron Wildavsky, The Politics of the Budgetary Process.

33
Eleventh Report, "Organization and Management of Missile Programs," 1959, p. 150.

34
Robert S. McNamara, "United States Nuclear Strategy," in Vital Speeches of the Day, September 18, 1967, p. 743. See also, Kurth, "A Widening Gyre: The Logic of American Weapons Procurement," p. 396.

Some literature regarding this subject reads like a religious allegory: "Whenever a new discovery is made in Science, the devil is quick to capture it, while angels start a lengthy discussion on how to use the discovery in the most efficient way." See V. Emelyanov, "On the Question of the Development of Military Technology," in The Impact of New Technologies on the Arms Race, T. B. Feld, et al. ed., p. 335.

35
"ABM: Yes or No?" The Center for the Study of Democratic Institutions, A Center Occasional Paper, Donald Brennan, p. 22.

36
"Developments in Military Technology and Their Impact on United States Strategy and Foreign Policy," Report of Washington Center of Foreign Policy Research of The Johns Hopkins University, (Washington: GPO, 1959), p. 61.

37
Colin S. Gray, "Air Defense: A Sceptical View," Queens Quarterly, Spring 1972, p. 3.

38
United States Congress, Senate, Hearings Before the Committee on Foreign Relations, "Strategic and Foreign Policy Implications of ABM Systems," 91st Congress, 1st Session (Washington: GPO, 1969), p. 150. See also Knorr and Morgenstern, "Science and Defense: . . . " p. 37; and Colin S. Gray, "The Arms Race is About Politics," Foreign Policy, Winter 1972-73, p. 120.

39
See page one of the text.

Chapter Two

40
Indeed, scientific breakthroughs are often viewed as being the product of some absent-minded scientist stumbling onto new laws of nature. While this image makes wonderful reading, scientific discovery is most often the result of hard constant explorations. In both cases, though, the trials and errors are present.

41
Henry De Wolf Smyth, Atomic Energy For Military Purposes:, "The Official Report on the Development of the Atomic Bomb." p. 2. Hereafter cited as The Smyth Report. In actual figures, one kilogram of matter (2.2 lbs.) if converted entirely into energy, would yield 25 billion kilowatt hours.

42
Ibid., pp. 16, 25, 31-33, 44-47, 98, and 247. Among them were the separation of isotopes from uranium and plutonium and controlling the critical size of a large atomic pile while conducting a sustained chain reaction. These bridges were built and crossed in the 1930's and 1940's, yet, even the Alamogordo Test was filled with great uncertainty. The bomb was not created by "the devilish inspiration of some warped genius but by thousands of normal men and women working for the safety of their country," p. 223. See also, Bernard Brodie, "The Atomic Bomb and American Security," Memo 18, Yale Institute of International Studies, p. 2. Brodie's paper, circa 1945, expressed concern about possible acts of nuclear sabotage and terrorism, a relevant concern today.

43
For a discussion of the physical effects of nuclear weapons see, Los Alamos Scientific Laboratory's, The Effects of Nuclear Weapons, prepared for and in cooperation with the United States Department of Defense and United States Atomic Energy Commission (Washington: GPO, 1950), and The Effects of Nuclear Weapons, United States Department of Defense (Washington: GPO, 1962).

44
United States Government, Department of War, The United States Strategic Bombing Survey:, "The Effects of Strategic Bombing on Japanese Morale," (Washington: GPO, 1947), p. 4. See also, Brodie, Strategy In The Missile Age, pp. 107, 123, and 130.

45
Ibid., p. 152.

46
Ibid., pp. 82 and 152. Brodie, "The Atomic Bomb and American Security," p. 15. The Effects of Atomic Weapons 1950, p. 17, and George Quester, Nuclear Diplomacy: The First Twenty-five Years, p. 7.

47
United States Congress, Joint Committee on Atomic Energy, "The Hydrogen Bomb and International Control: Technical and Background Information," 81st Congress, 2nd Session (Washington: GPO, 1950), pp. 15-18. The American nuclear monopoly was a rather ephemeral condition of the post-war world. The Soviet detonation on July 29, 1949 was a "technological surprise" in only the gross underestimation of Soviet capabilities. The Smyth Report provided much nuclear knowledge. See Brodie, "The Atomic Bomb and American Security," pp. 20-21.

48
See Quester, p. 7.

49
United States Congress, Senate, Hearings Before the Committee on Foreign Relations, "Developments in Military Technology and Impact on United States Strategy and Foreign Policy," 87th Congress, 1st Session (Washington: GPO, 1961), Arnold Wolfers, p. 315.

50
Samuel P. Huntington, "Interservice Competition and the Political Roles of the Armed Services," The American Political Science Review, March 1961, p. 44. Interservice rivalry at this time tended to weaken the military as a whole but strengthened the individual services. See also Edgar M. Bottome, The Missile Gap: A Study of the Formulation of Military and Political Policy, p. 18.

51
Quester, p. 102. Despite the enormous increases in nuclear power, there were conflicting estimates over the length of any future war. The newly innaugurated Eisenhower Administration would plan on the "average" of the short Air Force

estimate and the long Army one. The final figure was three years. See also, Report, "Study of Airpower," pp. 2-5, and the Report of Panel II of the Special Studies Project, The Rockefeller Report, 1958.

52
Warner R. Schilling, Paul Y. Hammond, and Glenn H. Snyder, Strategy, Politics, and Defense Budgets; especially the chapter "NSC-68: Prologue to Rearmament." It is frequently assumed that Korea pushed NSC-68 from its status as an Executive paper to a full defense program. This was not entirely the case. When the Korean War began, NSC-68 remained unprogrammed and unapproved; p. 345.

53
Kahn, p. 419. See Peter M. Bowers, Boeing Aircraft Since 1916, p. 62. See also, Hearings, "Strategy and Science: . . " 1969, p. 266.

54
Brodie, Strategy In The Missile Age, pp. 84, 185, 393, and 403. The outcome of any future could be decided by 1) who strikes first? 2) with what degree of surprise? 3) against what preparations. See also, Hearings, "Study of Airpower," 1956, pp. 125, 441, 1278, and 1481. The element of surprise was not lost on Soviet strategists, although, Stalin's "principles of war" had yet to be discounted.

55
The decision to move ahead on fusion was made in 1950. Fusion was surrounded by much technological uncertainty because of the difficulty in controlling the reaction. See "The Hydrogen Bomb and International Control: . . . ," 1950, pp. 1 and 23. For an analysis of the qualitative differences between megaton and kiloton weapons, see The Effects of Nuclear Weapons, 1962. pp. 87-91.

56
Bottome, The Missile Gap: . . . , p. 17. See also, Hearings, "Inquiry Into Satellite and Missile Programs," 1957 and 1958, Dr. Edward Teller, p. 6. And Eleventh Report, "Organization and Management of Missile Programs," 1959, p. 69.

57
John Foster Dulles, "Foreign Policies and National Security," in Vital Speeches of the Day, February 1, 1954. Gradually, Dulles' comments were retracted; but if one examines the course actually pursued by national defense policy and military programming over the period that followed, it was the original speech which stood. It was, however, difficult to determine exactly how much US "initiative" 'massive retaliation' meant. The ambiguity was intentional.

58
Remarks made by General Curtis Le May, cited by Kaufmann, p. 13.

59
From Lambeth, p. 241. As early as 1945, Brodie wrote that "massive retaliation" combines the maximum of indiscriminate destruction with the minimum of direct control. The question reased was one of political credibility; see "The Atomic Bomb and American Security," p. 8. Brodie later wrote, that because of the Soviet possession of fusion, the time for a doctrine of "massive retaliation" should certainly have been ending in 1954, not just beginning. All future American strategic doctrine would be based on some form of "massive retaliation," Strategy In the Missile Age, pp. 249-251.

60
Cited by David Rees, "Towards the McNamara Doctrine," in The Military-Technical Revolution, John Erickson ed., p. 86. Page 100 of The Washington Center's Foreign Policy Research Report, 1959 loc. cit., presents a good discussion of the economic motivations behind the "New Look."

61
Hearings, "Study of Airpower," 1956, p. 1668. For a discussion of the politics and economics of both interservice rivalry and the nuclear-non-nuclear force levels debate, see Maxwell D. Taylor, The Uncertain Trumpet; Eleventh Report, "Organization and Management of Missile Programs," 1959, pp. 151-154; Hearings, "Inquiry Into Satellite and Missile Programs," 1958, p. 1007; Bottome, The Missile Gap: . . . p. 32; and The Rockefeller Report. The Soviet Union would also undergo a similar period where nuclear firepower was substituted for manpower. In both cases, general purpose forces would ultimately be seen as having great strategic utility by increasing the credibility of the deterrent.

62
Albert Wohlstetter, "The Delicate Balance of Terror," Foreign Affairs, January 1959, p. 211.

63
For an excellent analysis of air defense see, Colin S. Gray's, "Air Defense: A Sceptical View," and "Canada and NORAD: A Study in Strategy," Behind the Headlines, June 1972. For the scenario of a Soviet bomber attack, see Hearings, "Strategy and Science," 1969, p. 4, and for the basics of the system, see Eleventh Report, "Organization and Management of Missile Programs," 1959. Interestingly, the Air Force showed little enthusiasm for defensive measures because of the funds it would divert from B-52 procurement, Quester, p. 23. While the Air Defense system of the 1950's may have been illogically defined, its development gave technological insights into future anti-ballistic missile defenses; it also created another industrial lobby.

64
Albert Wohlstetter et. al., Protecting US Power to Strike Back in the 1950's and 1960's, RAND-290, p. 33. SAC forces were "soft" and concentrated at a few bases with insufficient warning available, and active defense facilities were very poor.

65
Colin S. Gray, "'Gap' Prediction and America's Defense: . . . "

66
Hearings, "Study of Airpower," 1956, pp. 184-1770. The perception of the Soviet bomber program was a mirror-image of that of the United States, i. e. the building of a large long-range Air Force until the deployment of missile forces.

67
Ibid., p. 1587. Along with production rate increases came a hefty increase in the size of the B-52 wing, from 30-45. And there would be eleven heavy bomber wings instead of seven. The twenty per month production rate was never attained; the rate was final at fifteen. See Hearings, "Inquiry Into Satellite and Missile Programs," 1958, p. 271.

68
Again, it is a question of degree. The Eisenhower Administration, although responding to the pressures of "gap" prediction, could have procured more planes than "sensible precaution" dictated. See Gray, "'Gap' Prediction and America's Defense: . . . ," p. 265.

69
While the manned bomber is more vulnerable, it possesses certain advantages over missiles; it can be launched on waining and recalled; it has a very large payload; and it can hunt for targets. Manned bombers will not likely be completely replaced by missiles; they also have a strong Air Force and industrial lobby.

70
Eleventh Report, "Organization and Management of Missile Programs," 1959, pp. 35-52. The basic clash in the missile field was between the Army and the Air Force. With the formation of NASA in 1958, came yet another area of jurisdictional debate involving the Department of Defense and the Space Agency, p. 144.

71
Hearings, "Inquiry Into Satellite and Missile Programs," 1958, p. 1007.

72
Eleventh Report, "Organization and Management of Missile Programs," 1959, p. 71.

73
Hearings, "Study of Airpower," 1956, p. 40. The accounting procedures had been altered by the Administration and an increase in research and development funds was shown when actually R & D decreased.

74
Morton Halperin, "The Gaither Committee and the Policy Process," World Politics, April 1961, p. 367.

75
An ad hoc committee was formed to decide on a single land-based IRBM but the group could not state with assurance which was the better system, THOR or JUPITER. Ultimately, both were deployed. See Eleventh Report, "Organization and Management of Missile Programs," 1959, pp. 33 and 115. However, by the end of 1956, the Army and Navy were separated from their joint IRBM program, and the Navy went on to develop POLARIS, p. 29. "Back-up" systems frequently become the priority program's chief rival.

76
The following was asked of Secretary of Defense McElroy in January 1959: "Do you assume that Russia is now ahead of us in missiles?" The Secretary responded, "No, we do not assume that as of now." See United States Congress, Senate, Joint Hearings Before the Preparedness Investigating Subcommittee of the Committee on Armed Services and the Committee on Aeronautical and Space Sciences, "Missile and Space Activities," 86th Congress, 1st Session (Washington: GPO, 1959), p. 49. The Administration defined the so-called "missile gap" in terms of "state-of-the art" technologies, in which the DoD claimed the United States was ahead; see United States Congress, Senate, Hearings Before the Preparedness Investigating Subcommittee of the Committee on Armed Services in Conjunction with the Committee on Aeronautical and Space Sciences, "Missiles, Space, and Other Major Defense Matters," 86th Congress, 2nd Session (Washington: GPO, 1960), p. 218. However, the Senate Armed Services Committee was not to be placated.

77
Report of The Washington Center of Foreign Policy Research, 1959, p. 57. The Report goes on to say that even if the United States wanted to overbuild its missile deterrent, it could not. "The choice as it affected the early years of the missile gap was no longer an option for the United States." p. 58. Events would prove this an erroneous assumption.

78
Bottome, The Missile Gap: . . . ,p. 118.

79
Hearings, "Missiles, Space, and Other Major Defense Matters," 1960, p. 502. Missile technology was advancing so rapidly that to have gone ahead with full-scale deployment of ATLAS and TITAN would have been a costly mistake; see, Hearings, "Inquiry Into Satellite and Missile Programs," 1958, p. 2319. The first-generation ICBM's were liquid-fuel making them a first-strike weapon. Solid-fuel was, however, having difficulties; pp. 1735 and 2368-2383.

80
Bottome, The Missile Gap: . . . , pp. 59-60. The Republicans blamed the "missile gap" on the Truman Administration for failing to provide sufficient attention and money to the programs. However, money did not seem to be the real issue in missile development; from 1950-1959, twenty-five billion was spent; see Eleventh Report, "Organization and Management of Missile Programs," 1959, p. 63.

81
Bottome, The Missile Gap: . . . , p. 168.

82
Report of The Washington Center of Foreign Policy Research, 1959, p. 3.

83
Ibid., p. 4.

Chapter Three

84
Ibid., p. 8. Albert Wohlstetter wrote in his article, "The Delicate Balance of Terror," that the pillars of nuclear deterrence were cast in the 1950's; p. 216.

85
Committee on Government Operations Print, "Defense Analysis: Two Examples," 1969, p. 6.

86
Eleventh Report, "Organization and Management of Missile Programs," 1959, pp. 68 and 146. The MINUTEMAN development plan was also the most daring example of concurrency management. The complete development and production of the system were done simultaneously and in three years. See Eugene M. Emme, ed., The History of Rocket Technology, p. 157. Current procurement policy is "fly before you buy," exactly opposite of MINUTEMAN's pattern.

87
MINUTEMAN was to be placed in silos hardened to 300 psi. while the command and control centers were to be hardened to 1,000psi. See Earnest G. Schwiebert, A History of the USAF Ballistic Missiles, p. 60. The enemy's attack-timing problem with a "triad" U.S. force to be destroyed was seen to be very great.

88
The United States "did not have the least idea where Soviet missile sites were located." See Hearings, "Missiles, Space, and Other Major Defense Matters," 1960, p. 287. And when satellites began to provide more reliable targeting data, because of POLARIS' guidance system and limited payload, the SAC bombers and the MINUTEMAN ICBM's were the counterforce weapons.

89
Department of Defense Annual Report for Fiscal Year 1961, (Washington: GPO, 1962), p. 3.

90
The Military Balance 1971-1972, p. 56.

91
This was a statement made by President Eisenhower cited by Halperin, "The Gaither Committee and the Policy Process," p. 371. The first official break with the "All or Nothing" philosophy was signaled by General L. Norstad's speech of 11/12/57. In it he stated a need for an option "more useful than the simple choice between all or nothing. If we have means to meet less-than-ultimate threats with a decisive but less-than-ultimate response, the very possession of this ability would discourage the threat, and would thereby provide us with essential political and military manouever-ability," see Brodie, Strategy In The Missile Age, p. 337. However, throughout the Eisenhower years there was a constant debate over how much conventional capability was needed. See Hearings, "Inquiry Into Satellite and Missile Programs," 1958, General Taylor, pp. 476 and 529; and Hearings, "Study of Airpower," 1956, General Gavin, pp. 740, 810, and 841.

92
Robert S. McNamara cited by Kaufmann, p. 75. For the ethos of the use of force in the Kennedy Administration see, David Halberstam's, The Best and the Brightest. In 1961, American forces were still preparing for different wars; the Air Force for a short nuclear war and the Army for a long war, see Hearings, "Planning-Programming-Budgeting," 1967, Dr. A. Enthoven, p. 97.

93
Robert S. McNamara cited by Kaufmann, p. 92.

94
Ibid., p. 75.

95
Roswell Gilpatric, "Present Defense Policies and Programs," in Vital Speeches of the Day, December 1, 1961.

96
Kaufmann, p. 75.

97
Ibid., p. 92. The reader is reminded to consider these phrases: "to try to limit the consequences of a nuclear exchange" and "Considering what is at stake..." in the context of the ABM debate.

98
Ibid., p. 94.

99
"We are a country that has indicated repeatedly that we will not undertake a pre-emptive strike. Therefore, we have a very real problem because we do not know how many of the holes are going to be filled and how many of the holes are going to be empty." See Hearings, "Status of US Strategic Power," 1968, p. 357. However, a renunciation of pre-emptive war is not a fact.

100
United States Congress, Senat, Report by the Preparedness Investigating Subcommittee of the Committee on Armed Services, "Status of US Strategic Power," 90th Congress, 2nd Session (Washington: GPO, 1968), p. 12. See also, Kurth, "A Widening Gyre:...", p. 382 and Robert S. McNamara, "US Nuclear Strategy," p. 743. McNamara stated that the final force levels of MINUTEMAN and POLARIS were the results of "hedging" against a possible Soviet build-up, another mirror-image perception. Much uncertainty of the Soviet threat should have been eliminated with SAMOS. As is often the case, force levels are compromise figures; such was the case with MINUTEMAN, the Air Force had requested 3,000.

101
The Military Balance 1971-1972, p. 56. Improvements in Soviet forces began to erode 'damage-limitation.' See Hearings, Strategic and Foreign Policy Implications of ABM Systems," 1969, p. 25. The capabilities of the SSBN would make the sea-based deterrent a vital element in 'assured destruction.' However, as General Wheeler has stated, "there will always be some elements of 'flexible response,'" see Hearings, "Status of US Strategic Power," 1968, Part I, p. 3.

102
The United States introduced the A-2 and A-3 models of POLARIS, the MINUTEMAN II, and the HOUND-DOG equipped B-52G and H. Damage-limitation as a serious strategy for a country which renounced preventive and pre-emptive war would be much more viable with an emphasis on strategic defense. The ABM debate was still years ahedd.

103
Hearings, "Scope, Magnitude, and Implications of the US ABM Program," 1967, p. 72. Superiority would be redefined to mean technological or qualitative superiority, see Hearings, "Status of US Strategic Power," 1968, Part I, General Wheeler, p. 17 and Dr. J. Foster, p. 59.

104
Robert S. McNamara, "US Nuclear Strategy." 'Assured destruction' was the very essence of United States doctrine, not necessarily the Soviet Union's.

105
Ibid., p. 738.

106
Ibid., p. 739.

107
See Appendix B, "Cumulative Percentage Distribution of Population and Industrial Capacity of the US and USSR: 1970." Soviet population and industry was not as densely confined as those of the US. Therefore, there were fewer Soviet prime targets for the US to attack.

108
See Appendix C, "Assured Destruction Calculations." Four hundred equivalent megatons would kill 74 million Russians and destroy 76% of all Soviet industry. These figures reflect immediate damage only and were thought to be sufficiently high enough to provide a state of deterrence.

109
For a critique of the US problem-solving approach to strategic policy-making, see Ralph E. Strauch, "Winners and Losers: A Conceptual Barrier in Our Strategic Thinking," RAND P-4769, June, 1972. For comments and criticisms on the Office for Systems Analysis, see United States Congress, Senate, Memorandum Prepared at the Request of the Subcommittee on National Security and International Operations of the Committee on Government Operations, "Uses and Abuses of Analysis," 90th Congress, 2nd Session (Washington: GPO, 1968). Aaron Wildavsky, "Rescuing Policy Analysis From PPBS," Public Administration Review, March/April, 1969. And for a journeyman's guide to systems analysis see, E.S. Quade and W.I. Boucher, Systems Analysis and Policy Planning.

110
As General Wheeler stated, "the cornerstone of US strategy is Assured Destruction, although it has been given greater weight than the Joint Chiefs of Staff would have advocated." See Hearings, "Status of US Strategic Power," 1968, Part I, p. 5.

111
Robert S. McNamara, "US Nuclear Strategy," p. 739. With future MIRV technology, a missile's throweight would be the most relevant criteria in determining the number of separate warheads.

112
MIRV was something on the nature of an invention. It was invented in the US probably in 1962 or 1963. Only the trade journals gave it coverage and until 1967, the idea was only well-known in classified circles. Around 1968 it began to be a prominent topic of discussion in the US. See United States Congress, House, Hearings Before the Subcommittee on National Security Policy and Scientific Developments of the Committee on Foreign Affairs, "Diplomatic and Strategic Impact of Multiple Warhead Missiles," 91st Congress, 1st Session (Washington: GPO, 1969), Donald Brennan, p. 128.

113
Hearings, "Status of US Strategic Power," 1968, Part I, pp. 33 and 121. The blast effects of nuclear weapons do not increase in direct proportion to their yield. For a counter-force weapon, doubling the accuracy is comparable to increasing the yield by a factor of 10. MIRV's also can demolish urban areas more effectively than a large yield single warhead.

114
There were many "mad momentum" interpretations given to MIRV development and BMD technology, see Hearings, "Diplomatic and Strategic Impact of Multiple Warhead Missiles," 1969, p.2. With a freeze on numbers of launchers, MIRV was a satisficer to the JCS, while BMD was an expansion of air defense. Incidentally, the Army needed BMD to stay in the missile game.

115
Hearings, "Inquiry Into Satellite and Missile Programs," 1958, pp. 380-381. The conflict over air defense missions and roles was eventually settled by an arbitrary 200 mile limit: missiles with greater range would be the Air Force's, missiles with less range would be the Army's. However, "area" defense and "point" defense did not lend themselves to easy distinction. Jurisdiction over air defense remained ambiguous, see Eleventh Report, "Organization and Management of Missile Programs," 1959, p.126.

116
Hearings, "Study of Airpower," 1956, p. 257. Also, Brodie, Strategy In The Missile Age, p. 176.

117
Brodie, "The Atomic Bomb and American Security," pp. 9-11. As early as 1945, Brodie recognized the dangers in the dogma, "the best defense is the best offense." Brodie wrote, "Whatever may be the specific changes indicated, it is clear that our military authorities will have to bestir themselves to a wholly unprecedented degree in revising military concepts inherited from the past."

118
The NIKE-ZEUS was the first ABM system. Because of its mechanically steered radar and limited range, it could be easily overcome by decoys and jamming. It would have also been obsolete by the time it was deployed. However, against the simple ICBM threat, i.e., one attacking missile per radar and interceptor, the NIKE-ZEUS had a track record of 10 kills in 14 attempts (71%). It was impressive for a "bullet hitting a bullet." See "Ballistic Missile Defense: Two Views," p. 2.

119
NIKE-X had phased array radars which were electronically slewed and had a multi-variate tracking capability. Computers aided in guidance and data processing. SPRINT was the high-acceleration missile which would be launched after the atmosphere had filtered out decoys. NIKE-ZEUS remained the long-range missile, see Hearings, "Strategic and Foreign Policy Implications of ABM Systems," 1969, p. 25. With exoatmospheric radiation, it was no longer necessary for a "bullet to hit a bullet." NIKE-X if deployed, would also have been outrun by technology. McNamara resisted strong pressures for its deployment.

120
Hearings, "Scope, Magnitude, and Implications of the US ABM Program," 1967, p. 135. SENTINEL was based on PAR, MAR, MSR, and TACMAR radars; SPARTAN long-range missiles and SPRINTS for shorter ranges. The 15-20 site deployment cost was estimated at 5 billion and Initial Operating Capability (IOC) would have been in the early 1970's.

121
See Appendix D, "SENTINEL'S Effectiveness Against A Chinese Attack;" Hearings, "Scope, Magnitude, and Implications of the US ABM Program," 1967, p. 135. The difficulties in penetrating defenses is as technologically challenging as defense itself, see "Ballistic Missile Defense: Two Views," Donald Brennan, p. 7.

122
This was somewhat questionable. For details of the atmospheric effects of nuclear explosions see, The Effects of Nuclear Weapons 1962, pp. 506-514.

123
For remarks concerning the "testability" of an ABM system, see "ABM: Yes Or No?," Donald Brennan, p. 19.

124
SENTINEL was technically limited in terms of a Soviet first-strike. But it was recognized that the system had great "growth" potential; its deployment would also have given "in-field" experience in operating a strategic defense. Official DoD statements indicated that SENTINEL was not the first step in an anti-Soviet system, see Hearings,"Status of US Strategic Power," 1968, Part I, pp. 52 and 346-371. One must note that MIRV had been advancing on its own despite the Soviet slow-down in their GALOSH ABM. In terms of image, and status, an ABM system was a symbol of superpower status; see Hearings, "Scope, Magnitude, and Implications of the US ABM Program," 1967, p. 73.

125
Adding a new weapon system will neither necessarily nor automatically represent any escalation in the arms competition, see Hearings, "Strategy and Science:...," 1969, pp. 115 and 148.

126
As J.J. Holst has written, "it is necessary for decision-makers to abandon any dogmatic pre-suppositions about in-exorable arms race response and fixed levels of 'assured destruction,'" "Ballistic Missile Defense: Two Views," p. 36.

127
This argument was as incredible as the all too common belief that the Chinese were irrational, see Robert S. McNamara, "US Nuclear Strategy," p. 742. The implication was that 'assured destruction' may not deter the Chinese. For a more accurate appraisal of Chinese behavior see, Arthur Huck, The Security of China.

128
Hearings, "Strategic and Foreign Policy Implications of ABM Systems," 1969, Dr. E. Teller, p. 503.

129
United States Congress, House, Committee on Armed Services, "Supplementary Hearings on Defense Procurement Authorization Relating to SALT Agreement," 92nd Congress, 2nd Session (Washington: GPO, 1972). SAFEGUARD still had radar limitations, but a "hard-point" system was under development, see United States Congress, Senate, Hearings Before the Committee on Foreign Relations, "ABM, MIRV, SALT, and the Nuclear Arms Race," 91st Congress, 2nd Session (Washington: GPO, 1970), p. 61.

130
See Statement by Secretary of Defense Melvin R. Laird, Fiscal Year 1971 Defense Program and Budget, (Washington: GPO, 1970), pp. 46-47. For a further discussion of strategic defenses, see Hearings, "Strategy and Science:...", 1969, Herman Kahn, pp. 111-115.

131
United States Comgress, Senate, Hearings Before the Committee on Armed Services, "Authorization for Military Procurement, Research and Development, Fiscal Year 1971, and Selected Reserve Strengths," 91st Congress, 2nd Session (Washington: GPO, 1970), p. 2237. For details of the public's sentiment to the ABM see, United States Congress, House, Briefing Before the Committee on Appropriations, "SENTINEL Anti-Ballistic Missile System," 91st Congress, 1st Session (Washington: GPO, 1969), pp. 2-8. As Dr. J. Wiesner has stated: "offensive systems are less abstrusive. People are not conscious of them. They can be put in quietly. But an ABM is different; it does not do a lot of good to defend one-half of our population, so an ABM has to be a massive thing. It is put in people's backyards so to speak. It also shows up as an enormous budget item," Hearings, "Strategy and Science:...", 1969, p. 19.

132
Typical of the strategic wisdom of the peridd was the following exchange:
Sen. Fulbright: "Are you familiar with the Maginot Line?"
DR. Panofsky: "I have heard about it, yes, sir."
Sen. Fulbright: "Well, it was a defense, wasn't it?"
Dr. Panofsky: "Yes."
Sen. Fulbright: "Was it more costly to build than it was for the Germans to penetrate it?"
Dr. Panofsky: "I frankly don't know the answer to that question."
Sen. Fulbright: "I was under the impression it was very costly and utterly ineffective."
See Hearings, "The Strategic and Foreign Policy Implications of ABM Systems," 1969, p. 373.

133
H. Scoville, Y. Kulish, P. Gallois, and D. Brennan, "Strategic Forum: The SALT Agreements," Survival, September/October, 1972. Interpretations vary as to why the USSR has signed away "defense of the homeland." The complete text of the SALT Agreements is provided in Appendix A.

134
Former Ass't Secretary of Defense Packard was quoted as saying, "sufficiency is a nice word to use in a speech, but it doesn't mean a God-damned thing." The US did not work through many of the intellectual questions surrounding SALT.

As Donald Brennan has testified, "The proposed ABM Treaty does the wrong thing well and the Interim Agreement does the right things badly," see United States Congress, Senate, Hearings Before the Committee on Foreign Relations, "Strategic Arms Limitation Agreements," 92nd Congress, 2nd Session (Washington: GPO, 1972), p. 186. For a discussion of the dominant American arms race mythologies see, Colin S. Gray, "The Arms Race Is About Politics," Foreign Policy, Winter, 1972-73.

135
One of the two permitted US ABM sites is the National Command Authority (NCA) ABM and will probably not be deployed; see United States Congress, Senate, Hearings Before the Committee on Armed Services, "Fiscal Year 1973 Authorization for the Military Procurement, Research and Development, Construction Authorization for the SAFEGUARD ABM, and Active Duty and Selected Reserve Strengths," 92nd Congress, 2nd Session (Washington: GPO, 1972), pp. 4286-4288.

136
By assuring that "the missile will get through" there is no hedge against accident, unauthorized firing, Nth country complications, or a range of superpower options. Furthermore, "it is immoral not to attempt defense," see Hearings, Senate, 1972 "Strategic Arms Limitation Agreements," Sen. J. Buckley, p. 257.

137
The vulnerability of a hardened ICBM was recognized long before a substantial force was buried, see Hearings, "Inquiry Into Saltellite and Missile Programs," 1958, General Gavin, p. 503. A CEP of 30 meters is possible, see D.C. Hoag, "Ballistic Missile Guidance," in The Impact of New Technologies on the Arms Race, by B.T. Feld et.al. p. 81. SALT I has not braked the qualitiative arms competition.

138
"To our minds, international negotiations are so completely a means for ending conflict that we are blind to the fact that they may be... equally adapted to continuing it," see United States Congress, Senate, Selected Writings Compiled by the Subcommittee on National Security and International Operations of the Committee on Government Operations, "The Soviet Approach to Negotiation," 91st Congress, 1st Session (Washington: GPO, 1969), p. 28.

139
Hearings, Senate, "Strategic Arms Limitation Agreements," 1972, p. 33; Hearings, House, "Military Implications of SALT," 1972, G. Smith, p. 15099; and United States Congress, Senate, Hearings Before the Committee on Armed Services, "Military Implications of the Treaty on the Limitation of Anti-Ballistic

Missile Systems and the Interim Agreement on Limitation of Strategic Offensive Arms," 92nd Congress, 2nd Session (Washington: GPO, 1972).

140
Ibid., p. 188. There has been no "road-test" of the deterrent system with a strategically muscular Soviet Union. Numbers do matter as Donald Brennan states, "most political leaders and military leaders are not academic strategists; these leaders not only count weapons, they tend to think in terms of who will come out ahead...," see Hearings, Senate, Strategic Arms Limitation Agreements," 1972, p. 188. For a discussion of the gains and losses for both sides at SALT I, see William R. Kintner and Robert L. Pfaltzgraff, "Assessing the Moscow SALT Agreements," Orbis, Summer, 1972.

141
In fact, much of the 'hard' negotiating in SALT I was done in Washington, see United States Congress, Senate, Hearings Before the Subcommittee on National Security and International Operations of the Committee on Government Operations, "International Negotiation: Some Operational Principles of Soviet Foreign Policy," 92nd Congress, 2nd Session (Washington: GPO, 1972), p. 207.

142
Colin S. Gray, "The Arms Race Is About Politics," p. 129.

143
Enlargement may be the more accurate term. Under the terms of SALT I, a missiles's volume may be increased by 32%, see Hearings, Senate, "Military Implications of SALT," 1972, p. 312 and Hearings, House, Military Implications of SALT," 1972, pp. 15106, 15111, 15119, 15137, 15140, and 15145.

144
Martin L. Pearl,"SALT and Its Illusions," Bulletin of the Atomic Scientists, December, 1971, p. 8. As Jeremy J. Stone has written, "We are now accustomed to maintaining three separate strategic forces... Rationalizations can be offered for this but at bottom, it is service rivalry and bureaucratic inertia that sustain three distinct systems," see his "When and How to Use SALT," Foreign Affairs, January, 1970, p. 267.

145
Many of these decisions reflect reversals of earlier technological-strategic choices: among them are current development programs for a "heavy" ICBM and a submarine-launched cruise missile (SLCM). Many decisions naturally involve "follow-on" programs; for a description of these see, Hearings, "FY 1973 Authorization...," 1972, B-1 bomber-pp. 2331-2363; TRIDENT submarine and missile system-

pp. 2633-2683 and 3139-3217; ARBRES warhead- pp. 2089-2120; ABM technology- pp. 3033-3096. For the new additions to bomber defenses see, Colin S. Gray, Canadian Defense Priorities: A Question of Relevance, pp. 77-84.

Chapter Four

146
Bernard Brodie, "The Impact of Technological Change on the International System: Reflections on Prediction," Journal of International Affairs, Vol. 25, No. 2, 1971, p. 217. It is also a matter of inevitable political compromise.

147
Hearings, "Strategic and Foreign Policy Implications of ABM Systems," 1969, Dr. K. Kaysen, p. 150.

148
Ralph Waldo Emerson, "Self-Reliance," in the Complete Writings of Ralph Waldo Emerson, New York: W.H. Wise & Co., 1929, pp. 141-142.

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APPENDIX A

TREATY BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON THE LIMITATION OF ANTI-BALLISTIC MISSILE SYSTEMS

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Proceeding from the premise that nuclear war would have devastating consequences for all mankind,

Considering that effective measures to limit anti-ballistic missile systems would be a substantial factor in curbing the race in strategic offensive arms and would lead to a decrease in the risk of outbreak of war involving nuclear weapons,

Proceeding from the premise that the limitation of anti-ballistic missile systems, as well as certain agreed measures with respect to the limitation of strategic offensive arms, would contribute to the creation of more favorable conditions for further negotiations on limiting strategic arms,

Mindful of their obligations under Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons,

Declaring their intention to achieve at the earliest possible date the cessation of the nuclear arms race and to take effective measures toward reductions in strategic arms, nuclear disarmament, and general and complete disarmament,

Desiring to contribute to the relaxation of international tension and the strengthening of trust between States,

Have agreed as follows:

ARTICLE I

1. Each Party undertakes to limit anti-ballistic missile (ABM) systems and to adopt other measures in accordance with the provisions of this Treaty.

2. Each Party undertakes not to deploy ABM systems for a defense of the territory of its country and not to provide a base for such a defense, and not to deploy ABM systems for defense of an individual region except as provided for in Article III of this Treaty.

ARTICLE II

1. For the purposes of this Treaty an ABM system is a system to counter strategic ballistic missiles or their elements in flight trajectory, currently consisting of:

(a) ABM interceptor missiles, which are interceptor missiles constructed and deployed for an ABM role, or of a type tested in an ABM mode;

(b) ABM launchers, which are launchers constructed and deployed for launching ABM interceptor missiles; and

(c) ABM radars, which are radars constructed and deployed for an ABM role, or of a type tested in an ABM mode.

2. The ABM system components listed in paragraph 1 of this Article include those which are:

(a) operational;
(b) under construction;
(c) undergoing testing;
(d) undergoing overhaul, repair or conversion; or
(e) mothballed.

ARTICLE III

Each Party undertakes not to deploy ABM systems or their components except that:

(a) within one ABM system deployment area having a radius of one hundred and fifty kilometers and centered on the Party's national capital, a Party may deploy: (1) no more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites, and (2) ABM radars within no more than six ABM radar complexes, the area of each complex being circular and having a diameter of no more than three kilometers; and

(b) within one ABM system deployment area having a radius of one hundred and fifty kilometers and containing ICBM silo launchers, a Party may deploy: (1) no more than one hundred ABM launchers and no more than one hundred ABM interceptor missiles at launch sites, (2) two large phased-array ABM radars comparable in potential to corresponding ABM radars operational or under construction on the date of signature of the Treaty in an ABM system deployment area containing ICBM silo launchers, and (3) no more than eighteen ABM radars each having a potential less than the potential of the smaller of the above-mentioned two large phased-array ABM radars.

ARTICLE IV

The limitations provided for in Article III shall not apply to ABM systems or their components used for development or testing, and located within current or additionally agreed test ranges. Each Party may have no more than a total of fifteen ABM launchers at test ranges.

ARTICLE V

1. Each Party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based.

2. Each Party undertakes not to develop, test, or deploy ABM launchers for launching more than one ABM interceptor missile at a time from each launcher, nor to modify deployed launchers to provide them with such a capability, nor to develop, test, or deploy automatic or semi-automatic or other similar systems for rapid reload of ABM launchers.

ARTICLE VI

To enhance assurance of the effectiveness of the limitations on ABM systems and their components provided by this Treaty each Party undertakes:

(a) not to give missiles, launchers, or radars, other than ABM interceptor missiles, ABM launchers, or ABM radars, capabilities to counter strategic ballistic missiles or their elements in flight trajectory, and not to test them in an ABM mode; and

(b) not to deploy in the future radars for early warning of strategic ballistic missile attack except at locations along the periphery of its national territory and oriented outward.

ARTICLE VII

Subject to the provisions of this Treaty, modernization and replacement of ABM systems or their components may be carried out.

ARTICLE VIII

ABM systems or their components in excess of the numbers or outside the areas specified in this Treaty, as well as ABM systems or their components prohibited by this Treaty, shall be destroyed or dismantled under agreed procedures within the shortest possible agreed period of time.

ARTICLE IX

To assure the viability and effectiveness of this Treaty, each Party undertakes not to transfer to other States, and not to deploy outside its national territory, ABM systems or their components limited by this Treaty.

ARTICLE X

Each Party undertakes not to assume any international obligations which would conflict with this Treaty.

ARTICLE XI

The Parties undertake to continue active negotiations for limitations on strategic offensive arms.

ARTICLE XII

1. For the purpose of providing assurance of compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.

2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.

3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty. This obligation shall not require changes in current construction, assembly, conversion, or overhaul practices.

ARTICLE XIII

1. To promote the objectives and implementation of the provisions of this Treaty, the Parties shall establish promptly a Standing Consultative Commission, within the framework of which they will:

(a) consider questions concerning compliance with the obligations assumed and related situations which may be considered ambiguous;

(b) provide on a voluntary basis such information as either Party considers necessary to assure confidence in compliance with the obligations assumed;

(c) consider questions involving unintended interference with national technical means of verification;

(d) consider possible changes in the strategic situation which have a bearing on the provisions of this Treaty;

(e) agree upon procedures and dates for destruction or dismantling of ABM systems or their components in cases provided for my the provisions of this Treaty;

(f) consider, as appropriate, possible proposals for further increasing the viability of this

Treaty, including proposals for amendments in accordance with the provisions of this Treaty;

(g) consider, as appropriate, proposals for further measures aimed at limiting strategic arms.

2. The Parties through consultation shall establish, and may amend as appropriate, Regulations for the Standing Consultative Commission giverning procedures, composition and other relevant matters.

ARTICLE XIV

1. Each Party may propose amendments to this Treaty. Agreed amendments shall enter into force in accordance with the procedures governing the entry into force of this Treaty.

2. Five years after entry into force of this Treaty, and at five year intervals thereafter, the Parties shall together conduct a review of this Treaty.

ARTICLE XV

1. This Treaty shall be of unlimited duration.

2. Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from the Treaty. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests.

ARTICLE XVI

1. This Treaty shall be subject to ratification in accordance with the constitutional procedures of each Party. The Treaty shall enter into force on the day of the exchange of instruments of ratification.

2. This Treaty shall be registered pursuant to Article 102 of the Charter of the United Nations.

Done at Moscow on May 26, 1972, in two copies, each in the English and Russian languages, both texts being equally authentic.

For the United States of America:

RICHARD NIXON,
President of the United States of America.

For the Union of Soviet Socialist Republics:

L. I. Brezhnev,
General Secretary of the Central Committee of the CPSU.

INTERIM AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON CERTAIN MEASURES WITH RESPECT TO THE LIMITATION OF STRATEGIC OFFENSIVE ARMS

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Convinced that the Treaty on the Limitation of Anti-Ballistic Missile Systems and this Interim Agreement on Certain Measures with Respect to the Limitation of Strategic Offensive Arms will contribute to the creation of more favorable conditions for active negotiations on limiting strategic arms as well as to the relaxation of international tension and the strengthening of trust between States,

Taking into account the relationship between strategic offensive and defensive arms,

Mindful of their obligations under Article VI of the Treaty on the Non-Proliferation of Nuclear Weapons,

Have agreed as follows:

ARTICLE I

The Parties undertake not to start construction of additional fixed land-based intercontinental ballistic missile (ICBM) launchers after July 1, 1972.

ARTICLE II

The Parties undertake not to convert land-based launchers for light ICBMs, or for ICBMs of older types deployed prior to 1964, into land-based launchers for heavy ICBMs of types deployed after that time.

ARTICLE III

The Parties undertake to limit submarine-launched ballistic missile (SLBM) launchers and modern ballistic missile submarines to the numbers operational and under construction on the date of signature of this Interim Agreement, and in addition to launchers and submarines constructed under procedures established by the Parties as replacements for an equal number of ICBM launchers of older types deployed prior to 1964 or for launchers on older submarines.

ARTICLE IV

Subject to the provisions of this Interim Agreement, modernization and replacement of strategic offensive ballistic missiles and launchers covered by this Interim Agreement may be undertaken.

ARTICLE V

1. For the purpose of providing assurance of compliance with the provisions of this Interim Agreement, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.

2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.

3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Interim Agreement. This obligation shall not require changes in current construction, assembly, conversion, or overhaul practices.

ARTICLE VI

To promote the objectives and implementation of the provisions of this Interim Agreement, the Parties shall use the Standing Consultative Commission established under Article XIII of the Treaty on the Limitation of Anti-Ballistic Missile Systems in accordance with the provisions of that Article.

ARTICLE VII

The Parties undertake to continue active negotiations for limitations on strategic offensive arms. The obligations provided for in this Interim Agreement shall not prejudice the scope or terms of the limitations on strategic offensive arms which may be worked out in the course of further negotiations.

ARTICLE VIII

1. This Interim Agreement shall enter into force upon exchange of written notices of acceptance by each Party, which exchange shall take place simultaneously with the exchange of instruments of ratification of the Treaty on the Limitation of Anti-Ballistic Missile Systems.

2. This Interim Agreement shall remain in force for a period of five years unless replaced earlier by an agreement on more complete measures limiting strategic offensive arms. It is the objective of the Parties to conduct active follow-on negotiations with the aim of concluding such an agreement as soon as possible.

3. Each Party shall, in exercising its national sovereignty, have the right to withdraw from this Interim Agreement of it decides that extraordinary events related

to the subject matter of this Interim Agreement have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from this Interim Agreement. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme interests.

Done at Moscow on May 26, 1972, in two copies, each in the English and Russian languages, both texts being equally authentic.

For the United States of America:

RICHARD NIXON,
President of the United States of America.

For the Union of Soviet Socialist Republics:

L. I. BREZHNEV,
General Secretary of the Central Committee of the CPSU.

PROTOCOL TO THE INTERIM AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON CERTAIN MEASURES WITH RESPECT TO THE LIMITATION OF STRATEGIC OFFENSIVE ARMS

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Having agreed on certain limitations relating to submarine-launched ballistic missile launchers and modern ballistic missile submarines, and to replacement procedures, in the Interim Agreement,

Have agreed as follows:

The Parties understand that, under Article III of the Interim Agreement, for the period during which that Agreement remains in force:

The US may have no more than 710 ballistic missile launchers on submarines (SLBMs) and no more than 44 modern ballistic missile submarines. The Soviet Union may have no more than 950 ballistic missile launchers on submarines and no more than 62 modern ballistic missile submarines.

Additional ballistic missile launchers on submarines up to the above-mentioned levels, in the US--over 656 ballistic missile launchers on nuclear-powered submarines, and in the USSR--over 740 ballistic missile launchers on nuclear-powered submarines, operational and under construction, may become operational as replacements for equal numbers of ballistic missile launchers on older submarines.

The deployment of modern SLBMs on any submarine, regardless of type, will be counted against the total level of SLBMs permitted for the US and the USSR.

This Protocol shall be considered an integral part of the Interim Agreement.

Done at Moscow this 26th day of May, 1972.

For the United States of America:

RICHARD NIXON,
President of the United States of America.

For the Union of Soviet Socialist Republics:

L. I. BREZHNEV,
General Secretary of the Central Committee of the CPSU.

(Enclosure 3)

1. AGREED INTERPRETATIONS.

(a) Initialed Statements.

The texts of the statements set out below were agreed upon and initialed by the Heads of the Delegations on May 26, 1972.

ABM TREATY

(A)

The Parties understand that, in addition to the ABM radars which may be deployed in accordance with subparagraph (a) of Article III of the Treaty, those non-phased-array ABM radars operational on the date of signature of the Treaty within the ABM system deployment area for defense of the national capital may be retained

(B)

The Parties understand that the potential (the product of mean emitted power in watts and antenna area in square meters) of the smaller of the two large phased-array ABM radars referred to in subparagraph (b) of Article III of the Treaty is considered for purposes of the Treaty to be three million.

(C)

The Parties understand that the center of the ABM system deployment area centered on the national capital and the center of the ABM system deployment area containing ICBM silo launchers for each Party shall be separated by no less than thirteen hundred kilometers.

(D)

The Parties agree not to deploy phased-array radars having a potential (the product of mean emitted power in watts and antenna area in square meters) exceeding three million, except as provided for in Articles III, IV, and VI of the Treaty, or except for the purposes of tracking objects in outer space or for use as national technical means of verification.

(E)

In order to insure fulfillment of the obligation not to deploy ABM systems and their components except as provided in Article III of the Treaty, the Parties agree that in the event ABM systems based on other physical

principles and including components capable of substituting for ABM interceptor missiles, ABM launchers, or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with Article XIII and agreement in accordance with Article XIV of the Treaty.

(F)

The Parties understand that Article V of the Treaty includes obligations not to develop, test or deploy ABM interceptor missiles for the delivery by each ABM interceptor missile or more than one independently guided warhead.

(G)

The Parties understand that Article IX of the Treaty includes the obligation of the US and the USSR not to provide to other States technical descriptions or blueprints specially worked out for the construction of ABM systems and their components limited by the Treaty.

INTERIM AGREEMENT

(H)

The Parties understand that land-based ICBM launchers referred to in the Interim Agreement are understood to be launchers for strategic ballistic missiles capable of ranges in excess of the shortest distance between the northeastern border of the continental US and the northwestern border of the continental USSR.

(I)

The Parties understand that fixed land-based ICBM launchers under active construction as of the date of signature of the Interim Agreement may be completed.

(J)

The Parties understand that in the process of modernization and replacement the dimensions of land-based ICBM silo launchers will not be significantly increased.

(K)

The Parties understand that dismantling or destruction of ICBM launchers of older types deployed prior to 1964 and ballistic missile launchers on older submarines being replaced by new SLBM launchers on modern submarines will be initiated at the time of the beginning of sea trials of a replacement submarine, and will be completed in the

shortest possible agreed period of time. Such dismantling or destruction, and timely notification thereof, will be accomplished under procedures to be agreed in the Standing Consultative Commission.

(L)

The Parties understand that during the period of the Interim Agreement there shall be no significant increase in the number of ICBM or SLBM test and training launchers, or in the number of such launchers for modern land-based heavy ICBMs. The Parties further understand that construction or conversion of ICBM launchers at test ranges shall be undertaken only for purposes of testing and training.

(b) Common Understandings.

Common understanding of the Parties on the following matters was reached during the negotiations:

A. Increase in ICBM Silo Dimensions.--Ambassador Smith made the following statement on May 26, 1972: "The Parties agree that the term 'significantly increased' means that an increase will not be greater than 10-15 percent of the present dimensions of land-based ICBM silo launchers".

Minister Semenov replied that this statement corresponded to the Soviet understanding.

B. Location of ICBM Defenses.--The U.S. Delegation made the following statement on May 26, 1972: "Article III of the ABM Treaty provides for each side one ABM system deployment area centered on its national capital and one ABM system deployment area containing ICBM silo launchers. The two sides have registered agreement on the following statement: 'The Parties understand that the center of the ABM system deployment area centered on the national capital and the center of the ABM system deployment area containing ICBM silo launchers for each Party shall be separated by no less than thirteen hundred kilometers.' In this connection, the U.S. side notes that its ABM system deployment area for defense of ICBM silo launchers, located west of the Mississippi River, will be centered in the Grand Forks ICBM silo launcher deployment area." (See Initialed Statement "C".)

C. ABM Test Ranges.--The U.S. Delegation made the following statement on April 26, 1972: "Article IV of the ABM Treaty provides that 'the limitations provided for in Article III shall not apply to ABM systems or their components used for development or testing, and located within current or additionally agreed test ranges.' We believe it would be useful to assure that there is no misunderstanding as to current ABM test ranges. It is our

understanding that ABM test ranges encompass the area within which ABM components are located for test purposes. The current U.S. ABM test ranges are at White Sands, New Mexico, and at Kwajalein Atoll, and the current Soviet ABM test range is near Sary Shagan in Kazakhstan. We consider that non-phased array radars of types used for range safety or instrumentation purposes may be located outside of ABM test ranges. We interpret the reference in Article IV to 'additionally agreed test ranges' to mean that ABM components will not be located at any other test ranges without prior agreement between our Governments that there will be such additional ABM test ranges."

On May 5, 1972, the Soviet Delegation stated that there was a common understanding on what ABM test ranges were, that the use of the types of non-ABM radars for range safety or instrumentation was not limited under the Treaty, that the reference in Article IV to "additionally agreed" test ranges was sufficiently clear, and that national means permitted identifying current test ranges.

D. Mobile ABM Systems.--On January 28, 1972, the U.S. Delegation made the following statement: "Article V(1) of the Joint Draft Text of the ABM Treaty includes an undertaking not to develop, test, or deploy mobile land-based ABM systems and their components. On May 5, 1971, the U.S. side indicated that, in its view, a prohibition on deployment of mobile ABM systems and components would rule out the deployment of ABM launchers and radars which were not permanent fixed types. At that time, we asked for the Soviet view of this interpretation. Does the Soviet side agree with the U.S. side's interpretation put forward on May 5, 1971?"

On April 13, 1972, the Soviet Delegation said there is a general common understanding on this matter.

E. Standing Consultative Commission.--Ambassador Smith made the following statement on May 23, 1972: "The United States proposes that the sides agree that, with regard to initial implementation of the ABM Treaty's Article XIII on the Standing Consultative Commission (SCC) and of the consultation Articles to the Interim Agreement on offensive arms and the Accidents Agreement,* agreement establishing the SCC will be worked out early in the follow-on SALT negotiations; until that is completed, the following arrangements will prevail: when SALT is in session, any consultation desired by either side under these Articles can be carried out by the two SALT Delegations; when SALT is not in session, ad hoc arrangements for any desired consultations under these Articles may be made through diplomatic channels."

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*See Article 7 of Agreement to Reduce the Risk of Outbreak of Nuclear War Between the United States of America and the Union of Soviet Socialist Republics, signed September 30, 1971.

Minister Semenov replied that, on an ad referendum basis, he could agree that the U.S. statement correpsonded to the Soviet understanding.

F. Standstill.--On May 6, 1972, Minister Semenov made the following statement: "In an effort to accommodate the wishes of the U.S. side, the Soviet Delegation is prepared to proceed on the basis that the two sides will in fact observe the obligations of both the Interim Agreement and the ABM Treaty beginning from the date of signature of these two documents."

In reply, the U.S. Delegation made the following statement on May 20, 1972: "The U.S. agrees in principle with the Soviet statement made on May 6 concerning observance of obligations beginning from date of signature but we would like to make clear our understanding that this means that, pending ratification and acceptance, neither side would take any action prohibited by the agreements after they had entered into force. This understanding would continue to apply in the absence of notification by either signatory of its intention not to proceed with ratification or approval."

The Soviet Delegation indicated agreement with the U.S. statement.

2. UNILATERAL STATEMENTS

(a) The following noteworthy unilateral statements were made during the negotiations by the United States Delegation:--

A. Withdrawal from the ABM Treaty

On May 9, 1972, Ambassador Smith made the following statement: "The U.S. Delegation has stressed the importance the U.S. Government attaches to achieving agreement on more complete limitations on strategic offensive arms, following agreement on an ABM Treaty and on an Interim Agreement on certain measures with respect to the limitation of strategic offensive arms. The U.S. Delegation believes that an objective of the follow-on negotiations should be to constrain and reduce on a long-term basis threats to the survivability of our respective strategic retaliatory forces. The USSR Delegation has also indicated that the objectives of SALT would remain unfulfilled without the achievement of an agreement providing for more complete limitations on strategic offensive arms. Both sides recognize that the initial agreements would be steps toward the achievement of more complete limitations on strategic arms. If an agreement providing for more complete strategic offensive arms limitations were not achieved within five years, U.S. supreme interests could be jeopardized. Should that occur, it would constitute a basis for

withdrawal from the ABM Treaty. The U.S. does not wish to see such a situation occur, nor do we believe that the USSR does. It is because we wish to prevent such a situation that we enphasize the importance the U.S. Government attaches to achievement of more complete limitations on strategic offensive arms. The U.S. Executive will inform the Congress, in connection with Congressional consideration of the ABM Treaty and the Interim Agreement, of this statement of the U.S. position."

B. Land-Mobile ICBM Launchers

The U.S. Delegation made the following statement on May 20, 1972: "In connection with the important subject of land-mobile ICBM launchers, in the interest of concluding the Interim Agreement the U.S. Delegation now withdraws its proposal that Article I or an agreed statement explicitly prohibit the deployment of mobile land-based ICBM launchers. I have been instructed to inform you that, while agreeing to defer the question of limitation of operational land-mobile ICBM launchers to the subsequent negotiations on more complete limitations on strategic offensive arms, the U.S. would consider the deployment of operational land-mobile ICBM launchers during the period of the Interim Agreement as inconsistent with the objectives of that Agreement."

C. Covered Facilities

The U.S. Delegation made the following statement on May 20, 1972: "I wish to emphasize the importance that the United States attaches to the provisions of Article V, including in particular their application to fitting out or berthing submarines."

D. "Heavy" ICBMs

The U.S. Delegation made the following statement on May 26, 1972: "The U.S. Delegation regrets that the Soviet Delegation has not been willing to agree on a common definition of a heavy missile. Under these circumstances, the U.S. Delegation believes it necessary to state the following: The United States would consider any ICBM having a volume significantly greater than that of the largest light ICBM now operational on either side to be a heavy ICBM. The U.S. proceeds on the premise that the Soviet side will give due account to this consideration."

E. Tested in ABM Mode

On April 7, 1972, the U.S. Delegation made the following statement: "Article II of the Joint Draft Text used the term 'tested in an ABM mode,' in defining ABM components, and Article VI includes certain obligations concerning such testing. We believe that the side should have a common understanding of this phrase. First, we would note that

the testing provisions of the ABM Treaty are intended to apply to testing which occurs after the date of signature of the Treaty, and not to any testing which may have occurred in the past. Next, we would amplify the remarks we have made on this subject during the previous Helsinki phase by setting forth the objectives which govern the U.S. view on the subject, namely, while prohibiting testing of non-ABM components for ABM purposes: not to prevent testing of ABM components, and not to prevent testing of non-ABM components for non-ABM purposes. To clarify our interpretation of 'tested in an ABM mode,' we note that we would consider a launcher, missile or radar to be 'tested in an ABM mode' if, for example, any of the following events occur: (1) a launcher is used to launch an ABM interceptor missile, (2) an interceptor missile is flight tested against a target vehicle which has a flight trajectory with characteristics of a strategic ballistic missile flight trajectory, or is flight tested in conjunction with the test of an ABM interceptor missile or an ABM radar at the same test range, or is flight tested to an altitude inconsistent with interception of targets against which air defenses are deployed, (3) a radar makes measurements on a cooperative target vehicle of the kind referred to in item (2) above during the reentry portion of its trajectory or makes measurements in conjunction with the test of an ABM interceptor missile or an ABM radar at the same test range. Radars used for purposes such as range safety or instrumentation would be exempt from application of these criteria."

F. No-Transfer Article of ABM Treaty

On April 18, 1972, the U.S. Delegation made the following statement: "In regard to this Article (IX), I have a brief and I believe self-explanatory statement to make. The U.S. side wishes to make clear that the provisions of this Article do not set a precedent for whatever provision may be considered for a Treaty on Limiting Strategic Offensive Arms. The question of transfer of strategic offensive arms is a far more complex issue, which may require a different solution."

G. No Increase in Defense of Early Warning Radars

On July 28, 1970, the U.S. Delegation made the following statement: "Since Hen House radars (Soviet ballistic missile early warning radars) can detect and track ballistic missile warheads at great distances, they have a significant ABM potential. Accordingly, the U.S. would regard any increase in the defenses of such radars by surface-to-air missiles as inconsistent with an agreement."

(b) The following noteworthy unilateral statement was made by the Delegation of the U.S.S.R. and is shown here with the U.S. reply:

On May 17, 1972, Minister Semenov made the following unilateral "Statement of the Soviet Side:" "Taking into account that modern ballistic missile submarines are presently in the possession of not only the U.S., but also of its NATO allies, the Soviet Union agrees that for the period of effectiveness of the Interim 'Freeze' Agreement the U.S. and its NATO allies have up to 50 such submarines with a total of up to 800 ballistic missile launchers thereon (including 41 U.S. submarines with 656 ballistic missile launchers). However, if during the period of effectiveness of the Agreement U.S. allies in NATO should increase the number of their modern submarines to exceed the numbers of submarines they would have operational or under construction on the date of signature of the Agreement, the Soviet Union will have the right to a corresponding increase in the number of its submarines. In the opinion of the Soviet side, the solution of the question of modern ballistic missile submarines provided for in the Interim Agreement only partially compensates for the strategic imbalance in the deployment of the nuclear-powered missile submarines of the USSR and the U.S. Therefore, the Soviet side believes that this whole question, and above all the questions of liquidating the American missile submarine bases outside the U.S., will be appropriately resolved in the course of follow-on negotiations."

On May 24, Ambassador Smith made the following reply to Minister Semenov: "The United States side has studied the 'statement made by the Soviet side' of May 17 concerning compensation for submarine basing and SLBM submarines belonging to third countries. The United States does not accept the validity of the considerations in that statement."

On May 26 Minister Semenov repeated the unilateral statement made on May 24. Ambassador Smith also repeated the U.S. rejection on May 26.

APPENDIX B

"CUMULATIVE PERCENTAGE DISTRIBUTION OF POPULATION AND INDUSTRIAL CAPACITY IN 1970"

(# of cities in order of population rank)

	US		USSR		China	
# Cities	Pop.	Ind.	Pop.	Ind.	Pop.	Ind.
10	25.1	33.1	8.3	25.0	3.7	30-35
50	42.0	55.0	20.0	40.0	6.8	50-60
100	48.0	65.0	25.0	50.0	8.6	65-75
200	55.0	75.0	34.0	62.0	9.0	80-90
400	60.0	82.0	40.0	72.0	10.0	85-90
1,000	63.0	86.0	47.0	82.0	11.0	

(figures are percentages)

Source: Statement by Secretary of Defense Melvin R. Laird, FY 1971, Defense Program and Defense Budget, p. 44.

APPENDIX C

"US ASSURED DESTRUCTION CALCULATIONS"

Soviet Population and Industry Destroyed
(Assumed 1972 total population 247 million .
Urban population 116 million)

1 MT Equivalents	Total Populations Fatalities		Industrial Capacity Destroyed
Delivered Warheads	Millions	%	%
100	37	15	59
200	52	21	72
400	74	30	76
800	96	39	77
1200	109	44	77
1600	116	47	77

Note: Fatalities are the immediate fatalities in an exchange.

Source: Statement of Secretary of Defense Robert S. McNamara on The FY 1969-73 Defense Program and 1969 Defense Budget. p. 57.

APPENDIX D

"SENTINEL'S EFFECTIVENESS AGAINST CHINESE ATTACK"

US Fatalities From a Chinese First Strike
1975-80

# Chinese ICBM's	X	2.5X	7.5X
US Fatalities (millions)			
without sentinel	7	11	23
with sentinel	a/	a/	1

a/ Fewer than 1 million deaths with some probability of no deaths

Source: Statement by Secretary of Defense Clark M. Clifford
The 1970 Defense Budget and Defense Program for FY 1970-74. p. 54

APPENDIX E

"EXPENDITURES FOR STRATEGIC FORCES"

(in millions)

FY62	FY63	FY64	FY65	FY66	FY67
11,252	10,403	9,257	7,075	6,685	6,893

FY68	FY69	FY70	FY71	FY72	FY73
7,884	9,618	9,596	7,737	7,639	8,846

Note: Expenditures are in terms of FY__ value.

Source: Compiled from annual posture statements of the Secretary of Defense FY68-FY73.

APPENDIX F

"WEAPON SYSTEM PROGRAMS TO WATCH"

(cost--millions)

	FY69 (Actual)	FY70 (Actual)	FY71 (Actual)	FY72 (Planned)	FY73 (Proposed)
ULMS	5	10	44	140	942
B-1	25	77	75	370	445
ARBRES	105	109	100	104	104
HARDSITE			25	60	80
ABM TECHNOLOGY	137	175	104	96	102
SATELLITE SURVEILLANCE			105	86	80

Source: Compiled from annual posture statements of the Secretary of Defense. FY68-FY73.

GLOSSARY

Accelerometer: an instrument which is so designed that it responds to the accelerations of the earth relative to the suspended mass of the instrument rather than measuring either the velocity or the displacement of the earth; used in the inertial guidance systems of missiles

Active Defense: defense involving interception of attacking enemy aircraft or missiles by using either aircraft or missiles

AMSA (Advanced Manned Strategic Aircraft): now the B-1 bomber program, the follow-on to the B-52 (The craft would be a large bomber with a capability for penetrating adversary defenses at low altitudes and supersonic speeds. It would carry sophisticated penaids. Operational capability could be achieved by 1980 at a cost of forty-five million per aircraft.)

ARBRES (Advanced Ballistic Reentry System): research and development of reentry vehicles, new heat-shielding techniques, hardening of warheads, penetration aids, and guidance

Area Type Defense: defense system permitting the defense of any number of targets within fairly large areas (The feasibility of such defense is dependent on use of aircraft or missiles that are effective over long ranges.)

Assured Destruction Capability: ability to inflict some specific level of damage on an adversary with a very high degree of confidence (This is generally equated with the ability to destroy adversary population and industry and was the official United States doctrine in the McNamara Pentagon.)

ASW (Anti-Submarine Warfare): all operations aimed at locating, tracking, identifying, and potentially destroying enemy submarines

ATLAS: United States first generation ICBM; large liquid fuel missile of high vulnerability

Attack Timing Problem: the problem of simultaneous destruction of the adversary's strategic forces, in a timed, coordinated manner

AWACS (Airborne Warning and Control System): system involving the use of large aircraft carrying radars, computers, and communications facilities to control the engagement between intercepting aircraft and adversary bombers (The system is less vulnerable to attack by missiles.)

B-52: the principal United States intercontinental strategic bomber; designed for high altitude penetration but long since modified for low level attack at subsonic speed

B-70: one proposed follow-on bomber to the B-52; designed to fly at MACH 3 and penetrate at high altitudes (The program was cancelled when it was discovered that high level penetration of the enemy's defenses would be much more difficult than low level attack.)

Backscatter Radar: radar which detects changes in the characteristics of the ionosphere (These changes in the ionosphere affect the intensity of the radio-frequency waves emitted by the radar transmitter and "scatter" them back to the radar receiver.)

BMD (Ballistic Missile Defense): any system intended to defend against attack by ballistic missiles

BMEWS (Ballistic Missile Early Warning System): an electronic system for providing detection and early warning of attack by ICBMs

Catalytic War: war resulting from the act of a smaller power provoking war between two great powers so that they will destroy each other

CEP (Circular Error Probable): a commonly used measure of the inaccuracy of weapon systems (In repeated firings, fifty percent of the weapons would miss their targets by less than the CEP or median miss distance and fifty percent would miss by more than the CEP. A frequent misinterpretation assumes that all weapons miss their targets by a distance equal to the CEP, which is like assuming that all student score at the fiftieth percentile on an exam. A nautical mile, 6,080 feet, is the standard dimension for measuring the CEP.)

Counterforce Capability: ability to destroy the adversary's strategic offensive forces

Damage Limiting: use of strategic forces to reduce the capacity of the country being attacked to inflict damage on the attacker

Decoy: device intended to confuse enemy defenses

Decoy Discrimination: ability of the defender to distinguish between decoys and real warheads or bombers

Deterrence: prevention from action because of the fear of consequences; a state of mind brought about by the existence of a credible threat of unacceptable counteraction

ECM (Electronic Counter Measures): equipment to enhance the penetration and survival of the United States' strategic bomber force as it approaches its targets; devices which jam radars, black it out, etc.

Endoatmospheric Interception: interception at altitudes of up to forty miles

Exchange Ratio: the number of attacking missiles necessary to destroy one target

FB-111: bomber version of the F-111 aircraft; replacement bomber for the B-58 (It was anticipated that the FB-111 would enter SAC in FY69 and that 250 aircraft would be procured. The program has been severely cutback.)

First Strike Capability: synonymous with a counterforce capability; the ability to destroy the enemy's strategic offensive forces by attacking first

FOBS (Fractional Orbital Bombardment System): systems involving the delivery of nuclear weapons from low altitude orbital trajectories; (Unlike ICBMs, FOBS requires the use of reverse thrust to bring the warhead down on target. Because the apogee of the trajectory is lower than that of an ICBM, detection using long range radars is more difficult. However, the payload that can be delivered with a given propulsion system is smaller than with that of an ICBM; and the accuracy is generally poorer because of the flattened trajectory.)

Galosh: Moscow ABM system

Greater-Than-Expected Threat: the medium to upper range of Soviet forces (The nature of the exercise in

Hardening: protection of military facilities by making them resistant to blast effects of a nuclear weapon

Highest Expected Threat: the upper range of National Intelligence Estimates (NIE) for each element of the Soviet Union's strategic forces

HOUND DOG: stand-off missile carried by the United States' strategic bomber force designed to be launched prior to the bombing run in order to "soften" the defensive environment enhancing penetration

ICBM: Intercontinental Ballistic Missile; a range of at least 5,000 nautical miles

IRBM: Intermediate Range Ballistic Missile; a range of roughly 2,000-4,000 nautical miles

JUPITER: United States Army IRBM program during the 1950's; a first generation, liquid fueled missile developed for quick deployment in overseas bases

Kiloton (KT): 1,000 tons of TNT

Megaton (MT): 1,000,000 tons of TNT

MINUTEMAN: a three-stage, solid-propellent, second-generation ICBM equipped with a nuclear warhead and designed for highly automated, remote operation (Currently, MINUTEMAN III is being phased onto the force. It is designed to carry MIRVs.)

MIRV (Multiple Individually Targetable Reentry Vehicle: system now being deployed in which a warhead cluster is carried by a "bus" (A single guidance and propulsion system will control the orientation and velocity of the bus from which the RVs will be released sequentially. After each release, there will be a further adjustment in the velocity and direction of the bus. Thus, each reentry vehicle can be directed to a separate target. MIRVs can penetrate defenses with sufficient accuracy. It is well-suited to being a counterforce weapon.)

MRBM (Medium Range Ballistic Missile): this signifies a range of about 1,500 nautical miles.

MRV (Multiple Reentry Vehicle): the first technological step to MIRV; a cluster of warheads which is independently targetable only in the sense that it can be released sequentially or in a shotgun pattern with no post-boost guidance

Nth Country Problem: the possibility of diffusion of nuclear weapons to an indeterminate or "N" number of countries through the development of independent capabilities or the acquisition of nuclear weapons from the existing nuclear powers

NIKE-X: plan for large-scale, anti-ballistic missile deployment for the protection of the United States against a massive Soviet attack (The system had very high potential costs and questionable technological concepts. It was not deployed.)

Nuclear Non-Proliferation Treaty: treaty approved by the United States in 1968 by which each non-nuclear signatory would undertake not to acquire nuclear weapons and not to assist non-nuclear powers in acquiring nuclear weapons

Open Skies Proposal: proposal by President Eisenhower at the Geneva Summit Conference (1955) for the reciprocal aerial inspection of the United States and the Soviet Union and for the exchange of blueprints of the military establishments of the two countries as safeguards against surprise attack

Overkill: the idea that the nuclear forces of the United States is much larger than required for inflicting unacceptable damage on the homeland of the Soviet Union (This concept fails to consider factors of reliability, including, aborted missiles during entire flight, defensive measures, etc.)

Over-The-Horizon Radar: radar which detects objects at a low level around the curvature of the earth; a significant advance over the line-of-sight radar which had serious "blind-spots"

Parity: the quality or state of being equal in strategic forces

Passive Defense: defense by protective shelter, hardening, dispersal, airborne alert, etc.

Penetration Aids (Penaids): devices facilitating the entry of aircraft or missiles through enemy active defenses, including decoys which simulate warheads and the use of chaff (See ECM, SCAD, SRAM, HOUND DOG)

Phased Array Radar: radars in which the beam is steered electronically, therefore involving no moving parts

(These radars have an advantage over the older, mechanically steered radars in that they can handle many tracks simultaneously and can move from one track to another.)

POLARIS: United States nuclear powered, missile launching submarine carrying sixteen missiles (The term is also used to refer to the missiles of which there have been three versions. The first two, POLARIS A-1 and A-2 each carried single warheads with a yield of about 1MT. POLARIS A-3 carries three smaller warheads which are not individually targetable.)

POSEIDON: successor to the polaris missile capable of carrying many warheads or MIRVs

Pre-Emptive War: first strike designed to knock out the adversary's offensive forces in anticipation of a possible strike by him

Preventive War: a premeditated attack by one country against another, which is unprovoked in the sense that it does not wait upon a specific aggression or other overt action by the target state, and in which the chief and most immediate objective is the destruction of the latter's strategic forces

Real-Time Re-Targeting: the ability to provide information for the instant substitution of ICBMs for those which have aborted their missions

SABMIS (Sea-based Anti-Ballistic Missile System): system designed to utilize many of the SAFEGUARD components aboard United States Navy vessels

SALT (Strategic Arms Limitation Talks): negotiations between the United States and the Soviet Union from November, 1969 to May, 1972, aimed at limiting their strategic arms (See Appendix)

SAFEGUARD: United States ABM system which was the follow-on to SENTINEL; designed to protect MINUTEMAN from a Soviet first strike and to provide residual protection to the United States population; limited to two sites under the recent ABM Treaty of SALT I

Salvage-Fusing: a device placed in the warheads of ICBMs which would detonate the payload when approached by an anti-ballistic missile

SCAD (Subsonic Cruise Armed Decoy): penetration aid being developed (SCAD will use radar cross-section augmentors

and jamming devices to more effectively simulate the bomber's electronic signature characteristics and to help dilute enemy defenses.)

Second Strike: a blow delivered after receiving an enemy nuclear attack; most commonly defined as a retaliatory attack aimed at area targets (i.e., enemy population centers) with forces that may have been depleted by an enemy's first strike

Second-Strike Capability: the ability to survive an attack and launch a retaliatory blow large enough to inflict intolerable damage on the opponent

Self-Fulfilling Prophecy: (1) the assertion implied in a nation's attitude of trust or distrust toward another nation, which generates, if believed, a like attitude on the part of the other, thereby reinforcing the first nation's attitude and making the implied assertion self-validating; (2) a psychological effect by which one side's defensive action may be observed by the other, which misinterpreting it as aggressive, may, therefore, make some defensive move; this, if misread in turn by the other side, confirms the original suspicions. (Reactions and signals may thus be set into motion until a point of no return is reached.)

SENTINEL: proposed United States light ABM system to defend population against a Chinese attack, accidental launches, and the first step in the deployment of a thick ABM vis a vis the Soviet Union

SLBM: Submarine Launched Ballistic Missile

SLCM: Submarine Launched Cruise Missile (The United States has a Research and Development Program on this type of missile which is air-breathing and designed to penetrate at low altitude

Soft Facilities: missile sites, command and control centers, or other facilities that have not been provided with protective shielding against the effects of nuclear explosions

SRAM (Short Range Attack Missile): a smaller, more accurate, low altitude missile used in the like mission of HOUND DOG

SSBN: nuclear powered ballistic missile firing submarine

SSN: nuclear powered attack submarine

Strategic: to be considered strategic, the concept of attacking the enemy's homeland must be first and foremost

Tactical: not capable of striking the enemy's homeland (The distinction between strategic and tactical is rather a question of emphasis and semantic differentiation. Both are in the eyes of the beholder.)

Tallinn Defense: defensive system deployed by the Soviet Union (The prevailing view in the United States intelligence community is that the Tallinn system is a bomber air defense system with no significant ABM capability. However, some believe that with an upgrading of the radars, an ABM system may be possible.)

Terminal Defenses: defenses designed to intercept a missile during the final part of its trajectory (Such defenses make use of the differential decelerating effect of the atmosphere to facilitate discrimination between warheads and less dense penetration aids. Because such defenses involve interception late in the trajectory, they are relatively inflexible. Thus, the missiles deployed to defend one point cannot defend other points some distance away.)

THOR: United States Air Force's IRBM missile project; comparable to the Army's JUPITER

TITAN: United States back-up ICBM to ATLAS (Presently, there are fifty-four TITAN II's in the United States force which can carry the largest payload.)

Triad: the concept that the United States should maintain three independent types of strategic weapons systems: ICBMs, manned bombers, and SLBMs

ULMS: has been renamed TRIDENT, and may refer to either a new SSBN or a new missile, the follow-on to POSEIDON (The ULMS program is designed to make use of greater areas of the oceans and employ longer range missiles.)

Yield-To-Weight Ratio: the explosive power of a nuclear weapon relative to its weight or destructive power per pound of the warhead