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# THESIS

BEYOND ARMAGEDDON: DETERRENCE WITH LESS

by

Patrick Joseph Kolbas

June, 1991

Thesis Advisor: Professor Frank M. Teti

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This thesis examines the implications for nuclear deterrence between the United States and the Soviet Union brought about by the dramatic changes in the strategic environment during the 1980s. Specifically, it examines the potential for a new criteria of deterrence at significantly lower levels of strategic weapons. The analysis indicates that a targeting strategy which emphasizes economic and industrial facilities will deter the Soviet Union. This targeting strategy allows for a reduction to 1500 strategic weapons while maintaining the robustness of nuclear deterrence between the United States and the Soviet Union. Using as its criteria arms race stability, breakout stability, crisis stability, verification, predictability, consequences of war, and the security of friends and allies, this thesis concludes that a force structure comprised of the Trident D-5 Submarine-launched ballistic missile and the B-2 bomber best ensures deterrence both against the Soviet Union and any other nuclear power regardless of changes in their political or ideological orientation. To provide maximum flexibility while negotiating the agreement and to hedge against a breakdown in U.S./Soviet relations prior to implementation, the thesis recommends a modernization program for U.S. strategic forces including funding for the restructured Strategic Defense Initiative which is now named Global Protection Against Limited Strikes.

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# Beyond Armageddon: Deterrence with Less

by

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Lieutenant, United States Navy
B.S., United States Naval Academy, 1984

Submitted in partial fulfillment
of the requirements for the degree of

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## ABSTRACT

This thesis examines the implications for nuclear deterrence between the United States and the Soviet Union brought about by the dramatic changes in the strategic environment during the 1980s. Specifically, it examines the potential for a new criteria of deterrence at significantly lower levels of strategic weapons. The analysis indicates that a targeting strategy which emphasizes economic and industrial facilities will deter the Soviet Union. This targeting strategy allows for a reduction to 1500 strategic weapons while maintaining the robustness of nuclear deterrence between the United States and the Soviet Union. Using as its criteria arms race stability, breakout stability, crisis stability, verification, predictability, consequences of war, and the security of friends and allies, this thesis concludes that a force structure comprised of the Trident D-5 Submarine-launched ballistic missile and the B-2 bomber best ensures deterrence both against the Soviet Union and any other nuclear power regardless of changes in their political or ideological orientation. To provide maximum flexibility while negotiating the agreement and to hedge against a breakdown in U.S./Soviet relations prior to implementation, the thesis recommends a modernization program for U.S. strategic forces including funding for the restructured Strategic Defense Initiative which is now named Global Protection Against Limited Strikes.



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## Table of Contents


I. INTRODUCTION ..... 1

II. BACKGROUND ..... 7

A. STRATEGIC PLANNING AND FORECASTING ..... 7

B. ASSUMPTIONS ..... 11

C. START II CRITERIA ..... 15

D. SOVIET AND AMERICAN INTERESTS IN REDUCTIONS ..... 18

1. Soviet Interests in START II ..... 20

2. American Interests in START II ..... 22

III. FORMULATING THE START II LIMITS ..... 25

A. DETERRENCE: THEORY AND DECLARATORY POLICY ..... 25

B. DETERMINING THE NUMBER OF STRATEGIC WEAPONS .. 37

1. What Will Deter the Soviet Union in 2005-2010? ..... 40

2. How Much Will Deter the Soviet Union in 2005-2010? ..... 43

3. What if Deterrence Fails with the Soviet Union in 2005-2010? 43

C. STRATEGIC FORCES AVAILABLE FOR START II ..... 44

D. U.S. FORCE STRUCTURES UNDER START II ..... 50

IV. ASSESSMENTS OF FORCE STRUCTURES ..... 60

A. VERIFICATION AND PREDICTABILITY ..... 60

B. THE CONSEQUENCES OF GENERAL WAR ..... 62

C. SECURITY OF ALLIES AND FRIENDS ..... 63

D. CRISIS, ARMS RACE, AND BREAKOUT STABILITY ..... 64

1. Those Force Options Having Crisis Stability ..... 66

2. Those Force Options Not Having Crisis Stability ..... 70

3. Those Force Options with Arms Race Stability ..... 72

4. Those Force Options without Arms Race Stability ..... 73

5. Breakout Stability ..... 74

E. SELECTION OF BEST OPTIONS ..... 75

V. CONCLUSIONS AND RECOMMENDATIONS ..... 78

INITIAL DISTRIBUTION LIST ..... 95

# I. INTRODUCTION

The National Security Strategy of the United States is designed to fulfill the following four broad interests and objectives:

- The survival of the United States as a free and independent nation, with its fundamental values intact and its institutions and people secure.
- A healthy and growing U.S. economy to ensure opportunity for individual prosperity and a resource base for national endeavors at home and abroad.
- A stable and secure world, fostering political freedom, human rights, and democratic institutions.
- Healthy, cooperative and politically vigorous relations with allies and friendly nations.[1]

Of crucial importance is the first--the survival and freedom of the United States. If the United States is destroyed or subjugated by another nation, the remaining three interests and objectives are meaningless.

For the past 40 years the United States has relied on a strategy of nuclear deterrence to ensure its freedom and survival. By the mid to late 1960s the political leadership acknowledged that nuclear deterrence was not enhanced by ever growing numbers of strategic nuclear weapons.[2] While total nuclear disarmament was viewed as an unfeasible utopia, the control of strategic weapons

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[1] *National Security Strategy of the United States* (Washington, D.C.: The White House, March 1990), pp. 2 and 3.

[2] Alain C. Enthoven and K. Wayne Smith, *How Much is Enough? Shaping the Defense Programs, 1961-1969* (New York: Harper and Row, 1971), p. 207 and Michael Krepon, "Has Arms Control Worked?" *Bulletin of the Atomic Scientists*, May 1989, p. 28. Hereafter, the term strategic weapons is used for either strategic nuclear weapons or warheads.

and their associated testing was deemed as an acceptable means to maintain or enhance nuclear deterrence.[3] As a result, arms control has come to play an important but subordinate role in preserving nuclear deterrence and U.S. national security.

During the latter half of the 1980s attention was focused on the potential impact of the Strategic Arms Reductions Talks (START) on nuclear deterrence. The general consensus concerning START is that nuclear deterrence is not adversely affected even in the worst case scenarios used to evaluate it.[4] Though START has yet to be signed by the President, let alone ratified by the Senate, many proposals already exist for much deeper reductions in the strategic nuclear arsenals of the United States and the Soviet Union.[5] On the surface, these calls may appear valid and noteworthy. But reductions for the sole purpose of reductions is a dangerous proposition. No matter the good or bad points of the Strategic Arms Limitation Talks (SALT) and the START processes, the strength of nuclear deterrence remains robust. Likewise, future reductions should not diminish the strength of nuclear deterrence and increase the likelihood of nuclear war.

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[3]Richard Smoke, "The Evolution of American Defense Policy," in *American Defense Policy*, 5th ed., ed. John Reichart and Steven Sturm (Baltimore: Johns Hopkins University Press, 1987), pp. 117, 118; Amos A. Jordon, William J. Taylor, Jr., and Lawrence J. Korb, *American National Security*, 3d ed. (Baltimore: Johns Hopkins University Press, 1989), pp. 540-544; and Lawrence Freedman, *The Evolution of Nuclear Strategy*, 2d ed. (New York: St. Martin's Press, 1989), pp. 197-199.

[4]For example see Michael M. May, George F. Bing, and John D. Steinbruner, *Strategic Arms Reductions* (Washington, D.C.: The Brookings Institution, 1988).

[5]"The New Nuclear Age," *The Economist*, 10 March 1990, pp. 11, 12; Harold A. Feiveson and Frank N. von Hippel, "Beyond START: How to Make Much Deeper Cuts," *International Security*, vol. 15, no. 1 (Summer 1990): pp 154-180; and Paul H. Nitze, "Leapfrog into START II," *New York Times*, p. A-19.

The purpose of this study is to go beyond the current START proposals and to determine a plausible START II framework which does not diminish the strength of nuclear deterrence as it exists in 1991. As used in this study, nuclear deterrence is equivalent to crisis stability which is presently very robust. The Soviet Union has no incentive to launch a first strike because the United States is capable of responding with its remaining strategic weapons in any scenario and destroying the Soviet Union as a viable nation.

The task of looking ahead at potential futures is an important intellectual and practical exercise. Speculating about the future helps to prepare policy makers. It would also help them to respond to changes and the difficult questions posed by Congress and concerned citizens about the future course of foreign and defense policy.

For its first 12 to 18 months in office, the Bush administration appeared unwilling or unable to consider the implications of radical changes in the international environment. With the dramatic changes in Eastern Europe and the Soviet Union, and the positive trend in Soviet-American relations, the administration's spokesmen failed to articulate clearly the future national security and military strategies. While the failure to grapple with these events was rectified to some extent by the March 1990 issue of the *National Security Strategy of the United States*, it was not until August 1990 that the new U.S. national security strategy and General Colin Powell's "base" force were publicly presented.[6]

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[6]Michael R. Gordon, "New Pentagon Strategic Plan For a World After Cold War," *New York Times*, 2 August 1990, p. A-1, A-12; President George Bush, "Remarks by the President to the Aspen Institute Symposium," 2 August 1990 (Washington, D.C.: The White House, Office of the

Up through the congressional hearings on the Bush administration's Fiscal Year 1991 Defense Budget request, a strong impression was given that its approach to the new world was to be much like the old one.[7] No other factor drove the Defense Budget except the deficit. Official projections of the Defense Budget were not based on a clear articulation of national objectives or national security strategy.

The Bush administration lost valuable time and political capital because it could only defend its Defense Budget request on the basis of hedging and prudence.[8] The fact that it took 18 months to articulate a new and relatively coherent military strategy is evidence that a future without a Cold War was never considered by either the Reagan or Bush administrations. If it was considered, the conclusions were likely pigeon holed, stifled, or ignored. This study hopes to provide a contribution in preparing for one potential future involving arms control and strategic weapons.

In the first chapter the conceptual framework for this study is established. The methodological approach is provided by the complex forecasting model of

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Press Secretary); Secretary of Defense Dick Cheney, "Remarks as Delivered by Secretary of Defense Dick Cheney to the Institute for Strategic Studies," The Homestead, Hot Springs, VA., 6 September 1990 (Washington, D.C.: Office of the Assistant Secretary of Defense (Public Affairs)) and General Colin L. Powell, "Remarks by General Colin L. Powell, Chairman of the Joint Chiefs of Staff, at the 72d Annual National Convention of the American Legion, Indianapolis, Indiana, 30 August 1990," (Washington, D.C.: Office of the Assistant Secretary of Defense (Public Affairs))

[7]Senate Appropriations Committee, Subcommittee on Defense, *Department of Defense Appropriations Fiscal Year 1991*, part 2, 101st Cong., 2d sess., pp. 311 and 312. The opening statement of Senator Daniel Inouye, chairman of the subcommittee, makes light of the business as usual approach of the Department of Defense regarding strategic weapons.

[8]For example see the opening testimony of Secretary of Defense Dick Cheney before the Senate Armed Services Committe, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 1, 101st Cong., 2d sess., pp 7-13.

William Ascher and William H. Overholt. Next, the chapter will layout the assumptions which were made to provide reasonable constraints. The intent is not to create an ideal world, which is clearly unattainable, but to examine a situation that has its basis in reality. In addition, the criteria used to measure and evaluate a START II are defined. The criteria are those articulated by President Bush in the March 1990 edition of the *National Security Strategy of the United States*: crisis stability, arms race stability, breakout stability, verification, predictability, security of allies, and consequences of war. Finally, the chapter will conclude by discussing why the United States should consider deep reductions in strategic weapons.

The second chapter will determine the size of possible reductions by reviewing deterrence theory and U.S. deterrence policies following World War II and then answer the three fundamental questions about nuclear deterrence. What Soviet targets should be held at risk? How many of those targets should be held at risk? And what if deterrence fails? The analysis indicates that a reduction to a level of 1500 strategic weapons is feasible and maintains or enhances U.S. national security while providing a hedge against uncertainties. The second chapter concludes by presenting a projection of the strategic nuclear forces available to the United States and the Soviet Union and a number of force options available to each in START II.

The analysis of the third chapter further substantiates the conclusion that 1500 strategic weapons are enough. Using the arms control criteria of the first chapter each force option will be analyzed to determine which option (or options) best enhances U.S. national security.

The final chapter considers the implications of the START II regime formulated in the study. A significant area of concern is the costs involved for strategic force modernization at a time of fiscal constraint. The choices made regarding strategic force modernization during the 1990s will have a significant influence on negotiating flexibility for START II. For example, the failure to fund land-based Intercontinental Ballistic Missile (ICBM) modernization may preclude the United States from pursuing that as a basing option for START II even if it is the desired choice. Finally, it is necessary to consider the potential effects the other three major nuclear powers may have on crisis stability with the recommended force option in place. While a future with France, the United Kingdom and the People's Republic of China simultaneously hostile to the United States is unlikely, there is no margin for error. The United States requires a force option immune to the effects that these nuclear powers may have on the strategic balance. A force structure centering on the Trident D-5 Submarine-launched Ballistic Missile (SLBM) and the B-2 bomber meets the most stringent requirements of nuclear deterrence in this future.

# II. BACKGROUND

## A. STRATEGIC PLANNING AND FORECASTING

It should appear obvious that effective long-range strategic planning is essential for developing policies and strategies which fulfill the interests and objectives of the United States. Several methodological approaches can be used to facilitate this planning. The specific approach utilized should be chosen based on several desirable criteria while recognizing that there are inevitable tradeoffs between these criteria.

First, the approach should be plausible. The analyst should be able to discard results which have no basis in reality or are clearly incorrect. Second, the approach should allow for results which appear counterintuitive to the premises used. For example, the economic policy of supply side economics at first appears counterintuitive because of its premise that cutting taxes leads to increased government revenue. Third, the approach should be sufficiently explicit so that other analysts can later apply it and develop the same results. Fourth, the approach should be comprehensive in its exploration of the chosen factors; yet, it should be as simple as possible because a simple approach is less difficult to employ, less intimidating to those attempting to learn it, and easier to assess its

reliability and plausibility. Finally, the approach should work with existing theory yet be sensitive to nuances.[9]

In addition, there are factors within the respective organization which require consideration when choosing a methodological approach. Analysts will tend to favor approaches that they know over those that they do not know. Efforts are needed to ensure that an untried approach is not discarded nor ignored simply because of unfamiliarity. However, if a new approach is used because the forecasting problem makes it necessary to do so, then its uncertainties should be explicitly stated so that analysts and recipients can better evaluate and understand the results. This procedure will assist in determining whether the new approach is useful or not. Also, the particular approach utilized will require specific analytical skills. The analyst assigned should possess the necessary skills to accomplish the task. Finally, the choice of any one approach will be a function of the time and effort required before the results are complete; the data requirements; and the manner in which the results will be communicated.[10]

The approach chosen by this study to examine START II comes from the excellent text by William Ascher and William H. Overholt, *Strategic Planning and Forecasting*. They propose two models for forecasting, one in which the actor has little control over his surrounding environment, and a more complex model

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[9]William Ascher and William H. Overholt, *Strategic Planning and Forecasting: Political Risk and Economic Opportunity* (New York: John Wiley & Sons, 1983), pp. 61-66.

[10]Defense Intelligence Agency, Report DDE-2200-227-83, *Methodology Catalog: An Aid to Intelligence Analysts and Forecasters*, by Joseph Peter Longo, December 1983, pp I-5 through I-7.

consisting of a strong actor who has the ability to influence his environment to varying degrees. The complex forecasting model is shown in Figure 1.[11]

The first step in using the model is to determine, list, and rank the national interests of concern. This task is obviously not as easy as it sounds since few people usually agree on the relative priority of any interest or the necessary tradeoffs between them. The second step is to describe the future environments. As shown in Figure 1, the model uses three types of environments: core, environment I through n (I through III shown for brevity), and exogenous. This concept of the total environment demonstrates a recognition that a strong actor with specific interests has various degrees of influence over his surrounding environment ranging from a great deal to practically none. The core environment is that portion of the total environment that is either stable or which the actor can exercise great control over relative to his interests. The portions identified as environments (envir) I through III, together called the basic environment, are those environments that are distinct from each other and from the core and over which the actor has less control. The outer portion, identified as exogenous, consists of those contingencies which do not fit into any of the constructed environments; in otherwords, the unexpected or unpredicted.

To meet the actor's needs for this complex situation, a three-part strategy is designed. The first strategy is the core strategy and is designed to handle only the core environment. The core strategy is supplemented by a basic strategy which is

[11]The following discussion is derived from Ascher and Overholt, *Strategic Planning*, pp. 21-41.

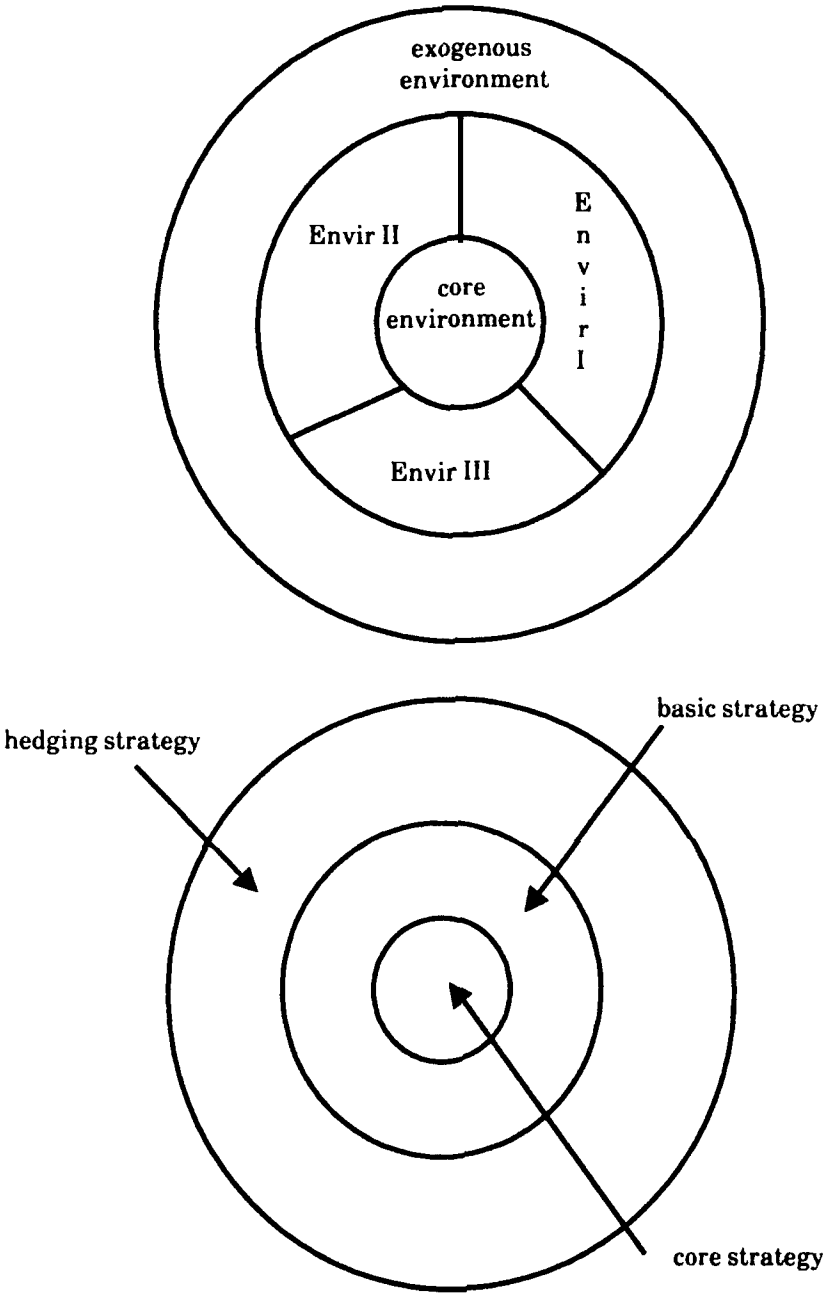


**Figure 1**
**Ascher and Overholt Complex Forecasting Model**

SOURCE: William Ascher and William H. Overholt, *Strategic Planning and Forecasting: Political Risks and Economic Opportunity* (New York: John Wiley & Sons, 1983), pp. 21-41.

designed to influence the respective surrounding environments towards the actor's preferred environment. Finally, a hedging strategy is included to handle the unforeseen contingencies not covered by the other two strategies.

The model in Figure 1 reflects a sophisticated view of alternative futures and how to formulate the means to handle them. It recognizes that the potential futures for a strong actor like the United States range from those which it can influence to those over which it has little or no influence.

For the purposes of this study, the Soviet Union remains the core environmental actor of concern. The other nuclear powers and the known emerging nuclear powers exist in environments I through n. The unknown radical states which may procure nuclear weapons exist in the exogenous environment. The core national interest of concern is the continued survival and freedom of the United States. The policy utilized to meet that national interest is nuclear deterrence. Thus, the goal is to determine the lowest number of strategic weapons which can exist in START II while maintaining the robustness of nuclear deterrence. The model in Figure 1 represents the conceptual framework guiding this study and its projection of the future core environment with the Soviet Union. Once the projection is complete and a feasible core strategy formulated, as operationalized by the recommended force options for START II, the question as to what degree this core strategy works for the other environments will be addressed.

## B. ASSUMPTIONS

First, START I could be signed and ratified in either 1991 or 1992 and fully implemented by the year 1998 or 1999. At the Washington Summit in June 1990, the Soviet Union and the United States made a commitment to commence talks

regarding future reductions once START I is ratified.[12] As a result, a START II could be ready for signature by the year 2000 and fully implemented between 2008 and 2010. Scrapping the current START regime for talks on deeper reductions, as proposed by Paul Nitze, is a destabilizing concept.[13] Though this proposal appears on the surface to have validity, it is not in the best interest of either party. The most important aspect of START and follow-on agreements is verification. The verification regime in START will be the most comprehensive and intrusive in the history of either nation.[14] There will be snags and misunderstandings to work out; both nations will have to achieve a degree of cooperation never before attempted. Trying to go to far in a short period of time could cause discord between the two nations. Time is needed for the United States and the Soviet Union to develop a more harmonious relationship. For example, the strength of the special relationship between the United States and the United Kingdom took several decades to develop.

Second, even with the recent positive trend in Soviet-American relations, the Soviet Union will remain the most likely adversary in a nuclear war. 40 years of animosity will not disappear overnight. START II must be framed with that reality in mind. Once formulated, START II can then be evaluated in terms of the other three existing major nuclear powers (United Kingdom, France, People's Republic of China) and any emerging nuclear powers. The agreement reached will

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[12]*Joint Statement on Future Negotiations on Nuclear and Space Arms and Further Enhancing Strategic Stability*, 1 June 1990, (Washington, D.C.: The White House, 1 June 1990).

[13]Nitze, "Leapfrog into START II."

[14]*Joint Statement on the Treaty on Strategic Offensive Arms*, 1 June 1990, (Washington, D.C.: United States Arms Control and Disarmament Agency (USACDA), June 1990).

be bilateral in nature. The other three major nuclear powers have indicated that they will not participate in arms control talks which include their strategic nuclear forces. A willingness to participate in later negotiations may exist only after deep reductions are made by the United States and the Soviet Union.[15]

Third, a smaller number of strategic weapons is able to maintain the extended deterrence of Europe. Rough strategic parity between the United States and the Soviet Union has existed since the SALT I Interim Agreement on Strategic Offensive Arms entered force on 3 October 1972. Even with the expansionistic tendencies of the Soviet Union in the late 1970s and early 1980s, Western Europe and the United States were not attacked by the Soviet Union. The lack of war suggests that two factors are important for the extended deterrence of Europe. The first factor is the uncertainty involved in any large scale war between the United States and the Soviet Union. The possibility of escalation to large scale use of strategic weapons is inherent to any conflict between the two superpowers if theater or battlefield nuclear weapons are present. The second factor is the existence of enough strategic weapons which can carry out an assured destruction attack. If these two factors are maintained, then a smaller number of strategic weapons will not adversely affect extended deterrence.[16]

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[15]Robert S. Norris and others, "Nuclear Weapons," in *SIPRI Yearbook 1989: World Armaments and Disarmaments* (New York: Oxford University Press, 1989), pp. 29, 33 and Robert S. Norris and others, "Nuclear Weapons," in *SIPRI Yearbook 1990: World Armaments and Disarmaments* (New York: Oxford University Press, 1990), pp.40, 46.

[16]This assumption is derived from the excellent review of the three schools of thought concerning strategic nuclear deterrence by Charles Glaser, "Why Do Strategists Disagree about the Requirements of Strategic Nuclear Deterrence," in *Nuclear Arguments*, ed. Lynn Eden and Steven E. Miller (Ithaca, NY: Cornell University Press, 1989), pp. 109-171 and this author's review of the various sources cited therein.

Fourth, nuclear armed sea-launched cruise missiles (SLCMs) will remain explicitly unconstrained in START II due to the difficulties and costs (primarily operational) of verification.[17] The general provisions of START I regarding annual declarations of numbers will continue. The total number of nuclear SLCMs will number less than 880. Nonnuclear cruise missiles will be unconstrained by START II.

Fifth, the counting rules for START II will be relatively simple. The actual number of warheads carried by each bomber, submarine, or land-based missile will count. The limit and sublimits in START II will apply equally to both the United States and the Soviet Union. Within any sublimit, each side can arrange their forces in a manner suitable to their interests. For example, if a sublimit of 1000 warheads exists for silo-based ICBMs, each side could deploy any number and variety of silo-based ICBMs as long as the total number of warheads does not exceed 1000. In addition, two to three ballistic missile submarines (SSBNs) in overhaul or restricted availability in shipyards will not count against ballistic missile sublimits since SSBNs are unable to launch strategic weapons in those conditions.[18] In addition, only those bombers actually available for alert would

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[17]Dr. Edward L. Warner, a senior defense analyst in the RAND Corporation, discussed these problems during testimony before the Senate Foreign Relations Committee. See Senate Foreign Relations Committee, *The Future of U.S.-Soviet Relations*, 101st Cong., 1st sess., April-June 1989, p. 599.

[18]Current START I proposals reportedly allow two to three SSBNs in overhaul or restricted shipyard availability to not count against ballistic missile sublimits. This portion of the START I regime is assumed to carry over into START II. See Senate Appropriations Committee, Subcommittee on Defense, *Department of Defense Appropriations Fiscal Year 1991*, part 3, 101st Cong., 2d sess., p. 358 and Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess., p. 87.

count against any limits. Those in long term maintenance or used for training purposes would not count.

Finally, the Anti Ballistic Missile (ABM) Treaty will remain in effect as signed in 1972 and modified in 1974. Only one ABM site can exist and must be located to defend either the national capital (Soviet Union) or ICBM silo launchers (United States).[19]

## C. START II CRITERIA

Arms control is a subordinate part of the national security problem and must be considered, framed, and pursued in that context. A "good" arms control agreement is worthless if it makes the nation less secure. At best, START II should enhance national security. At worst, START II should have a neutral effect. The *National Security Strategy of the United States* suggests several criteria to use in judging a potential START II agreement.

First, START II should foster crisis stability. Minimal incentives for the Soviet Union to launch a first strike should exist on a day-to-day basis. The key factor is the survival of at least 750 American strategic weapons which are capable of retaliation. This measure assumes that a START II is in place and that no breakout by Soviet strategic weapons constrained in the agreement is in progress. If 750 strategic weapons survive which are capable of retaliating, crisis stability exists. If less than 750 strategic warheads survive which are capable of retaliating, crisis stability does not exist.

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[19]National Academy of Sciences, *Nuclear Arms Control: Background and Issues* (Washington, D.C.: National Academy Press, 1985), Appendix C.

Second, the agreement should foster arms race stability. The agreement should not encourage the Soviet Union to quicken the development and deployment of unconstrained weapons to counter the effects of a START II. This measure is purely a qualitative assessment and the author's projection based on the trends in technological advances.

Third, the treaty should promote breakout stability. The American strategic nuclear force should have the ability to survive with 750 strategic weapons under any circumstances. 750 strategic weapons provides for the flexibility to launch strikes of a few warheads up to an assured destruction attack. If no breakout is needed to reduce the survivability of the American force to below 750 warheads, or if a doubling of Soviet strategic weapons does not prevent the survival of one-half the American force, then breakout stability exists. Breakout stability does not exist if an increase in Soviet strategic weapons of up to 50 percent reduces the survivability of the American force to 750 warheads.

Fourth, predictability regarding the size, nature, and evolution of Soviet strategic nuclear forces should be enhanced. This predictability allows for strategic planners to have a better grasp of the potential problems in the future by reducing uncertainty about the status of Soviet strategic nuclear forces.

Fifth, adequate verification is a must. Verification should act to reduce the incentives for breakout. It should provide adequate indication time for the United States to take action before the Soviet Union gains the capability to destroy one-half of the American strategic weapons.

Sixth, should a war involving the use of nuclear weapons occur, its consequences to the United States should be constrained to the greatest extent

possible as related to the objectives in the wartime environment. It is an American historical tendency to view war or conflict as an aberration and not as a continuation of policy using other means. As a result, when the United States does engage in a war or conflict, it tends to do so reluctantly and couches its goals in moral tones: World War I--make the world safe for democracy, the war to end wars; World War II--the four freedoms; and the Gulf War--free Kuwait from Iraqi oppression.[20] Also, the American tendency is towards limiting the casualties suffered by American military forces to the minimum necessary to attain victory. The dropping of the atomic bombs on Hiroshima and Nagasaki; while also motivated by other factors including revenge for Pearl Harbor, latent racism, and the potential for diplomatic leverage with the Soviet Union;[21] was primarily justified by its early ending of the war and preventing the horrendous casualties anticipated from an invasion of the Japanese home islands.[22] The latest example of the American tendency to limit its losses is the Gulf War where great emphasis was placed on technology and firepower as substitutes for American blood.

Finally, the strength of collective security between the United States and its friends and allies should not be reduced as a result of START II. A cornerstone of U.S. security policy in the years since World War II is the concept of collective security. Strong military alliances and economic relations with friendly nations have served to protect their interests as well as those of the United States.

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[20]Cecil V. Crabb, Jr., *American Foreign Policy in the Nuclear Age*, 2d ed., (New York: Harper & Row, 1965), pp. 23-27.

[21]Thomas G. Paterson, J. Garry Clifford, and Kenneth J. Hagan, *American Foreign Policy: A History* (Lexington, MA: D.C Heath and Company, 1977), pp. 429-435.

[22]One should consider the American and Japanese casualties suffered during the island invasions up to and including Iwo Jima and Okinawa. On Okinawa alone over 100,000 Japanese

Collective security facilitates communications among nations, improves the integration of various military forces through joint training and exercises, and provides a demonstration of U.S. commitment to friends. The strength of collective security remains important even with the end of the Cold War. Its importance was most recently demonstrated by the coalition forged by President Bush to confront Iraq's occupation of Kuwait. A reduction in strategic weapons must not reduce the strength of collective security.[23]

## D. SOVIET AND AMERICAN INTERESTS IN REDUCTIONS

For an arms control agreement to be ratified and implemented, a sufficient convergence of interests must exist between the United States and the Soviet Union. The interests of the two nations for arms control can be divided into three competitive categories: political, military, and economic.

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died while over 20,000 Americans were killed or wounded. These figures did not give much comfort to the American leadership when considering the anticipated costs of the planned Kyushu and Honshu invasions. Whether other diplomatic or economic means could have ended the war with Japan as quickly if not sooner remains a subject of debate. However, even after the atomic bombs were dropped and the surrender decree issued by the Emperor, it still took his personal intervention to ensure compliance by the military. See Alvin D. Coox, "The Effectiveness of the Japanese Military Establishment in the Second World War," in *Military Effectiveness*, vol. 3, *The Second World War*, ed. Allan R. Millet and Williamson Murray (Boston: Allen & Unwin, 1988), pp. 19, 32-34; Kenneth J. Hagan, *This People's Navy* (New York: The Free Press, 1991), pp. 327, 328; Robert W. Love, Jr., "Fighting a Global War, 1941-1945," in *In Peace and War: Interpretations of Naval History, 1775-1978*, ed. Kenneth J. Hagan (Westport, CT: Greenwood Press, 1978), pp. 285, 286; and Russell F. Weigley, *The American Way of War* (Bloomington, IN: Indiana University Press, 1977), pp. 310, 311.

[23]*National Security Strategy*, p. 26; Department of Defense, *Annual Report to the Congress, Fiscal Year 1990*, (Washington, D.C.: GPO, 1989), p. 49; Department of Defense, *Annual Report to the President and the Congress, January 1990* (Washington, D.C.: GPO, 1990), pp. 5, 6; and Department of Defense, *Annual Report to the President and the Congress, January 1991* (Washington, D.C.: GPO, 1991), pp. 8, 9.

These interests are called competitive because while positive benefits may accrue in one category, another category could accrue negative benefits. This is one way to view the Washington Naval Conference of November 1921 through February 1922. Politically an argument can be made that the agreements made at the conference were beneficial to the United States. The Anglo-Japanese alliance was abolished in the Four Power Treaty and the Open Door policy for China was endorsed in the Nine Power Treaty. However, militarily an argument can be made that the agreements had a negative impact. Submarines, cruisers, and destroyers were not limited, allowing an arms race in those categories, and the United States pledged not to further fortify its Pacific possessions.[24]

In addition, as Thomas Schelling and Morton Halperin pointed out in a classic work in the field, arms control agreements do not necessarily provide monetary savings:

> If both sides can profit from improved communications, from more expensive military forces that are less prone to accident, from expensive redeployments that minimize the danger of misinterpretation and false alarms, arms control may cost more, not less.[25]

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[24]Paterson, Clifford, and Hagan, *American Foreign Policy*, pp. 339-341 and Walter LaFeber, *The American Age* (New York: W.W. Norton and Company, 1989), pp. 320-323.

[25]Thomas Schelling and Morton Halperin, *Strategy and Arms Control* (New York: The Twentieth Century Fund, 1961), p. 2.

While this statement was written 30 years ago it remains valid today.[26] In response to a question regarding whether monetary savings should still serve as a criterion, Schelling responded:

> If there are arms controls, formal or informal, that promise to reduce military costs significantly and not impede the achievement of other objectives, such cost reduction would be a sufficient reason to proceed.... we emphasized that arms control might well entail greater outlays. Second-strike weapons could be more costly than first-strike ones. Measures that reduce the likelihood of the use of nuclear weapons might necessitate outlays for conventional forces. More reliable systems of surveillance and warning, and command and control, which are required by arms control pacts, or are in the spirit of arms control, may be expensive.... Arms control that raised costs would not violate a criterion; it would merely, if successful, achieve objectives worth the money.[27]

An arms control agreement or lack thereof requires tradeoffs between the three categories of interests. An early decision is required as to the importance of each and the negotiating approach of the United States formulated accordingly.

### 1. Soviet Interests in START II

Since the advent to power in 1985 of Mikhail Gorbachev, the Soviet Union has gone through a significant period of change. The concepts of perestroika and glasnost have evolved out of the realization that the economic situation in the Soviet Union is a shambles and must be dealt with if the Soviet Union is to remain a viable empire.

Recognizing that the ability to compete with the West over the long term required an inward focus, Gorbachev has promoted internal change and openness

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[26]Barry M. Blechman, "Cost Reduction Dubious," *Bulletin of the Atomic Scientists*, May 1989, pp. 38, 39; Edward L. Warner and David A. Ochmarek, *Next Moves* (New York: Council on Foreign Affairs, 1989), pp. 5, 6.

[27]Thomas Schelling, "From An Airport Bench," *Bulletin of the Atomic Scientists*, May 1989, p. 29.

in order to rebuild and improve the Soviet economy and society. This inward focus suggests an attempt to gain a sort of "breathing space" in its competition with the West. If the fundamental aspects of the Communist ideology and Russian historical tendencies are not altered, then the long term aim of the Soviet Union is presumably to come back onto the world scene as a more capable and robust world power. However, this goal of improving the economy and society remains valid regardless of the orientation of the political leadership.

Gorbachev and his supporters have come to realize that the elements of national power include the economy, social/political development, and ideological approach as well as military capability. The improvement and restructuring of the other elements of national power requires the availability of resources. The most likely source of these resources are those committed to the military sector. START I and II would provide one means of freeing up these resources for the economy.

Politically, a START I and II would provide evidence to the world that the Soviet Union is a reliable participant in international affairs. The positive political benefits for the Soviet Union's cooperative and relatively benign attitude with the Western nations over the past one to two years are evident in the Persian Gulf. The Soviet Union has achieved a diplomatic involvement in that region which it never before possessed.[28] Furthermore, the lack of an overt Soviet threat has essentially stopped all nuclear and nonnuclear force modernization in NATO. Finally, even the Soviet crackdown in Lithuania, while condemned by President

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[28]John M. Goshko, "Soviets want to join U.S. as Mideast peace-talk sponsors," *The Monterey Herald*, 26 April 1991, p. 2A.

Bush, resulted in no significant countermeasures by the United States.[29] Bellicose actions directed at the United States through the mid-1980s did not provide many benefits for the Soviet Union while cooperation has.

Militarily the Soviet Union has much to gain through a START I and II. Resources for the improvement of conventional forces may become more available. As a result, their relative capability and quality could increase with lower numbers of strategic weapons. In addition, the shape and evolution of American forces could become more predictable in START I and II.

### 2. American Interests in START II

One observation is immediately required. The above discussion regarding the arms control interests of the Soviet Union are in general applicable to the United States. The arms control criteria for START II discussed earlier address most of the military and political aspects of the American interests. Using a cooperative approach, even with a competitor or foe, will likely provide the United States more benefits than a win or lose approach. For example, France does not have the level of friendship with the United States as does the United Kingdom. However, even during the most serious of disagreements, both the United States and France have found cooperation, however reluctant, more beneficial.

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[29]Michael Wines, "Bush Deplores Soviet Crackdown But takes No Steps in Response," *New York Times*, 14 January 1991, p. A-1, 7; "Bush Statement on Lithuania," *New York Times*, 14 January 1991, p. A- 7; and Maureen Dowd, "White House Sticks to its Subdued Reaction to Baltic Crackdown," *New York Times*, 15 January 1991, p. A-7.

The conclusion that cooperation is better for both the United States and the Soviet Union is supported by President Bush in the *National Security Strategy of the United States*:

> Our goal is to move beyond containment, to seek the integration of the Soviet Union into the international system as a constructive partner.... The United States will seek to engage the USSR in a relationship that is increasingly cooperative. Moscow will find us a willing partner in creating conditions that will permit the Soviet Union to join, and be welcome in, a peaceful, free, and prosperous international community.... We look for fundamental alterations in Soviet institutions and practices that can only be reversed at great economic and political costs.... In the military sphere, with agreements in place--and weapons destroyed, production lines converted, and forces demobilized--any future Soviet leadership (i.e., friendly or hostile) would find it costly, time-consuming, and difficult to renew the pursuit of military supremacy and impossible to attempt without providing ample strategic warning.[30]

As further noted by Edward L. Warner and David Ochmarek in their book *Next Moves*:

> The successful conclusion of major arms control agreements, such as the SALT agreements and the ABM treaty, and sustained compliance with them, generally has had a positive "spillover" effect on the broader East-West political relationship. Advances in the bilateral arms control process can encourage cooperation in other areas, including crisis avoidance and crisis management, expanded economic and cultural relations, and, importantly, mutual restraint in regional conflicts.[31]

The recent example of restraint and cooperation by the Soviet Union with the United States occurred during the recent Gulf Crisis and War. The United States was able to remove most of its combat capability from Europe with little or no public concern. The numerous United Nations resolutions promoted by the

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[30] *National Security Strategy*, pp. 9,10.

[31] Warner and Ochmarek, *Next Moves*, p. 5.

United States were not vetoed or unduly hampered by Soviet actions. And although there were some last minute Soviet peace overtures to Iraq, many of the European nations, most notably France, also made last minute overtures. Could the United States have responded as vigorously as it did in the crisis and war with Iraq if the Soviet Union was still the uncooperative 'Evil Empire' of the 1980s?

## III. FORMULATING THE START II LIMITS

With the framework of the study established this chapter will determine the potential strategic force reductions in START II. The first section provides an historical overview of deterrence theory and U.S. deterrence policies since World War II. The second section continues this process by addressing the three enduring questions of nuclear deterrence for the Soviet Union in 2005-2010. The final two sections will focus on the strategic forces which the United States and Soviet Union can use in creating a number of potential force options in a START II regime.

### A. DETERRENCE: THEORY AND DECLARATORY POLICY

The deterrence policies of the United States following World War II can be placed within two historical eras. The first era, that of Massive Retaliation, existed from 1945 to the start of the Kennedy administration. The second era, that of Flexible Response, started with the Kennedy administration and continues today. Within both eras, U.S. policies have oscillated between responding symmetrically and asymmetrically to the Soviet threat.[32] At times the U.S. feels able to play its strength against Soviet weaknesses. At other times the U.S. tries to match Soviet strengths. During the era of Massive Retaliation, except for the momentary conventional buildup during the Korean War, the United States tried to play its

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[32]John Lewis Gaddis, *Strategies of Containment: A Critical Appraisal of Postwar American National Security Policy* (New York: Oxford University Press, 1982).

strength of nuclear weapons against the conventional and geographic strengths of the Soviet Union. In a general war with the Soviet Union the United States would use its nuclear weapons in an all out bombing campaign similar to those in World War II.[33] Because of the U.S nuclear superiority and the uncertainty surrounding the potential American use of nuclear weapons, Massive Retaliation, and its instrument the Strategic Air Command (SAC), was generally a bold and effective policy which attempted to match means to ends without bankrupting the United States.

However, with the perceived and projected decline in U.S. nuclear superiority by the end of the 1950s, there was increasingly more debate and discussion as to whether Massive Retaliation could still maintain nuclear deterrence. As a result, most of the modern thinking on deterrence came to fruition in the late 1950s in the writings of such individuals as William Kaufmann, Herman Kahn, and Glenn Snyder.

As one part of the interaction between entities from individuals to states, deterrence is a concept as old as established history. It exists at any level of interaction. Deterrence can be thought of as the caution one entity shows in the face of some superior power. As defined by Glenn Snyder:

> ...deterrence may follow, first, from any form of control which one has over an opponents present and prospective value 'inventory'; secondly from the

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[33]Joint Chiefs of Staff, "Evaluation of Current Strategic Air Offensive Plans (JCS 1952/1)," in *Nuclear Strategy, Arms Control, and the Future*, 2d ed., ed. P. Edward Haley and Jack Merrit (Boulder, CO: Westview Press, 1988), pp. 47-49 and David Alan Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1960," in *Strategy and Nuclear Deterrence*, ed. Steven E. Miller (Princeton, NJ: Princeton University Press, 1984), pp. 113-181.

communication of a credible threat or promise to decrease or increase that inventory; and, thirdly, from the opponent's degree of confidence that one intends to fulfill that threat or promise.[34]

In simpler terms the goal of deterrence is to prevent or keep an adversary from carrying out a particular action by communicating to that adversary what the likely costs will be. The expectation is that the adversary will be deterred from carrying out that action as long as less intolerable choices exist.[35] In the context of nations interacting with each other there are three general tools available for deterrence: military force including the use of general purpose forces or alliances; economic force including the use of trade restrictions or embargoes; and diplomatic force including the granting of recognition or the ending of diplomatic relations.[36]

The various tools of deterrence suggests that several deterrence orientations can exist. Kaufmann divides deterrence orientation into two area--punishment or reward. Punishment results when some form of costs are inflicted onto an adversary after he carries out the action which the recipient nation finds negative to its interests. Snyder, focussing in his work on the military realm, classifies deterrence by punishment as anytime nuclear weapons are utilized.[37] Rewards are an attempt to offer the adversary some positive benefit for not carrying out a particular action. Kaufmann is careful to distinguish deterrence by reward from

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[34]Glenn Snyder, *Deterrence and Defense*, (Princeton, NJ: Princeton University Press, 1961), p. 10

[35]William W. Kaufmann, "The Requirements of Deterrence," in *Military Policy and National Security*, ed. William W. Kaufmann (Princeton, NJ: Princeton University Press, 1956), p. 17.

[36]Snyder, *Deterrence*, pp. 9, 10 and Kaufmann, "Requirements of Deterrence," pp. 29-32.

[37]Snyder, *Deterrence*, p. 8.

the policy of appeasement by arguing that their are some areas where adversaries may have mutual interests. However, deterrence by reward can only succeed if the potential adversary desires to maintain the status quo, offers some concessions in return, or when the recipient nation can take back its concessions.[38] A third area of deterrence is denial. Deterrence by denial is the use of force to prevent an adversary from successfully occupying territory.[39] In the nuclear age Snyder assigns the role of deterrence by denial to general purpose forces because of the high costs associated with the use of nuclear weapons.

Deterrence can be categorized into three types. Herman Kahn defined these as Type I, II, and III:

> *Type I Deterrence* is the deterrence of direct attack. It is widely believed that if the United States were directly attacked, its response would be automatic and unthinking. The British call this "passive deterrence" on the plausible, but possibly incorrect, assumption that it requires no act of will to respond to a violation. *Type II Deterrence* is defined as using strategic threats to engage in very provocative acts, other than a direct attack on the United States itself. The British call this "active deterrence" because it clearly takes an act of will to initiate. *Type III Deterrence* might be called "tit-for-tat," graduated, or controlled deterrence. It refers to acts that are deterred because the potential aggressor is afraid that the defender or others will then take limited actions, military or nonmilitary, that will make the aggression unprofitable. (italics in original)[40]

Kaufmann takes Kahn's Type I and Type II deterrence and groups them as contingencies of the last resort. These contingencies consists of "an attack on areas which have come to be regarded as of vital interest to us, Communist use of nuclear

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[38]Kaufmann, "Requirements of Deterrence," p. 31, 32.

[39]Snyder, *Deterrence*, pp. 14,15.

[40]Herman Kahn, *On Thermonuclear War* , 2d ed., (Princeton, NJ: Princeton University Press, 1961), p. 126.

weapons, and those enemy actions which demonstrate there is a clear and present danger to U.S. society."[41] Beyond these contingencies are what Kaufmann calls the peripheral areas.

A credible deterrence policy has three components.[42] The first component requires that the forces assigned the deterrence mission have the capability to carry out the threat. For example, the threat of an effective nuclear retaliatory strike requires survivable nuclear forces. SSBNs are highly credible for this mission because of their ability to remain undetected in the oceans. The second component requires that the threat promise greater costs than what the opponent can reasonably expect to gain in benefits from the aggression. The final and most important component of credibility is intentions. Does the recipient nation actually intend to carry out on its threat and are these intentions successfully communicated. An adversary has three sources of information on which to base its judgment of U.S. intentions.

The first source is the U.S. record of previous actions in similar circumstances. A threatened course of action consistent with recent behavior is likely to have more credibility than one which represents a sharp break with tradition. For example, there was intensely negative allied reaction to the possibility that the United States would use atomic weapons during the Korean conflict for the simple fact that Hiroshima and Nagasaki were obliterated only a few years earlier.[43] Had the United States made a similar threat against Iraq in

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[41] Kaufmann, "Requirements of Deterrence," p. 29.

[42] This discussion on credibility is derived from Kaufmann, "Requirements of Deterrence," pp. 18-25.

[43] Clay Blair, *The Forgotten War* (New York: Times Books, 1987), pp. 522, 523, 533.

1991, the threat would have had little credibility because of the history of U.S. nuclear inaction in the peripheral areas since 1945.

The second source is the statements and behavior of the U.S. government. The credibility of any U.S. deterrence policy will depend to a large degree on the consistency of the statements, speeches, and actions of U.S. officials regarding that particular policy. If there is inconsistent behavior among the major leaders of government, it is possible that mixed and confusing signals will be sent to the adversary.

The final source is both domestic and allied public opinion. Given the democratic nature of the United States and its emphasis on collective security, any deterrence policy will suffer a loss in credibility if allied and domestic public opinion do not support it.

The difficulty with deterrence, as the critics of Massive Retaliation pointed out, is the chance that the adversary may challenge the United States to carry out its threat. In the case of Massive Retaliation, this challenge would leave the United States in a difficult position. The United States would have to either initiate nuclear war and suffer those consequences or face a loss of prestige, the decrease in capability to initiate future deterrence policies, and give encouragement to the adversary to take further actions.[44] Thus, the criticism of Massive Retaliation focussed on its perceived lack of flexibility and credibility.

The criticism of Massive Retaliation found favor with a Kennedy administration seeking to distance itself from the policies of its predecessor. The era of and search for Flexible Response had commenced. Seeing Massive

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[44]Kaufmann, "Requirements of Deterrence," p. 18.

Retaliation as a one option war plan, Secretary of Defense Robert McNamara attempted to answer the question of what deters the Soviet Union. His solution during the early years of the Kennedy administration was the policy of Damage Limitation. This policy had two aims: the targeting of Soviet military forces in order to minimize their capability to launch a powerful second strike against American cities; and a large enough contingent of American strategic reserve forces capable of destroying Soviet urban society.[45] The policy's goal as stated in a speech given by McNamara to the NATO Council in 1962 was "to preserve the fabric as well as the integrity of allied society."[46] This concept of deterrence was possible given the American superiority in strategic weapons. In several speeches and writings McNamara stated that nuclear strategy must be viewed in the same manner that conventional war had always been. This reevaluation of thought was contrary to the view, most notably articulated by Bernard Brodie, that nuclear weapons had fundamentally changed the character of military strategy.[47]

Yet, in one important respect McNamara did not differ from Brodie. He considered the target of ultimate value in any country to be its urban society. According to McNamara the destruction of an urban society (one-fourth the

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[45]Scott Sagan, *Moving Targets - Nuclear Strategy and National Security* (Princeton, NJ: Princeton University Press, 1989), pp. 28, 29.

[46]Secretary of Defense Robert McNamara, "Speech to NATO Council, Athens, 5 May 1962," in *U.S. Nuclear Strategy*, ed. Philip Bobbitt, Lawrence Freedman, and Gregory Treverton (New York: New York University Press, 1989), p. 206.

[47]Bernard Brodie, "The Atomic Bomb and American Security," in *U.S. Nuclear Strategy*, ed. Philip Bobbitt, Lawrence Freedman, and Gregory Treverton (New York: New York University Press, 1989), pp. 64-94.

population and one-half the industrial capacity) would take generations to recover from.[48] Thus, this society was naturally what each country must value the most.

McNamara repudiated Damage Limitation by 1963 because it was no longer deemed feasible. In his posture statement to Congress for 1963 he stated that "it will become increasingly difficult to destroy a sufficiently large proportion of he Soviet's strategic nuclear forces to preclude major damage to the United States, regardless of how large or what kind of strategic forces we build."[49] He believed that the continuation of Damage Limitation would call for a costly strategic arms race which would divert funds away from the buildup in conventional forces desired by the Kennedy administration. As a result, McNamara formulated the new deterrence policy of Assured Destruction. What deterred according to McNamara were secure second-strike forces capable of performing the mission of assured destruction.[50]

Mutual Assured Destruction (MAD) is the policy of Assured Destruction applied by McNamara to the strategic thinking of both the United States and the Soviet Union. The concept of assured destruction required the capability to absorb a surprise attack and survive with sufficient power to inflict unacceptable damage on the Soviet Union. Assured destruction assumed that the Soviet Union was deterred by a fear of devastating nuclear retaliation which would destroy its urban society. MAD assumed that both superpowers were deterred by this fear but that in the interests of deterrence each would still leave itself vulnerable to retaliation.

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[48]Sagan, *Moving Targets*, pp. 32, 33.

[49]P. Edward Haley and Jack Merrit, "The Years of Plenty," in *Nuclear Strategy, Arms Control, and the Future*, 2d ed., (Boulder, CO: Westview Press, 1988), p.61.

[50]Ibid.

While commonly called MAD, this policy was never accepted by the Soviet Union as its deterrence policy. MAD was a repudiation of McNamara's earlier damage limiting strategy which sought to limit losses to the population and industry in the event of war by destroying Soviet strategic forces.[51] Thus, as Gregory Treverton suggests, the idea was that "killing weapons is bad, killing people is good."[52]

The Nixon administration entered office in 1969 facing the same problem confronting John Kennedy in 1961, current nuclear strategy was perceived as lacking credibility and the capability to ensure deterrence, especially in NATO. Assured Destruction was seen as a single option strategy giving the President only two choices in a nuclear war: surrender or face complete destruction from Soviet retaliation in response to the American assured destruction strike. Both options were deemed unacceptable.[53] By 1972, the Defense Department began to study ways to change American strategy to provide more usable nuclear options while leaving an assured destruction capability as a last resort. This resulted in President Nixon's National Security Decision Memorandum (NSDM) 242 of January 1974 as conceived by Secretary of Defense James Schlesinger.

NSDM 242 differed from McNamara's policy of Assured Destruction in several key areas. First, Schlesinger believed that the Soviet leadership held its ability to recover and control Soviet society in the aftermath of a nuclear war as

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[51]Gregory Treverton, "From No Cities to Stable Vulnerability," in *U.S. Nuclear Strategy*, ed. Philip Bobbitt, Lawrence Freedman, and Gregory Treverton (New York: New York University Press, 1989), p. 196.

[52]Ibid., p. 200.

[53]Sagan, *Moving Targets*, pp. 39-41 and Philip Bobbitt, "Selective Options and Limited Response, 1974 - 1983," in *U.S. Nuclear Strategy*, ed. Philip Bobbitt, Lawrence Freedman, and Gregory Treverton (New York: New York University Press, 1989), p. 339.

vitally important. Deterrence was best strengthened by threatening this recovery and control through the use of Limited Nuclear Options (LNOs). By giving the President more usable options, the credibility of a potential U.S. nuclear strike was supposedly enhanced in case of limited Soviet nuclear strikes or a massive Soviet conventional attack in Europe. Should deterrence fail, escalation control was sought through the practice of self-restraint by both sides; in otherwords, the self-imposed withholding of nuclear strikes. The Schlesinger Doctrine was a step back towards the warfighting strategies of McNamara's early years: Damage Limitation and City Avoidance. The goal was to provide enough time for the United States and the Soviet Union to minimize escalation and maintain a general war at some level below the all out spasm inherent to a policy of Assured Destruction.[54]

The second major difference involved the targeting for the assured destruction (reserve) forces of the United States. Under McNamara cities and population were emphasized. Under NSDM 242 the focus shifted to the destruction of 70 percent of the Soviet industrial base and make the Soviet Union's recovery slower than that of the United States following a nuclear exchange. Because of the emphasis on slowing Soviet recovery, NSDM 242 was known as the Counterrecovery Strategy. However, though the language used by Nixon and Schlesinger was different and deemphasized assured destruction, the percentage of total warheads devoted to urban industrial targets actually increased from 16

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[54]Sagan, *Moving Targets*, pp. 42-44 and Desmond Ball, "Counterforce Targeting: How New? How Viable?" in *The Race for Security*, ed. Robert Scott (Lexington, MA: D.C. Heath and Co., 1987), p. 123.

percent under McNamara to 50 percent under Schlesinger. NSDM 242 was in some ways as much a strategy of assured destruction as McNamara's.[55]

This trend towards warfighting and damage limitation continued through the Carter and Reagan Presidencies. Under Carter, Presidential Directive (PD) 59 was signed. PD 59 had three objectives: flexible response, escalation control, and war termination on the lowest possible level at terms favorable to the United States. PD 59 was known as the Countervailing Strategy. According to Secretary of Defense Harold Brown it shifted American emphasis towards an ability which "would exact a prohibitively high price from the things the Soviet leadership prizes most--political and military control, nuclear and conventional military force, and the economic base to sustain a war."[56]

Early in the Reagan administration with the signing of National Security Decision Document (NSDD) 13, the trend of PD 59 was continued with little difference except to give increased emphasis to fighting a protracted nuclear war, ensuring the endurance of Command, Control, and Communications, and placing the Soviet political and military leadership at risk.[57] According to Richard Halloran the six missions necessary to accomplish the Countervailing Strategy were articulated in the 1982 *Defense Guidance*:

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[55]Sagan, *Moving Targets*, pp. 44 - 48.

[56]Department of Defense, *Department of Defense Annual Report, FY 1982*, (Washington, D.C.: GPO, 1981), p. 40. For further discussion see Walter Slocombe, "The Countervailing Strategy," in *Strategy and Nuclear Deterrence*, ed. Steven E. Miller (Princeton, NJ: Princeton University Press, 1984), pp. 245-254; Secretary of Defense Harold Brown, "Newport Address," in *U.S. Nuclear Strategy*, ed. Philip Bobbitt, Lawrence Freedman, and Gregory Treverton (New York: New York University Press, 1989), pp. 412- 414; and Richard Smoke, *National Security and the Nuclear Dilemma*, 2d ed., (New York: Random House, 1987), p. 228.

[57]Ball, "Counterforce Targeting," p. 124.

- Promote deterrence by being convincingly capable of responding to a first strike in such a way as to deny the Soviets (or any other adversary) their political and military objectives.
- Minimize the extent to which Soviet nuclear threats could be used in a crisis to coerce the United States and our allies.
- Maintain the capacity to support Allied commitments.
- Should deterrence fail, deny the Soviet Union (or any other adversary) a military victory at any level of conflict and force earliest termination of hostilities on terms favorable to the United States.
- Limit Damage, by active and passive measures, to the United States and its allies.
- Maintain in reserve, under all circumstances, nuclear offensive capabilities so that the United States would never emerge from a nuclear war without nuclear weapons while still threatened by enemy nuclear forces.[58]

These missions reflect the rationale for the modernization of American strategic nuclear forces started during the Carter administration and continued at a faster pace during the Reagan administration.

Two years of the Bush administration have not produced any radical or significant changes in the deterrence orientation of the United States. While significant progress has been made towards completing START I and the pace of strategic force modernization has slowed, the Countervailing Strategy remains

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[58]Richard Halloran, *To Arm a Nation: Rebuilding America's Endangered Defenses* (New York: MacMillan, 1986), pp. 282 - 283. While the *Defense Guidance* is a classified document, Halloran's assertion is both implicitly and explicitly supported by Department of Defense annual reports and other sources. See Slocombe, "The Countervailing Strategy," Department of Defense, *Annual Report to the Congress, Fiscal Year 1983* (Washington, D.C.: GPO, 1982), pp. I-17 through I-19, Department of Defense, *Annual Report, Fiscal Year 1990*, pp. 34-37, and Department of Defense, *Annual Report, January 1991*, pp. 51-60.

U.S. policy. Table 1 summarizes the history of U.S. deterrence policies and their growing complexity in the quest for credibility and flexibility.

## B. DETERMINING THE NUMBER OF STRATEGIC WEAPONS

Determining the number of strategic nuclear weapons is a three step process answering the questions "What deters?"; "How much is enough?"; and "What if deterrence fails?" It is fair to say that in the past, U.S. nuclear deterrence policy has emphasized a range of potential targets. Nuclear targeting has always consisted of four basic target groups. What has changed over time is the relative emphasis given to each target group.[59] Table 2 lists some examples of targets within each group.

In more recent testimony before Congress regarding the B-2 bomber, General John Chain, Commander-in-Chief of the Strategic Air Command (CINCSAC), defined three target categories: hard targets, soft targets, and mobile targets. Hard targets include ICBM silos, Launch Control Centers (LCCs), and command posts. Soft or area targets consist of defensive systems, airfields and submarine bases, factory complexes, and communication and economic networks. Mobile targets include aircraft, mobile missile launchers, surface navies, and armies out of garrison.[60]

In many ways, this division of potential targets is most useful when considering the effectiveness of various strategic weapons. Some strategic

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[59]Scott Sagan, *Moving Targets*, pp. 28, 29 and Jeffrey Richelson, "The Dilemmas of Counterpower Targeting," in *Strategic Nuclear Targeting*, ed. Desmond Ball and Jeffrey Richelson (Ithaca, NY: Cornell University Press, 1986), p. 160.

[60]Senate Armed Services Committee, *Testing and Operational Requirements for the B-2 Bomber*, 101st Cong., 1st sess., 21 July 1989, p. 9.

## TABLE 1
## OVERVIEW OF DETERRENCE POLICIES

| Era of Massive Retaliation | Time | Features |
|---|---|---|
| Postwar Doctrine | 1945-1952 | Countervalue Attack<br>Counterforce Attack |
| New Look | 1953-1959 | Countervalue Attack<br>Counterforce Attack<br>Tactical Nuclear Weapons |
| **Era of Flexible Response** | **Time** | **Features** |
| Damage Limiting/ Assured Destruction | 1960-1965 | Countervalue Attack<br>Counterforce Attack<br>Tactical Nuclear Weapons<br>Damage Limiting |
| Mutual Assured Destruction | 1966-1973 | Countervalue Attack<br>Counterforce Attack<br>Tactical Nuclear Weapons |
| Limited Nuclear Options/ Assured Destruction | 1974-1980 | Countervalue Attack<br>Counterforce Attack<br>Tactical Nuclear Weapons<br>Escalation Control |
| Countervailing Strategy | 1980-? | Countervalue Attack<br>Counterforce Attack<br>Tactical Nuclear Weapons<br>Escalation Control<br>Leadership<br>Prolonged War<br>Recovery Denial |

SOURCE: Author and Richard Lee Walker, *Strategic Target Planning: Bridging the Gap between Theory and Practice* (Washington, D.C.: National Defense University Press, 1983), p. 8

## TABLE 2
## TARGET GROUPS IN THE SOVIET UNION

1. *Soviet Nuclear Forces*:
   ICBMs and IRBMs, together with their launch facilities and launch command centers;
   nuclear weapons storage sites;
   airfields supporting nuclear-capable aircraft;
   nuclear ballistic missile submarine (SSBN) bases.
2. *Conventional military forces*:
   barracks;
   supply depots;
   marshaling points;
   conventional airfields;
   ammunition storage facilities;
   tank and vehicle storage yards.
3. *Military and political leadership*:
   command posts;
   key communication facilities.
4. *Economic and industrial targets*:
   a. war-supporting industry:
      ammunition factories;
      tank and armored personnel carrier factories;
      petroleum refineries;
      railway yards and repair facilities.
   b. industry that contributes to economic recovery:
      coal;
      basic steel;
      basic aluminum;
      cement;
      electric power.

Source: Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1981*, part 5, 96th Cong., 2d sess., p. 2721.

weapons are not hard target capable and cannot attack mobile targets. But by 2008, all American strategic weapons will have the ability to threaten hard targets. A question will remain, however, about the American ability to hold at risk mobile targets. Given the problems encountered by the coalition forces in quickly destroying the Iraqi SCUD launchers, despite coalition control of the airspace over Iraq, it is hard to accept Air Force statements that the B-2 will have the ability to hold mobile ICBM launchers at risk in Soviet airspace during a nuclear war.

### 1. What Will Deter the Soviet Union in 2005-2010?

The Soviet Union probably will continue to undergo dramatic changes. Political power will diffuse among the leadership of both the central state apparatus and the republics as the republics strive for varying degrees of autonomy or independence. The political power of the Soviet Union in 2005-2010 might be divided in a way similar in nature to that existing in the United States during its confederation period. In addition, the Soviet population's desires, which were released during the late 1980s and early 1990s, to develop some type of modern and competitive market economy will likely continue. The restructuring of the Soviet economy will place continued emphasis on the civilian sector and long term economic growth.[61]

These two factors suggest a reward and punishment approach for U.S. national security strategy. The rewards could include foreign aid, trade

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[61]Michael Dobbs, "Russian President Calls for 'War' Against Soviet Leaders," *The Monterey Herald*, p. 2A; Ann Imse, "Crowd Seeks Gorbachev Resignation," *The Monterey Herald*, p. 1A, 10A; and Interview between Roman Laba, Professor of Soviet and East European Studies, United States Naval Postgraduate School, and the author, 14 March 1991.

concessions or other nonmilitary means. Two potential punishments could exist. The first potential punishment could be the threat of a strategic arms race to divert resources away from the Soviet civilian economy. The second potential punishment would consist of a nuclear strategy designed to threaten the assets which the Soviet leadership values most. In this case, the Soviet Union's most valued asset is its long term economic growth and modernization. Thus, the targets in Table 2 to hold at risk are economic and industrial facilities.[62]

The major difficulties associated with targeting these facilities focuses on the specific damage criteria and the methodological approach to measure that criteria.[63] However, these difficulties do not invalidate the worth of this targeting strategy for both deterrence and warfighting. In case of nuclear war, the destruction of Soviet strategic weapons was an objective which the United States has planned to pursue because of the perception that both deterrence and

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[62]This projection of a Soviet future is not a mirror imaging of American values and concepts onto the Soviet Union. Instead it represents this author's conclusion regarding present trends within the Soviet Union. According to Professor Roman Laba, the general consensus regarding the best case future for the Soviet Union is one in which the republics have attained more political and economic power while leaving some transrepublic issues, such as external defense, in the hands of the central authority. The primary difference between this strategy and the Counterrecovery and Countervailing Strategies of the Nixon/Ford and Carter/Reagan/Bush administrations is the object of the threat. In those strategies, the object of the threat was the Communist leadership. In this strategy the object of the threat is the leadership of the various republics and those that support them by holding at risk the economic and political control which they have struggled to gain. For a discussion of the Counterrecovery and Countervailing strategies see Ball, "Counterforce Targeting; Bobbitt, "Selective Options and Limited Response;" Brown, "Newport Address;" Department of Defense, *Annual Report, FY 1982*, p. 40; Sagan, *Moving Targets*, pp. 39-48; Slocombe, "The Countervailing Strategy;" and Smoke, *National Security and the Nuclear Dilemma*, p. 228.

[63]Michael Kennedy and Kevin N. Lewis, "On Keeping Them Down; or, Why Do Recovery Models Recover So Fast?" in *Strategic Nuclear Targeting*, ed. Desmond Ball and Jeffrey Richelson (Ithaca, NY: Cornell University Press, 1986), pp 194-208 and Desmond Ball, "U.S. Strategic Forces: How Would They Be Used?" in *Strategy and Nuclear Deterrence*, ed. Steven E. Miller (Princeton, NJ: Princeton University Press, 1984), pp. 236-239.

warfighting were enhanced regardless of the difficulties associated with attaining such an objective.

A nuclear strategy emphasizing economic and industrial facilities is applicable even in a prolonged warfighting scenario. Following the completion of World War Two in Europe, Paul Nitze, then a member of the Strategic Bombing Survey, concluded that:

> ...strategic bombing was likely to cause the greatest disruption if it concentrated on basic industries and services such as oil and chemical, steel, power, and transportation. Unlike the ball-bearing and airframe plants, these basic industries, once severely damaged, could not be quickly restored to full production nor could stocks be readily replaced.[64]

Nitze's views were supported by those of Hitler's economic Czar, Albert Speer. Speer avoided placing plants for finished products underground because he believed that the allied powers would then focus on the basic industries if denied these other targets. Speer believed that the basic industrial plants could not be replaced as quickly as those committed to finished products, that they were inherently more vulnerable to attack, and if destroyed would have caused the greatest disruption in the economy and the ability of the country to fight a prolonged engagement.[65]

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[64]Paul H. Nitze with Ann M. Smith and Steven L. Rearden, *From Hiroshima to Glasnost* (New York: Grove Weidenfeld, 1989), p. 35.

[65]Ibid., p. 36. *The United States Strategic Bombing Survey*, Overall Report (European War) 30 September 1945: pp. 25, 37, 108 further supports the views of Nitze and Speer regarding which targeting would have had the larger impact on the ability of Germany to sustain its forces in the field.

### 2. How Much Will Deter the Soviet Union in 2005-2010?

Unclassified numbers are obviously vague for the targets of concern. However, some reasonable formulations can be made. A recent study performed by Martin Marietta for the Department of Defense analyzed the post-START I target base. Though the actual report has not been released, certain portions of it were cited by *Jane's Defense Weekly* in its 22 April 1989 issue. The relevant targets are:

> Priority 3 targets (Soviet War supporting industry): 1500 to 1600 targets consisting of: nuclear weapons production facilities, power plants, hydro-electric facilities, manufacturing facilities for critical components and military hardware production facilities.[66]

This number is close to that cited by Desmond Ball for those economic and industrial targets covered by U.S. strategic forces in a day-to-day alert posture and is further supported by the study *Strategic Arms Reductions*.[67] If the Soviet Union converts most of the industrial facilities currently used for military related items to non-defense use, a total of 1500 civilian economic targets could exist. This number represents a "worst case" or upper limit. An equal number of strategic weapons would be adequate to hold this target base at risk.

### 3. What if Deterrence Fails with the Soviet Union in 2005-2010?

The three questions of deterrence are related and influence each other. The answer to the question--what to do if deterrence fails?--influences how the United States might continue to deter the Soviet Union. A range of targeting

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[66]Barbara Starr, "Pentagon Studies 'Most Survivable' US ICBM Force Mix," *Jane's Defense Weekly*, 22 April 1989, pp 678-679.

[67]Desmond Ball, "Development of the SIOP, 1960-1983," in *Strategic Nuclear Targeting*, ed. Desmond Ball and Jeffrey Richelson (Ithaca, NY: Cornell University Press, 1986), p. 81 and May, Bing, and Steinbruner, *Strategic Arms Reductions*, p. 115.

options is required to allow the use of a few nuclear weapons up to the entire strategic nuclear arsenal. Employment options should emphasize functional groupings within the economic portion of the target base. Examples of targets include hydro-electric facilities, petroleum refineries, or transportation choke points. Geographic subsets of the functional options should exist as well to allow targeting of specific facilities or functions within the various republics of the Soviet Union. While emphasis is given to the economic-industrial realm, it is foolhardy to not consider and evaluate other targeting options for Soviet nuclear and nonnuclear forces.

## C. STRATEGIC FORCES AVAILABLE FOR START II

The force structures evolving from START I will influence the range of options available to the American negotiators for START II. Table 3 lists the characteristics of strategic weapons the United States could posses in 2005. The capabilities do not substantially differ from what presently exists. Ballistic missile accuracy probably is at its technological limit with the Peacekeeper and Trident D-5 missiles. Minuteman II and III missiles are not included because by 2008, the last of the aging Minuteman IIIs (if any remain) are scheduled for retirement.[68]

Table 4 lists those Soviet strategic weapons which could be available for a START II regime. Soviet capabilities are projected to improve dramatically,

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[68]General Accounting Office, *Strategic Forces: Minuteman Weapons System Status and Current Issues*, GAO/NSIAD-90-242 (Washington, D.C.: General Accounting Office, September 1990).

## TABLE 3
## AMERICAN STRATEGIC WEAPONS AVAILABLE IN 2005-2010

| Delivery Vehicle (sndv) | Range (nmi) | Yield (Mts) | CEP (nmi) | Throwweight (1000s of pounds) | Weapons per sndv |
|---|---|---|---|---|---|
| ICBM | | | | | |
| Peacekeeper | 5900 | .3-.4 | .054 | 7.0-7.9 | 10 |
| SICBM | 5900 | .475[a] | .07 | 1.3 | 1 |
| SLBM | | | | | |
| D-5 | 6500 | .3-.475 | .065 | 5.3 | 5-6[b] |
| BOMBERS | | | | WEAPONS CARRIED | |
| B-1B | 4000-6000 | | | Internal: 8 ALCM/ACM and 8 SRAMs, or 24 SRAMs or 24 B-61 Bombs<br>External: 14 ALCM/ACM or 14 SRAMs or 14 Bombs | |
| B-2 | 4400-6600 | | | 8 SRAMs and 8 B-83 Bombs, or 16 SRAMs, or 8 SRAMs and 8 B-61 Bombs | |
| BOMBER WEAPONS | | | | | |
| ALCM | 1400 | .2 | .05 | | 1 |
| ACM | 2200 | .2 | .02-.05 | | 1 |
| SRAM II | 200 | .2 | .05 | | 1 |
| B-61 Bomb | | .1-.5 | .07-.1 | | |
| B-83 Bomb | | 1.0-2.0 | .07-.1 | | |

**TABLE 3--Continued**

NOTES.

a. During testimony before the House Armed Services Committee, General Larry Welch, Air Force Chief of Staff, indicated that the yield of the SICBM is larger than the Peacekeeper's. See House Armed Services Committee, Procurement and Military Nuclear Systems Subcommittee, *National Defense Authorization Act for Fiscal Year 1990-HR 2461: Procurement of Aircraft, Missiles, Weapons and Tracked Combat Vehicles, Ammunition, and other Procurement*, 101st Cong., 1st sess., p. 113.

b. The technical feasibility of downloading the D-5 missile to 5-6 warheads was confirmed in testimony by Dr. J. D. Crouch, principal Deputy Assistant Secretary of Defense (International Security Policy) and Rear Admiral Kenneth Malley, head of the Strategic Systems Project Office for the U.S. Navy. In addition, the Soviet Union has shown interest in a provision for downloading in a START regime. See Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess., pp. 126, 129, 141.

SOURCE:

Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Years 1990 and 1991*, part 6, 101st Cong., 1st sess., p. 391; Congressional Budget Office, *Trident II Missiles: Capability, Costs, and Alternatives* (Washington, D.C.: GPO, July 1986); Congressional Budget Office, *Modernizing U.S. Strategic Forces: Costs, Effects, and Alternatives* (Washington, D.C.: GPO, November 1987); The International Institute for Strategic Studies, *The Military Balance 1990-1991* (London: The International Institute for Strategic Studies,1990); Department of Defense, *Soviet Military Power 1990* (Washington, D.C.: GPO, 1990); Mark Lambert, ed., *Jane's All the Worlds Aircraft* (Coulsdon, Surrey, England: Jane's Information Group, 1990); Duncan Lennox, ed., *Jane's Strategic Weapon Systems* (Coulsdon, Surrey, England: Jane's Information Group, 1990);

**TABLE 3--Continued**

SOURCE:

Donald Rice, "The Manned Bomber and Strategic Deterrence: The U.S. Air Force Perspective," *International Security*, vol. 15, no. 1 (Summer 1990): pp. 125, 126; Thomas C.Cochran and others, *Nuclear Weapons Databook*, vol. 1, *U.S. Nuclear Forces and Capabilities* (Cambridge, MA: Ballinger Publishing Co., 1984); Robert S. Norris and others, "Nuclear Weapons," in *SIPRI Yearbook 1990: World Armaments and Disarmament* (New York: Oxford University Press,1990); *Report to the Congress on the Analysis of Alternative Strategic Nuclear Force Postures for the United States Under a Potential START Treaty* (Unclassified Version), (Washington, D.C.: The White House, 25 July 1989); Robert S. Norris and Thomas B. Cochran, "U.S.-U.S.S.R. Strategic Offensive Nuclear Forces, 1946-1989," *Nuclear Weapons Databook Working Paper 90-2* (Washington, D.C.: Natural Resources Defense Council, May 1990); and Regina Cowen Karp, "US-Soviet Nuclear Arms Control," in *SIPRI Yearbook 1990: World Armaments and Disarmament* (New York: Oxford University Press, 1990), pp. 424-425.

TABLE 4
SOVIET STRATEGIC WEAPONS AVAILABLE IN 2005-2010

| Delivery Vehicle (sndv) | Range (nmi) | Yield (Mts) | CEP (nmi) | Throwweight (1000s of pounds) | Weapons per sndv |
|---|---|---|---|---|---|
| ICBM | | | | | |
| SS-18 M4 | 5900 | .5-.55 | .1-.14 | 16.7 | 10+ |
| SS-18 M5 | 5900 | .75 | .1-.14 | 16.0 | 10+ |
| SS-18 M6 | 5900 | 16[a] | .1-.14 | 16.0 | 1 |
| SS-24 | 5400 | .1-.55 | .1 | 7.0-8.0 | 10 |
| SS-25 | 5700 | .55-.75 | .1-.2 | 1.3-2.6 | 1 |
| SS-18 MOD | 5900 | .75 | .05 | 16.0 | 10 |
| SS-25 MOD | 5700 | .55-.75 | .07 | 1.3-2.6 | 1 |
| SLBM | | | | | |
| SS-N-20 | 4500 | .1 | .27-.3 | >2.5[b] | 10 |
| SS-N-23 | 4500 | .1 | .27-.486 | >2.5[b] | 4 |
| SS-N-20 MOD | 4500 | .3-.475 | .065 | >2.5[b] | 4 |
| SS-N-23 MOD | 4500 | .3-.475 | .065 | >2.5[b] | 10 |
| BOMBERS | | | | WEAPONS CARRIED | |
| Bear-H | 3100-3500 | | | 12 AS-15 or 19X ALCMs | |
| Blackjack | 3900 | | | 12 AS-15 or 19X ALCMs or 24 AS-16 SRAMs | |

TABLE 4--Continued

| Delivery Vehicle (sndv) | Range (nmi) | Yield (Mts) | CEP (nmi) | Throwweight (1000s of pounds) | Weapons per sndv |
|---|---|---|---|---|---|
| BOMBER WEAPONS | | | | | |
| AS-15 | 900-1600 | .25 | .05-.25 | | |
| AS-16 | 100 | .35 | .25 | | |
| AS-19X | 1600-2200 | .25 | .05 | | |

NOTES.

a. Throwweight places an upper limit on what actual warhead yield is. For non-MIRVed systems, one pound of throwweight is roughly equal to one kiloton of yield. For MIRVed systems, one pound of throwweight is roughly equal to .5 kiloton of yield due to the weight requirements of the post-boost vehicle and other support equipment. In no case has the actual yield of warheads exceeded that predicted by these ratios. See Peter Pry, "The Strategic Nuclear Balance, And Why It Matters" (PhD dissertation, University of Southern California, 1988), pp. 286-302.

b. No source consulted cited a specific throwweight for the SS-N-20 or 23. The only information provided was that their respective throwweights are more than that of the SS-N-18 which is cited at 2500 pounds.

SOURCE:

Author; Congressional Budget Office, *Trident II Missiles: Capability, Costs, and Alternatives* (Washington, D.C.: GPO, July 1986); Congressional Budget Office, *Modernizing U.S. Strategic Forces: Costs, Effects, and Alternatives* (Washington, D.C.: GPO, November 1987); The International Institute for Strategic Studies, *The Military Balance 1990-1991* (London: The International Institute for Strategic Studies,1990); Department of Defense, *Soviet Military Power 1990*, (Washington, D.C.: GPO, 1990);

TABLE 4--Continued

SOURCE:

Mark Lambert, ed., *Jane's All the Worlds Aircraft* (Coulsdon, Surrey, England: Jane's Information Group, 1990); Duncan Lennox, ed., *Jane's Strategic Weapon Systems* (Coulsdon, Surrey, England: Jane's Information Group, 1990); Thomas C. Cochran and others, *Nuclear Weapons Databook*, vol. 4, *Soviet Nuclear Weapons* (New York: Harper and Row, Ballinger Division, 1989).

especially in terms of SLBMs. This projection is based on the observation that Soviet technical capabilities usually lag behind U.S. capability about by 10 to 15 years.[69]

## D. U.S. FORCE STRUCTURES UNDER START II

To enhance deterrence U.S. nuclear forces will need the flexibility to carry out the range of targeting options mentioned here. These forces should posses the accuracy, reliability, range, survivability, and endurability to engage in a prolonged confrontation. As shown in Table 5, many force options are possible at a level of 1500 strategic weapons. But, a nuclear triad at this level of warheads is not necessary to maintain national security. Moreover, with lower numbers of strategic weapons, the allocation of warheads per delivery platform may have to

[69]Based on author's study of Thomas C. Cochran and others, *Nuclear Weapons Databook*, vol. 1, *U.S. Nuclear Forces and Capabilities* (Cambridge, MA: Ballinger Publishing Co., 1984) and Thomas C. Cochran and others, *Nuclear Weapons Databook*, vol. 4, *Soviet Nuclear Weapons* (New York: Harper and Row, Ballinger Division, 1989).

change from present configurations to avoid degrading national security. It may not be in the best interest of the United States to place all of its nuclear eggs in too few baskets and risk their loss. Not every force structure in Table 5 is consistent with the joint statement on future negotiations issued at the Washington Summit in June 1990 which states:

> In the new negotiations, the two sides agree to place emphasis on removing incentives for a nuclear first strike, on reducing the concentration of warheads on strategic delivery vehicles, and on giving priority to highly survivable systems. In particular, the two sides will seek measures that reduce the concentration of warheads on strategic delivery systems as a whole...[70]

Despite the failure to meet these criteria, the force structures are listed for purposes of comparison and analysis.

Table 6 lists several potential Soviet force structure in a START II regime. The list is not as exhaustive as the table presented to evaluate the U.S. position under START II. But, it does provide a means for the subsequent discussion.

While the analysis of this section shows that 1500 strategic weapons are adequate for both deterrence and deterrence failure, the remaining issue concerns how to deploy those warheads. The next chapter will evaluate the basing options for the United States using the arms control criteria earlier developed.

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[70] *Joint Statement on Future Negotiations*, 1 June 1990.

## TABLE 5
## POTENTIAL START II U.S. FORCE STRUCTURES

| MONAD | Warheads/Launcher | #s of Launchers |
|---|---|---|
| OPTION 1 | | |
| Mobile SICBM | 1 | 1500 |
| OPTION 2 | | |
| Rail Peacekeeper | 10 | 150 (75)[a] |
| OPTION 3 | | |
| Silo Peacekeeper[e] | 10 | 150 |
| OPTION 4 | | |
| Silo SICBM | 1 | 1500 |
| OPTION 5 | | |
| Mobile SICBM | 1 | 500 |
| Rail Peacekeeper[e] | 10 | 100 (50)[a] |
| OPTION 6 | | |
| Silo SICBM | 1 | 500 |
| Silo Peacekeeper[e] | 10 | 100 |
| OPTION 7 | | |
| Silo SICBM | 1 | 500 |
| Rail Peacekeeper[e] | 10 | 100 (50)[a] |
| OPTION 8 | | |
| Mobile SICBM | 1 | 500 |
| Silo Peacekeeper[e] | 10 | 100 |
| OPTION 9 | | |
| Trident D-5[b] | 5-6 | 360 (15-18)[a]<br>0-4 missile tubes disabled[c] |
| OPTION 10 | | |
| B-1B[d] | 16 ALCMs/ACMs, | 100-110 |
| OPTION 11 | | |
| B-2[d] | 8 SRAMs and 8 Bombs | 100-110 |

TABLE 5--Continued

| DYAD | Warheads/Launcher | #s of Launchers |
|---|---|---|
| OPTION 12 | | |
| Silo SICBM | 1 | 500 |
| Trident D-5[b] | 5-6 | 216-264 (11-18)[a]<br>0-12 missile tubes disabled[c] |
| OPTION 13 | | |
| Mobile SICBM | 1 | 500 |
| Trident D-5[b] | 5-6 | 216-264 (11-18)[a]<br>0-12 missile tubes disabled[c] |
| OPTION 14 | | |
| Silo SICBM | 1 | 500 |
| B-1B[d] | 16 ALCMs/ACMs | 70-75 |
| OPTION 15 | | |
| Mobile SICBM | 1 | 500 |
| B-1B[d] | 16 ALCMs/ACMs | 70-75 |
| OPTION 16 | | |
| Silo SICBM | 1 | 500 |
| B-2[d] | 8 SRAMs and 8 Bombs | 70-75 |
| OPTION 17 | | |
| Mobile SICBM | 1 | 500 |
| B-2[d] | 8 SRAMs and 8 Bombs | 70-75 |
| OPTION 18 | | |
| Rail Peacekeeper[e] | 10 | 50 (25)[a] |
| Trident D-5[b] | 5-6 | 216-264 (11-18)[a]<br>0-12 missile tubes disabled[c] |
| OPTION 19 | | |
| Silo Peacekeeper[e] | 10 | 50 |
| Trident D-5[b] | 5-6 | 216-264 (11-18)[a]<br>0-12 missile tubes disabled[c] |
| OPTION 20 | | |
| Rail Peacekeeper[e] | 10 | 50 (25)[a] |
| B-1B[d] | 16 ALCMs/ACMs | 70-75 |

TABLE 5--Continued

| DYAD | Warheads/Launcher | #s of Launchers |
|---|---|---|
| OPTION 21 | | |
| Silo Peacekeeper[e] | 10 | 50 |
| B-1B | 16 ALCMs/ACMs | 70-75 |
| OPTION 22 | | |
| Rail Peacekeeper[e] | 10 | 50 (25)[a] |
| B-2[d] | 8 SRAMs and 8 Bombs | 70-75 |
| OPTION 23 | | |
| Silo Peacekeeper[e] | 10 | 50 |
| B-2[d] | 8 SRAMs and 8 Bombs | 70-75 |
| OPTION 24 | | |
| B-1B | 16 ALCM/ACMs | 35-40 |
| Trident D-5 | 5-6 | 216-264 (11-18)[a] |
| | | 0-12 missile tubes disabled[c] |
| OPTION 25 | | |
| B-2[d] | 8 SRAMs and 8 Bombs | 35-40 |
| Trident D-5 | 5-6 | 216-264 (11-18)[a] |
| | | 0-12 missile tubes disabled[c] |

NOTES.

a. The number in parenthesis represents the total of SSBNs or trains carrying the missiles.

b. The United States and the Soviet Union apparently agree that two to three SSBNs in overhaul or restricted availability in shipyards will not count against the ballistic missile sublimits of START I. This portion of the START I regime is assumed to carry over to START II. See Senate Appropriations Committee, Subcommittee on Defense, *Department of Defense Appropriations Fiscal Year 1991*, part 3, 101st Cong., 2d sess., p. 358 and Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess., p. 88.

TABLE 5--Continued

NOTES.

c. The potential for disabling missile tubes in a START regime in a manner agreeable to the Soviet Union has been indicated in testimony before the Senate Armed Services Committee by Franklin Miller, Deputy Assistant Secretary of Defense for Nuclear Forces and Arms Control Policy. See Senate Armed Services Committee, *Defense Authorization for Fiscal Year 1991*, part 7, pp. 87, 88.

d. To determine the number of PAA bombers subtract ten percent from the number of bombers listed.

e. No downloading of the Peacekeeper was assumed because no discussion of this potential option was noted by the author in any official testimony before the House and Senate Armed Services Committees during the 1980s. The lack of testimony by Air Force and Department of Defense officials implies a belief that the key to stability in reality is not the number of warheads carried per platform but the survivability of the individual platform.

SOURCE: Author.

## TABLE 6
## POTENTIAL START II SOVIET FORCE STRUCTURES

| MONAD | Warheads/Launcher | #s of Launchers |
|---|---|---|
| OPTION 1 | | |
| SS-25 Mobile | 1 | 1500 |
| OPTION 2 | | |
| SS-24 Rail Mobile | 10 | 150 (75)[a] |
| OPTION 3 | | |
| SS-25 Silo | 1 | 1500 |
| OPTION 4 | | |
| SS-24 Silo | 10 | 150 |
| OPTION 5 | | |
| SS-18 MOD | 10 | 150 |
| OPTION 6 | | |
| SS-18 MOD | 10 | 104 |
| SS-18 M6 | 1 | 50 |
| SS-24 | 10 | 41 |
| OPTION 7 | | |
| SS-25 Mobile | 1 | 500 |
| SS-18 MOD | 10 | 100 |
| OPTION 8 | | |
| Bear-H or Blackjack[d] | 10-12 ALCMs or SRAMs | 135-165 |
| OPTION 9 | | |
| Typhoon (SS-N-20)[b] | 10 | 10 (6)[a]<br>10 missile tubes disabled[c] |
| Delta (SS-N-23)[b] | 4 | 224 (16-21)[a]<br>0-4 missile tubes disabled[c] |
| OPTION 10 | | |
| Delta (SS-N-23)[b] | 4 | 384 (24) |

TABLE 6--Continued

| DYAD | Warheads/Launcher | #s of Launchers |
|---|---|---|
| OPTION 11 | | |
| SS-25 Mobile | 1 | 500 |
| Delta (SS-N-23)[b] | 4 | 256 (18-23)[a]<br>0-4 missile tubes disabled[c] |
| OPTION 12 | | |
| SS-24 Mobile | 10 | 100 (50)[a] |
| Delta (SS-N-23)[b] | 4 | 256 (18-23)[a]<br>0-4 missile tubes disabled[c] |
| OPTION 13 | | |
| SS-25 Silo | 1 | 500 |
| Delta (SS-N-23)[b] | 4 | 256 (18-23)[a]<br>0-4 missile tubes disabled[c] |
| OPTION 14 | | |
| SS-24 Silo | 10 | 100 |
| Delta (SS-N-23)[b] | 4 | 256 (18-23)[a]<br>0-4 missile tubes disabled[c] |
| OPTION 15 | | |
| SS-18 MOD | 10 | 100 |
| Delta (SS-N-23)[b] | 4 | 256 (18-23)[a]<br>0-4 missile tubes disabled[c] |
| OPTION 16 | | |
| SS-25 Silo | 1 | 500 |
| Bear-H or Blackjack[d] | 10-12 ALCMs or SRAMs | 90-100 |
| OPTION 17 | | |
| SS-25 Mobile | 1 | 500 |
| Bear-H or Blackjack[d] | 10-12 ALCMs or SRAMs | 90-100 |
| OPTION 18 | | |
| SS-24 Mobile | 10 | 100 (50)[a] |
| Bear-H or Blackjack[d] | 10-12 ALCMs or SRAMs | 90-100 |

TABLE 6--Continued

| DYAD | Warheads/Launcher | #s of Launchers |
|---|---|---|
| OPTION 19 | | |
| SS-24 Silo | 10 | 100 |
| Bear-H or Blackjack[d] | 10-12 ALCMs or SRAMs | 45-55 |
| OPTION 20 | | |
| SS-18 MOD | 10 | 100 |
| Bear-H or Blackjack[d] | 10-12 ALCMs or SRAMs | 45-55 |
| OPTION 21 | | |
| Delta (SS-N-23)[b] | 4 | 256 (18-23)[a]<br>0-4 missile tubes disabled[c] |
| Bear-H or Blackjack[d] | 10-12 ALCMs or SRAMs | 45-55 |

NOTES.

a. The number in parenthesis represents the total of SSBNs or trains carrying the missiles.

b. The United States and the Soviet Union apparently agree that two to three SSBNs in overhaul or restricted availability in shipyards will not count against the ballistic missile sublimits of START I. This portion of the START I regime is assumed to carry over to START II. See Senate Appropriations Committee, Subcommittee on Defense, *Department of Defense Appropriations Fiscal Year 1991*, part 3, 101st Cong., 2d sess., p. 358 and Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess., p. 88.

TABLE 6--Continued

NOTES.

c. The potential for disabling missile tubes in a START regime in a manner agreeable to the Soviet Union has been indicated in testimony before the Senate Armed Services Committee by Franklin Miller, Deputy Assistant Secretary of Defense for Nuclear Forces and Arms Control Policy. See Senate Armed Services Committee, *Defense Authorization for Fiscal Year 1991*, part 7, pp. 87, 88.

d. To determine the number of PAA bombers subtract ten percent from the number of bombers listed.

SOURCE: Author.

# IV. ASSESSMENTS OF FORCE STRUCTURES

This chapter will evaluate the American force options listed in Table 5 using the arms control criteria defined in Chapter II. At the conclusion of this evaluation, the results will be summarized.

## A. VERIFICATION AND PREDICTABILITY

The verification system currently agreed to in START I is the most comprehensive and intrusive regime in the history of Soviet-American arms negotiations and provides the a model for START II. The verification regime at present consists of five components.

The first is on-site inspection. Twelve kinds of inspections will exist in START I. Examples include visual inspections of both bombers and warhead packages on-board missiles. Procedures for these inspections were practiced by the United States and the Soviet Union in the first half of 1990 to the apparent satisfaction of both countries. Other aspects of on-site verification include the monitoring of mobile ICBM and nuclear weapons facilities, observing the elimination of weapons and their related facilities, and inspections of suspect sites.[71]

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[71]USACDA, "Nuclear and Space Talks: U.S. and Soviet Proposals," *Issues Brief* (Washington, D.C.: USACDA, 3 July 1990); USACDA, "START: Heavy Bomber Inspections," *Issues Brief* (Washington, D.C.: USACDA, 29 January 1990); USACDA, "START: RV Inspections," *Issues Brief* (Washington, D.C.: USACDA, 29 January 1990).

The second is the use of satellites and other electronic systems, better known as national technical means (NTM) of verification. Essentially NTM counts the number of launchers and visually identifies their condition. Since NTM does not require the observing party to physically enter the other's territory, it is a less intrusive means of verification as compared to on-site inspections.

The third is a ban on on any practice that denies full access to telemetric information including the use of encapsulation, encryption or jamming. During the routine flight testing of missiles the telemetric information obtained by another party provides such indications as missile accuracy, size and number of warheads carried, and missile range and flight characteristics.

The fourth consists of information exchanges regarding the numbers, locations, and technical characteristics of the strategic nuclear forces of the United States and the Soviet Union. START I will require periodic updates of this information through the newly created Joint Compliance and Inspection Commission (JCIC). The JCIC or its equivalent will carry over into START II.

The final component deals with mobile ICBMs. Once completed, START I will set forth procedures for their deployment and the number of launchers permitted away from garrison. In addition, mobile ICBMs will be identified through the use of tags to minimize concern regarding the potential for rapid reloads.[72] While several details remain to be resolved regarding mobile ICBM verification, it is believed that these details will be resolved in START I in a manner satisfactory to both sides and remain the appropriate model for START II.

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[72]*Joint Statement on the Treaty* 1 June 1990, and USACDA, "START: Tagging Demonstration," *Issues Brief* (Washington, D.C.: USACDA, 29 January 1990).

Taken together, the five components of verification will provide adequate indications of Soviet compliance, or lack thereof, to START I and II. Through the cooperation necessary to make the agreement verifiable, confidence, and therefore predictability, regarding the strategic nuclear forces of the Soviet Union will be enhanced.

## B. THE CONSEQUENCES OF GENERAL WAR

At the lower level of strategic weapons and the range of employment options available, the effects of a war involving nuclear weapons would have a better chance for limitation. The levels of devastation inherent in the past due to the large levels of nuclear weapons need not exist. As former Secretary of Defense James Schlesinger stated before the House Armed Services Committee regarding START I:

> ...if we can reduce the weight of a hypothetical Soviet attack against the United States from lets say 3,000 megatons to 1,200 megatons, that while I am not one who talks about the ease of walking away from nuclear war, it is better from the United States' standpoint to reduce the weight of an attack in the event that deterrence fails...[73]

By reducing the weight of a nuclear attack, the potential for lowering the levels of death and destruction is enhanced.

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[73]House Armed Services Committee, *U.S. Strategic Forces and START*, 100th Cong., 2a sess., 16, 17 May 1988, p. 13.

## C. SECURITY OF ALLIES AND FRIENDS

In areas outside of Western Europe, as succinctly stated by McGeorge Bundy, "there is no good role for strategic weapons."[74] The American possession of strategic weapons did not deter North Korea from invading South Korea, nor did their existence prevent the downfall of South Vietnam, nor was Iraq kept from overrunning Kuwait in August 1990. As suggested by William Kaufmann conventional forces and the will to use them are a more credible and effective deterrent outside of Western Europe:

> If we show a willingness and ability to intervene with great conventional power in the peripheral areas, after the manner of Korea, we will have a reasonable chance of forestalling enemy military action there.[75]

So, the success of extended deterrence outside of Western Europe is predicated more on the general purpose forces which the United States can utilize in the areas of concern.

Within Western Europe, the effectiveness of extended deterrence has not depended on American strategic superiority. Bundy elaborates:

> It has depended on two great facts: the visible deployment of major American military forces in Europe, and the very evident risk that any large-scale

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[74]McGeorge Bundy, "Strategic Deterrence Thirty Years Later: What has Changed?" in *U.S.Nuclear Strategy*, ed. Phillip Bobbitt, Lawrence Freedman, and Gregory Treverton (New York: New York University Press, 1989), p. 460.

[75]William W. Kaufmann, "The Requirements of Deterrence," in *U.S. Nuclear Strategy*, ed. Phillip Bobbitt, Lawrence Freedman, and Gregory Treverton (New York: New York University Press, 1989), p. 180

engagement between Soviet and American forces would rapidly and uncontrollably become general, nuclear and disastrous.[76]

Therefore, two criteria will allow the continuing use of strategic weapons for the extended deterrence of Western Europe. The first is the presence of significant American general purpose forces combined with theater and battlefield nuclear weapons. Based on current analysis the United States will have around two years of warning time before the Soviet Union can launch a general invasion of Western Europe. This time will allow the United States to reconstitute its forces in large enough numbers and put them back into Europe before the Soviet Union can launch a successful invasion.[77] The second is the existence of enough strategic weapons capable of carrying out an assured destruction attack. If both criteria are met, successful deterrence in Europe against a Soviet attack will likely continue. The existence of the START II formulated here is not likely to diminish the security of the friends and allies of the United States.

## D. CRISIS, ARMS RACE, AND BREAKOUT STABILITY

Before evaluating each force option according to the criteria of crisis stability, arms race stability, and breakout stability, the parameters of the Soviet attack on the United States which are relevant for evaluating crisis stability must be established. Figure 2 lists the assumptions used in positing the retaliatory capability of American strategic forces following a Soviet first strike. These

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[76]Bundy, "Strategic Deterrence," p. 462.

[77]Department of Defense, *Annual Report, January 1991*, pp. 3, 5, 8. Obviously, this decision to reconstitute forces in Europe will be subject to more than just military/strategic factors. The domestic and international political and economic constraints in effect when the decision is considered will play a significant part in whether U.S forces return or not.

- Soviet forces attack from generated alert. The United States receives tactical (30 minutes) warning only: it does not detect the attack until Soviet ballistic missiles are launched or strategic bombers commence their penetration of American airspace.

- Soviet alert rates (all options):
  1.0 for silo-based and mobile ICBMs
  .75 for SSBNs
  .95 for bombers

- U.S. alert rates (assumes attacked while on day-to-day alert):
  .95 for silo-based and Rail mobile ICBMs[a]
  .9 for SICBM
  .55 for bombers[b]
  .7 for SSBNs[c]

- Penetration probability:
  1.0 for all ballistic missiles
  .85 for American bombers
  1.0 for Soviet bombers

NOTES

a. Assumes Rail Peacekeeper in garrison without continuous deployment.

b. As part of the Department of Defense's Major Aircraft Review completed in April 1990, the alert rate for a 75 B-2 bomber force would be .55. For START II this alert rate is assumed to carry over. See Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess, p. 390.

c. For SSBN alert rate see Assistant Chief of Naval Operations (Undersea Warfare) Memorandum, "Trident Submarine Effectiveness," 22 June 1989.

**Figure 2**
**Alert Rates and Penetration Probability Assumptions for Soviet and American Strategic Forces**

assumptions represent a worst case approach and heavily favor the Soviets. This approach is taken because the United States in a START II regime requires near absolute certainty regarding the size of its remaining nuclear forces and associated capability to retaliate against the Soviet Union.

### 1. Those Force Options Having Crisis Stability

The first force option having crisis stability is one consisting of 1500 mobile SICBMs. Studies performed by the Congressional Budget Office and Congressional Research Service have addressed mobile SICBM vulnerability to attack. For the Soviet Union to destroy 50 percent of a 500 missile mobile SICBM force which reacts to only tactical warning, the attacking force would require between 3000 to 4000 SS-18 equivalent (500 kiloton yield) warheads.[78] For an attack by the Soviet Union consisting of 1500 warheads against a 500 missile mobile SICBM force, only 15 percent (75 missiles) would be destroyed.[79] Other studies indicate that a survival rate of 85 to 90 percent will exist for 500 mobile SICBMs in the 3000 to 4000 warhead attack.[80] For a 1500 missile mobile SICBM force with adequate dispersal on present Minuteman bases and Federal Reservations in the Southwest, the same degree of survivability is probable.

The second force option having crisis stability is one consisting of 1500 SICBMs in superhardened silos. To consider the threat to the silo-based missile

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[78]Congressional Budget Office, *Modernizing U.S. Strategic Offensive Forces: Costs, Effects, and Alternatives* (Washington, D.C.: GPO, November 1987), pp. 55-58 and Steven A. Hildreth, *Mobile ICBM Choice: Military and Survivability Implications of the Bush Administration Proposal* (Washington, D.C.: Congressional Research Service, 25 August 1989), p. 15.

[79]Congressional Budget Office, *Modernizing U.S. Strategic Offensive Forces*, pp. 49-55.

[80]Michael Brown, "The U.S. Manned Bomber and Strategic Deterrence in the 1990s," *International Security*, vol. 14, no. 2 (Fall 1989): p. 12 note 16.

force one must first look at the ability of the Soviet Union to hold at risk those silos. Table 7 presents the single shot kill probability of the Soviet strategic nuclear forces available in the time frame of the study.

With American silos only hardened to a reported state of 2000 psi, the Soviet Union could theoretically destroy all 1500 SICBM in silo by using all of its missiles.[81] Reality and the uncertainties associated with the Soviet attack suggests that 300 to 750 SICBMs in silo would survive a Soviet attack.[82] Based on the assumptions made regarding the future Soviet Union, it would achieve no worthwhile objectives in this attack.

The third force option having crisis stability is one consisting of 1500 Trident D-5 warheads. With a 70 percent day-to-day alert ratio 1050 D-5 warheads would survive a Soviet attack.[83] Furthermore, unlike the land-based missile systems, a SSBN has the capability to defend itself against conventional attack while at sea.

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[81]See the discussion of silo hardness in Peter Pry, "The Strategic Nuclear Balance, And Why it Matters," (PhD dissertation, University of Southern California, 1988) pp. 277, 316-323; Senate Armed Services Committee, *MX Missile Basing System and Related Issues*, 98th Cong., 1st sess., and Senate Appropriations Committee, *Department of Defense Appropriations Fiscal Year 1986*, part 2, 99th Cong., 1st sess., pp. 501, 502, and 527. Even if the United States choose to superharden (a factor of 25 or more than present hardness) its silos, a nuclear exchange could still favor the Soviet Union because of the effects of crater kill. Crater kill results when a warhead's accuracy is such that its target is located near or within the crater excavated by the explosion. A target, no matter how hardened, can not withstand those effects. The crater radius (rc) of a warhead is calculated as follows: $rc = [(130\ (Y)^{.3})\ /2]$. Y is yield in kilotons,the answer is in feet. The SS-18 MOD has a rc of 473 feet and a CEP of 300 feet. The SS-25 MOD has a rc of 473 feet and a CEP of 420 feet. See Pry, "Strategic Nuclear Balance," p. 271 and Chapter 5, notes 36 and 37.

[82]750 strategic weapons survive when the Soviets target two warheads per silo. 300 strategic weapons survive a 'perfect' attack from the SS-18 MOD with one Soviet warhead targeted per silo.

[83]Assistant Chief of Naval Operations (Undersea Warfare) Memorandum, "Trident Submarine Effectiveness," 22 June 1989

**TABLE 7**
**SINGLE SHOT KILL PROBABILITY (SSKP)[a] OF SOVIET STRATEGIC WARHEADS AGAINST 5000, 7200, AND 25000 PSI HARDENED TARGETS**

| Weapon | CEP (nmi) | Yield (Mts) | SSKP 2K psi | SSKP 5K psi | SSKP 7.2K psi | SSKP 25K psi |
|---|---|---|---|---|---|---|
| SS-18 M4 | .1-.14 | .5 | .57-.81 | .37-.59 | .30-.50 | .14-.26 |
| M5 | .1-.14 | .75 | .67-.88 | .45-.69 | .37-.60 | .19-.33 |
| M6 | .1-.14 | 16.0 | 1.0 | .99-1.0 | .97-1.0 | .79-.95 |
| SS-24 | .1 | .1-.55 | .43-.83 | .26-.62 | .21-.53 | .10-.28 |
| SS-25 | .1-.2 | .55 | .35-.83 | .21-.62 | .17-.53 | .08-.28 |
| SS-25 | .1-.2 | .75 | .42-.88 | .25-.69 | .21-.60 | .10-.33 |
| SS-18 MOD | .05 | .75 | 1.0 | .99 | .97 | .80 |
| SS-25 MOD | .07 | .55-.75 | .97-.99 | .86-.91 | .78-.85 | .49-.56 |
| SS-N-20 | .27-.30 | .1 | .06-.07 | .03-.04 | N.C.[b] | N.C.[b] |
| SS-N-23 | .27-.486 | .1 | .02-.07 | .01-.04 | N.C.[b] | N.C.[b] |
| SS-N-20 MOD | .065 | .3-.475 | .94-.98 | .78-.87 | .69-.80 | .40-.50 |
| SS-N-23 MOD | .065 | .3-.475 | .94-.98 | .78-.87 | .69-.80 | .40-.50 |
| AS-15 | .05-.25 | .25 | .15-.98 | .09-.90 | .07-.83 | .03-.54 |
| AS-16 | .25 | .35 | .19 | .11 | .08 | .04 |
| AS-19X | .05 | .25 | .98 | .90 | .83 | .54 |
| AS-19 MOD | .02 | .25 | 1.0 | 1.0 | 1.0 | .99 |
| AS-16 MOD | .05 | .35 | .99 | .94 | .89 | .62 |

**TABLE 7--Continued**

NOTES.

a. SSKP = 1-.5* where * = $(6 \times Y^{(2/3)}) \div (H^{(2/3)} \times CEP^2)$. Y is yield in megatons; H is target hardness in pounds per square inch; CEP is the distance from target within which the warhead has a probability of falling 50 percent of the time. For a detailed explanation of the formula see Congressional Budget Office, *Trident II Missiles: Capability, Costs, and Alternatives* (Washington, D.C.: GPO, July 1986), Appendix A.

b. Not calculated.

SOURCE: Author based on data in Table 4.

The fourth force option having crisis stability is 500 mobile SICBMs and 1000 Trident D-5 warheads. The 700 D-5 warheads at sea and a minimum of 400 SICBM warheads would survive an all out Soviet attack.

The next two force options having crisis stability are 500 mobile SICBMs and 70 to 75 B-1B or B-2 bombers. 450 mobile SICBMs and 34 bombers carrying over 500 strategic weapons would survive a Soviet first strike.

The final two force options having crisis stability are 1000 Trident D-5 warheads and 35 to 40 B-1B or B-2 bombers. Extrapolating from present assessments, between 65 and 90 percent of the bombers on ready alert would escape under a likely Soviet SLBM attack.[84] 700 D-5 warheads and 11 to 16

[84]Congressional Budget Office, *Modernizing U.S. Strategic Offensive Forces*, pp. 99-110 and Michael Brown, "The Case Against the B-2," *International Security*, vol. 15, no. 1 (Summer 1990): pp 137 144

bombers carrying between 176 and 256 weapons would survive a Soviet first strike.

### 2. Those Force Options Not Having Crisis Stability

The first set of force options not having crisis stability are those with 50 or more Rail Peacekeeper missiles. Without continuous deployment, the Rail Peacekeeper would require seven to eleven hours of strategic warning to allow for dispersal.[85] The 'bolt from the blue' attack or the American failure to act on strategic warning would result in a complete loss of the Peacekeeper at a cost of no more than 40 to 50 nuclear warheads for the Soviet Union.[86]

In addition, Air Force and Department of Defense officials routinely dismiss a nuclear attack with no strategic warning.[87] It is important to remember the context of the answer and its implications. In todays strategic environment, a surprise attack does not prevent the United States from responding with devastating numbers to a Soviet nuclear attack. However, in a world of 1500 nuclear weapons, strategic warning will matter a great deal.

In response to a question regarding the survivability of the Rail Peacekeeper and fewer strategic nuclear weapons General John Chain, CINCSAC, responded, "If the Soviets were weapons-poor, that might make it (the Peacekeeper) a lucrative target..."[88] Following a Soviet attack less than 750

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[85]Congressional Budget Office, *Modernizing U S. Strategic Offensive Forces*, pp. 49-55; Hildreth, *Mobile ICBM Choice*, p. 15, and Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Years 1988 and 1989*, part 4, 100th Cong., 1st sess., pp. 1891-1893 and 1931-1932.

[86]Author assumes three or four Peacekeeper trains per garrison with two missiles per train.

[87]Senate Appropriations Committee, *Defense Appropriations Fiscal Year 1991*, part 2, pp. 351-353 and Senate Armed Services Committee, *Defense Authorization Fiscal Year 1991*, part 7, p. 65.

[88]Senate Appropriations Committee, *Defense Appropriations Fiscal Year 1991*, part 2, p.353.

American strategic weapons will survive if that force option has 50 or more Rail Peacekeepers.

The second set of force options not having crisis stability are those options with 50 or more Peacekeepers in silo. 50 to 150 Peacekeepers in silo present an inviting target. Even with two to three warheads targeted per silo, a Soviet attack, depending on the force option, would leave the United States with no more than 700 strategic weapons.

The next two force options not having crisis stability are 100 to 110 B-1B or B-2 bombers. The most likely threat to the bomber force would come from nuclear and nonnuclear SLCMs launched near the American coastline. American Air Defense Forces require as a minimum an adequate Indication and Warning (I&W) capability to scramble the alert bombers and defend against the cruise missiles under development by the Soviet Union. At present American air defense capabilities do not possess an adequate I&W or defensive capability.[89] If even a few cruise missiles are able to evade detection and strike the bomber bases, there is a strong potential for the number of American strategic weapons surviving a Soviet attack to be reduced below 750.

The next force option not having crisis stability is 500 SICBMs in silo and 1000 Trident D-5 warheads. Following a Soviet attack only the 700 D-5 warheads at sea would remain.

The final two force options not having crisis stability are 500 SICBMs in silo and 70 to 75 B-1B or B-2 bombers. An attack by the Soviet silo-based ICBMs

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[89]Major G.E. Myers, "A Force Structure for Stability," in *Dynamic Stability: A New Concept for Deterrence*, ed. LT Col Fred J. Ruele (Maxwell AFB, AL: Air University Press, September 1987), p. 89

could destroy between 250 and 450 of the SICBMs and 30 to 35 of the American bombers carrying some 500 strategic weapons.

### 3. Those Force Options with Arms Race Stability

The first three force options with arms race stability are 150 silo Peacekeeper, 1500 silo SICBM, or a combination of the two. The Soviet Union would have little incentive to pursue an arms race to counter either missile in silo. But efforts could be made by the Soviet Union to improve the accuracy of its cruise missiles. As demonstrated by the American cruise missiles in Iraq, highly accurate missiles can have devastating results. However, an improvement in cruise missile accuracy is a capability likely to be pursued in any arms control regime due to the military benefits such accuracy promises in conventional warfare.

The next force option having arms race stability is 500 mobile SICBM and 1000 Trident D-5 warheads. All present statements and studies by Navy and non-Navy sources indicate that the ASW problem will not be solved in a manner such that submarines are easily threatened.[90] At present, like the ASW problem, a breakthrough by the Soviets to successfully target and destroy mobile missiles with their aircraft or missiles is unlikely as demonstrated by the American

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[90]Assistant Chief of Naval Operations (Undersea Warfare) Memorandum, "Trident Submarine Effectiveness." For further discussion see the National Academy of Sciences, Naval Studies Board, *Navy-21: Implications of Advancing Technology for Naval Operations in the Twenty-First Century*, vol 1, *Overview* (Washington, D.C.: National Academy Press, 1988), *Statement of VADM D.L. Cooper, USN, Assistant Chief of Naval Operations (Undersea Warfare) before the Subcommittee on Seapower and Strategic and Critical Materials of the House Armed Services Committee*, 7 March 1990, (Washington, D.C.: Chief of Naval Information), and House Armed Services Committee, *Report of the Advisory Panel on Submarine and Antisubmarine Warfare*, 101st Cong., 1st sess., 21 March 1989.

experience in Iraq. The synergistic effects of these two platforms would compound any breakthrough efforts by the Soviets.

The final two force options with arms race stability are 1000 Trident D-5 warheads and 35 to 40 B-1B or B-2 bombers. With the synergistic effects between the SSBNs and the American bomber force, the need for the United States to build up a continental air defense system is not as great. By facing the Trident D-5 and B-1B or B-2 bombers the Soviet Union would have a choice of either focussing on the ASW problem or keeping its air defenses robust to reduce the threat posed by the American bomber force.

### 4. Those Force Options without Arms Race Stability

The first set of force options which do not have arms race stability are the mobile SICBM, Rail Peacekeeper (if deployed), and Trident D-5 SLBM monads or any combination of these three with silo-based missiles. With silo-based missiles, the Soviet Union in effect need only counteract a monad because missiles in silo are not a targeting problem. While the targeting of any of the mobile monad force structures is a very difficult and currently unlikely endeavor, the reliance by the United States on what is in effect just a single basing mode could provide incentives for the Soviet Union to develop some type of breakthrough in systems or weapons unconstrained by any agreement. While this area of arms control is highly speculative and subjective, it is not in the best interests of the United States to rely on any one basing mode for its strategic forces.

The next two force options without arms race stability are the 100-110 B-1B or B-2 bombers. The impetus for an arms race would rest primarily with the

United States and the difficult choice regarding continental air defense. To provide even a minimal I&W capability against the Soviet bomber and cruise missile forces would require a significant investment of funds. Obtaining an air defense capability similar to that of the Soviet Union would require the United States to spend substantial sums of money.[91]

### 5. Breakout Stability

With the exception of only two force options, all others have breakout stability. The first exception is 1500 silo SICBM. Using the throwweight to kiloton thumbrule for MIRVed ballistic missiles, the SS-18 MOD could perhaps add one to two more warheads per missile for an additional 150 to 300 warheads.[92] For the SS-25 MOD, the Soviet Union could conceivably add one warhead per missile for a gain of 1500 warheads. Because of the uncertainty surrounding missile accuracy and the inherent vulnerability of silo-based ICBMs, the 1500 missile SICBM force option is not stable. The second exception is the 500 mobile SICBM and the 1000 Trident D-5 warheads. The potential for breakout lies within the area of ballistic missile defense. The ABM Treaty encompasses only strategic ballistic missile defense, not tactical ballistic missile defense. The lack of specific controls on tactical ballistic missile defense; for example, when does a tactical

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[91]General John Chain, CINCSAC, testified before the Senate Armed Service Committee that the Soviet Union has historically spent many times as much on air defense than the United States has on its bomber force. This response suggests at least a four to one ratio of costs to provide a significant air defense capability. See Senate Armed Services Committee, *B-2 Bomber*, pp. 25, 26. In addition, the analysis by William P. Delaney regarding the costs for various levels of air defense supports this contention. See "Air Defense of the United States: Strategic Missions and Modern Technology," *International Security*, vol. 15, no. 1 (Summer 1990): pp 181-211.

[92]One pound of throweight equals .5 kiloton of yield, see Pry, "Strategic Nuclear Balance," pp. 286-302.

defense become a strategic defense?; creates the potential for the Soviet Union to quickly modify those systems to defend against U.S. strategic missiles. The United States could find itself unable to effectively retaliate by relying only on ballistic missiles. For all other force options, breakout by the Soviet Union is either not needed to threaten the survivability of American strategic forces or will have no effect on the survivability of those American forces.

## E. SELECTION OF BEST OPTIONS

The order of priority for selecting a force option is to evaluate first crisis stability, then arms race stability, followed by breakout stability. The ideal force structure would have a yes for each of them. Based on the results tabulated in Table 8, the two best force structures are 1000 Trident D-5 warheads and 35 to 40 B-1B or B-2 bombers.

With any of the three options selected the strength of nuclear deterrence is maintained. However, the selection of a force structure such as 150 Peacekeepers in silo would cause significant degradation to U.S. national security. If the implications of a chosen force structure are not considered except in the light of fiscal constraints or a quest for a peace dividend, the United States may find itself facing the nightmare it has spent over 40 years preventing--nuclear war. The final chapter will consider some implications of START II.

## TABLE 8
## CRISIS STABILITY, ARMS RACE STABILITY, AND BREAKOUT STABILITY

| Option | Crisis Stable | Arms Race Stable | Breakout Stable |
|---|---|---|---|
| 1500 Mobile SICBM | Y | N | Y |
| 150 Rail Peacekeeper | N | N | Y |
| 150 Silo Peacekeeper | N | Y | Y |
| 1500 Silo SICBM | Y | Y | N |
| 500 Mobile SICBM & 100 Rail Peacekeeper | N | N | Y |
| 500 Silo SICBM & 100 Silo Peacekeeper | N | Y | Y |
| 500 Silo SICBM & 100 Rail Peacekeeper | N | N | Y |
| 500 Mobile SICBM & 100 Silo Peacekeeper | N | N | Y |
| 1500 Trident D-5 | Y | N | Y |
| 100-110 B-1B | N | N | Y |
| 100-110 B-2 | N | N | Y |
| 500 Silo SICBM & 1000 Trident D-5 | N | N | Y |
| 500 Mobile SICBM & 1000 Trident D-5 | Y | Y | N |

TABLE 8--Continued

| Option | Crisis Stable | Arms Race Stable | Breakout Stable |
|---|---|---|---|
| 500 Silo SICBM & 70-75 B-1B | N | N | Y |
| 500 Mobile SICBM & 70-75 B-1B | Y | N | Y |
| 500 Silo SICBM & 70-75 B-2 | N | N | Y |
| 500 Mobile SICBM & 70-75 B-2 | Y | N | Y |
| 50 Rail Peacekeeper & 1000 Trident D-5 | N | N | Y |
| 50 Silo Peacekeeper & 1000 Trident D-5 | N | N | Y |
| 50 Rail Peacekeeper & 70-75 B-1B | N | N | Y |
| 50 Silo Peacekeeper & 70-75 B-1B | N | N | Y |
| 50 Rail Peacekeeper & 70-75 B-2 | N | N | Y |
| 50 Silo Peacekeeper & 70-75 B-2 | N | N | Y |
| 35-40 B-1B & 1000 Trident D-5 | Y | Y | Y |
| 35-40 B-2 & 1000 Trident D-5 | Y | Y | Y |

NOTES: Y = Option is stable; N = Option is not stable;

# V. CONCLUSIONS AND RECOMMENDATIONS

This study has projected a future core environment with the Soviet Union to determine the lowest number of strategic weapons which can exist in START II without lowering the deterrence threshold. The analysis indicates that 1500 strategic weapons are adequate to maintain the robustness of nuclear deterrence and U.S. national security as it exists in 1991.

However, the key to successful deterrence at this lower level of strategic weapons requires that the United States procure and maintain a survivable force structure which is immune to any conceivable Soviet first strike or changes in the political or ideological orientation of the Soviet leadership. A force structure comprised of the Trident D-5 SLBM and B-2 bomber meets these requirements.

After implementation, a START II force structure comprised of the Trident D-5 SLBM and B-2 bomber is a hedge against any changes in the condition of the Soviet Union. First, if a civil war erupts inside the Soviet Union, then the United States is better off with only 1500 strategic weapons inside that land. Second, if the Soviet economic reforms are a success but its political reforms a sham, then the ability of the Soviet Union to return to its previous expansionistic or aggressive tendencies is at least partially contained. There are obvious political costs associated with violating START II, the economic costs of entering into a strategic weapons arms race are prohibitive, and there are no incentives to breakout if the United States maintains a survivable force structure which is immune to the size of the Soviet strategic arsenal. Finally, if the Soviet Union holds together and

continues to progress towards some type of confederation, then the United States benefits from the cooperation, confidence, and easing of tensions resulting from the START process.

To maximize its negotiating flexibility and to hedge against a breakdown in the START process or in U.S./Soviet relations before START II is implemented, the United States should continue to modernize all three legs of the Triad. An important question arises concerning the ability of the United States to stay within fiscal constraints while modernizing its strategic forces. Table 9 presents the costs for modernizing various portions of the Triad along with some alternatives which serve as comparisons.

Historically, the United States has spent between 10 to 15 percent of its Defense Budget on strategic forces.[93] Assuming a decline, in fiscal year 1991 dollars, in the Defense Budget to $250 billion dollars by 1995, the United States would have between $25.0 to $37.5 billion dollars available each year for its strategic forces. This range of funds is sufficient to modernize and operate U.S. strategic forces through the 1990s and maintain the robustness of nuclear deterrence whether or not START II is negotiated and signed.

The costs to modernize and operate U.S. strategic forces in the 1990s are summarized in Table 10. The modernization program should have five major components. The first is the completion of the Trident D-5 program through the 18th SSBN. The second is the acquisition of the 75 plane B-2 program by fiscal year 1997. The third is the deployment of the 500 missile mobile SICBM program commencing in fiscal year 1997. The fourth is the remaining acquisition of various

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[93]Congressional Budget Office, *Modernizing U.S. Strategic Offensive Forces*, p. 2.

support programs including the SRAM II, ACM, KC-135R, and modifications to the B-1B. Shifting the 50 Peacekeepers in silo to the rail mobile basing plan should be canceled. Finally, there are sufficient funds available for the revamped Strategic Defense Initiative (SDI) program. The Department of Defense estimates that the reorganized SDI program, renamed Global Protection Against Limited Strikes (GPALS), will cost 20 percent less than the Phase I SDI deployment plan of 1989. If so, this works out to an average of $5.6 billion dollars per year for the new program.[94] Total acquisition costs for U.S. strategic forces through fiscal year 2000 would run $83.3 billion and average about $10.0 billion annually. The operations of U.S. strategic forces would average $9.9 billion dollars per year through the year 2000. Taken together, this modernization program provides flexibility while negotiating START II, acquires the most survivable and modern strategic weapons while staying within fiscal constraints, and acts as a hedge in case of a breakdown or failure in U.S./Soviet relations before START II is fully implemented.

The START II formulated in this study was designed to maintain the robustness of nuclear deterrence with the Soviet Union and did not consider the other three major nuclear powers or any emerging nuclear powers. As the number of strategic weapons possessed by the United States and the Soviet Union goes down, France, the United Kingdom, and the People's Republic of China have the potential to become nuclear superpowers if measured by the total number of

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[94]Department of Defense, *Annual Report, January 1991*, pp. 59, 60. For costs of the original Phase I SDI program see Congressional Budget Office, *Strategic Defenses: Alternative Missions and Their Costs* (Washington, D.C.: GPO, July 1989), p. xiii and Strategic Defense Initiative Organization, *1989 Report to the Congress on the Strategic Defense Initiative* (Washington, D.C.: Department of Defense, 1989), p. 4-2.

strategic weapons each possesses. Does this have any negative effects for the United States on crisis stability, arms race stability, or breakout stability? No.

The worst case for the United States is a coalition consisting of the Soviet Union, France, the United Kingdom, and the People's Republic of China. Table 11 presents the projected force structures for the other three major nuclear powers in the 2005 to 2010 timeframe. In effect, this coalition represents an instantaneous breakout in strategic weapons. From a day to day alert condition, an all out coalition attack would consist of 1100 to 1200 Soviet warheads and 1100 to 1200 warheads from the other three nations. For a U.S. force structure comprised of 1000 Trident D-5 warheads and 35 to 40 B-2 bombers carrying 500 strategic weapons, 700 Trident D-5 warheads and between 176 and 256 bomber carried weapons would survive an attack. The United States maintains crisis stability with a strategic force comprised of the Trident D-5 SLBM and B-2 bomber and can effectively retaliate against each of the aggressors holding at risk a variety of targets. Arms race stability continues to exist because the same difficult choice to concentrate on either air defense or ASW would confront the coalition.

A question frequently asked is whether the United States with fewer strategic weapons can deter emerging nuclear powers and radical nations. But deter them from what? A central strike against the homeland of the United States or an attack against its interests overseas? Historically, high levels of strategic weapons have not prevented thrusts against U.S. interests as demonstrated by the Korean War, the Vietnam War, the taking of the American Embassy in Tehran, and most recently the war with Iraq. Conventional forces remain the military

instrument necessary to deter and defend against aggression in the peripheral areas.

Will an irrational adversary launch strategic weapons against the United States? Herman Kahn addressed this issue in the 1960s and his thoughts remain relevant today:

> Moreover we want to deter even the mad. It is sometimes stated that even an adequate Type I Deterrent would not deter an irrational enemy. This might be true if irrationality were an all-or-nothing proposition. Actually, irrationality is a matter of degree and if the irrationality is sufficiently bizarre, the irrational decision maker's subordinates are likely to step in. As a result, we should want a safety factor in Type I Deterrence systems so large as to impress even the irrational and irresponsible with the degree of their irrationality and therefore the need for caution.[95]

In World War II Adolph Hitler did not use the chemical weapons which Germany possessed against the United Kingdom most likely because the United Kingdom possessed them as well. Furthermore, after he issued the orders to destroy Germany's economic and industrial infrastructure in the closing days of the war, many of his political and military subordinates, led by Albert Speer, counteracted those orders whenever possible.[96] If an adversary is completely insane or irrational, no amount of strategic weapons will prevent his attack. If there is some degree of rationality, 1500 strategic weapons are enough to create caution. In addition, the continued funding of GPALS and its potential for deployment will add to this caution.

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[95]Herman Kahn, *Thinking About The Unthinkable* (New York: Horizon Press, 1962), pp. 111, 112.

[96]Cornelius Ryan, *The Last Battle* (New York: Fawcett Popular Library, 1966), pp. 172, 173, 332-335

Other benefits are possible from the START process. Progress towards a START II would demonstrate the commitment of the United States and the Soviet Union to reduce the emphasis on strategic weapons. This commitment could have benefits in the area of nuclear nonproliferation. Many nonnuclear nations have threatened noncompliance or withdrawal from the Nonproliferation Treaty (NPT) unless the United States and the Soviet Union make progress in their strategic nuclear arms control talks. In addition, the actions of the United States and the Soviet Union could provide reduced incentives for non-NPT nations to acquire a nuclear ability as well as placing increased pressure on the other major nuclear powers to reduce their arsenals. Preventing further nuclear proliferation and reducing the strategic arsenals of others is clearly in the interest of the United States.

The result of fewer and more survivable strategic weapons will drive both the United States and the Soviet Union to a targeting strategy which inherently emphasizes assured destruction whether or not one or both nations believe in it as a deterrent. While there are major difficulties in determining damage criteria and the methods to measure that criteria, these difficulties are little different in their degree from those associated with targeting the Soviet strategic arsenal under a policy of Damage Limitation or the leadership of the Soviet Union under the Countervailing Strategy. The difficulties of targeting the economic and industrial facilities of the Soviet Union do not diminish the worth of this strategy as similar difficulties did not diminish the worth of those targeting strategies. Targeting the economic and industrial facilities of the Soviet Union is enough to deter in the projected environment. Fewer strategic weapons are most likely enough even if

the Soviet Union returns to its previous expansionistic tendencies due to the political, economic, and military constraints which will be in effect by the time START II is implemented. The recommended U.S. strategic modernization program provides a hedge against failure in the START process until START II is implemented while a START II force structure comprised of 1000 Trident D-5 warheads and 35 to 40 B-2 bombers carrying 500 strategic weapons maintains the robustness of nuclear deterrence against the Soviet Union and any combination of the other present or emerging nuclear powers.

## TABLE 9
## REMAINING COSTS TO COMPLETE THE BUSH/REAGAN STRATEGIC MODERNIZATION PROGRAM AND SOME ALTERNATIVES

| Program | Procurement[a] | Operations and Support (O & S)[b] | Total |
|---|---|---|---|
| Requested | | | |
| 500 Mobile SICBM[c] | 26.8 | 5.8 | 32.6 |
| 50 Rail Peacekeeper[d] | 6.0 | 4.4 | 10.4 |
| 100 Rail Peacekeeper[d] | 15.7 | 8.9 | 24.6 |
| 18 Trident SSBNs[e] | 10.4 | 36.9 | 47.3 |
| 132 B-2s (July 1989)[f] | 45.8 | 75.4 | 121.2 |
| 75 B-2s (April 1990)[g] | 34.0 | 44.5 | 78.5 |
| 97 B-1Bs and 15-17 B-2s[h] | 21.5 | 62.1 | 83.6 |
| Optional Programs | | | |
| 1000 Mobile SICBM[c] | 46.2 | 17.4 | 63.6 |
| 1500 Mobile SICBM[c] | 65.5 | 26.2 | 91.7 |
| 150 Rail Peacekeeper[d] | 23.2 | 13.3 | 36.5 |
| 500 Silo SICBM[i] | 61.6 | 8.2 | 69.8 |
| 1000 Silo SICBM[i] | 123.3 | 16.4 | 139.7 |
| 1500 Silo SICBM[i] | 184.8 | 24.6 | 209.4 |
| 100 Silo Peacekeeper[j] | 29.2 | 1.6 | 30.8 |
| 150 Silo Peacekeeper[j] | 43.9 | 2.5 | 46.4 |

**TABLE 9--Continued**

NOTES.

a. In $ billions, fiscal year 1991, and includes research, development, testing, and production costs which have yet to be spent on the program from 1 January 1991. The dollars from other fiscal years were converted to fiscal year 1991 using the conversion numbers in Department of Defense, *Annual Report to the President and the Congress, January 1990, Report to the Congress Fiscal Year 1986,* and *Report to the Congress Fiscal Year 1983,* (Washington, D.C.:, GPO, 1982, 1985, 1990). This figure represents the costs to complete and deploy the system or modification and does not consider the funds already spent.

b. In $ billions, fiscal year 1991, the costs of operations, (including fuel), maintenance (including spare parts), civilian and military personnel, training, and direct and indirect base support for 20 years.

c. Estimate for procurement and O & S of the first 500 SICBM comes from Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess., p. 103. The estimate for the next 1000 is the author's based on Ibid. and *MX Rail Garrison and Small ICBM: A Program Review*, Report of the House Armed Services Committee, 100th Cong., 2d sess., 21 March 1988, p. 9. The basing assumption for a 1000 or 1500 SICBM deployment assumes half are based in the Southwest and half on present Minuteman missile fields.

d. Estimate to put the first 50 or 100 Peacekeepers on rail comes from House Armed Services Committee, *National Defense Authorization Act for Fiscal Year 1990-HR 2461: Procurement of Aircraft, Missiles, Weapons and Tracked Combat Vehicles, Ammunition, and other Procurement*, 101st Cong., 1st sess., p. 113. Estimate for the next 50 is the author's. O&S costs are derived from *MX Rail Garrison and Small ICBM: A Program Review*, Report of the House Armed Services Committee, 100th Cong., 2d sess., 21 March 1988, p. 14.

**TABLE 9--Continued**

NOTES.

e. The procurement figure includes the cost to retrofit present Trident C-4 *Ohio*-class SSBNs to D-5 (total of eight) and procure enough D-5 missiles to load out 18 SSBNs; See Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess., p. 87 and Senate Appropriations Committee, Subcommittee on the Department of Defense, *Department of Defense Appropriations Fiscal Year 1991*, part 1, 101st Cong., 2d sess., p. 341. O&S costs are derived from Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1988 and 1989*, part 4, 100th Cong., 1st sess., pp. 1941, 1942. The estimate assumes 11 SSBNs operational as of 1 January 1991 with one entering the fleet per year thereafter.

f. Estimate for procurement costs for a 132 B-2 bomber fleet are derived from Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2nd sess., p. 386; Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1990 and 1991*, part 6, 101st Cong., 1st sess., p. 317; Senate Armed Services Committee, *Testing and Operational Requirements for the B-2 Bomber*, 101st Cong., 1st sess., 21 July 1989, p. 50; House Appropriations Committee, Subcommittee on the Department of Defense, *Department of Defense Appropriations for Fiscal Year 1991*, part 1, 101st Cong., 2nd sess., p. 425; and Donna Cassata, "Bush will propose new defense budget totaling $295 billion," *The Monterey Herald*, 2 February 1991, p. 8A. The figure also includes $.9 billion for remaining KC-135R tanker modifications and $2 billion for the SRAM II program.

Annual O&S costs for a B-2 bomber fleet are the subject of intense debate. The Air Force has projected from $10 million per aircraft (*Testing and*

TABLE 9--Continued

NOTES.

*Operational Requirements for the B-2 Bomber*) to $16 million per aircraft (Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 1, p 827). At present the annual O&S for the B-1B bomber fleet is $23 million per aircraft and projected to average $17 million per aircraft over the lifetime of the program. Given the technological leap which the B-2 represents an average of $22 million per aircraft over the life of the program is not unreasonable and very likely represents a gross underestimation based on prior Air Force statements regarding B-2 program costs. Annual O&S costs for a 150 plane KC-135R tanker fleet is estimated at $5.6 million per aircraft. See *Testing and Operational Requirements for the B-2 Bomber*, pp. 48, 52; Michael E. Brown, "The U.S. Manned Bomber and Strategic Deterrence in the 1990s," *International Security* vol. 14, no. 2, (Fall 1989): pp. 33-36 and Table 4, notes c and d; Michael E. Brown, "The Case Against the B-2," *International Security*, vol. 15, no. 1 (Summer 1990): pp. 144-152 and Donald Rice, "The Manned Bomber and Strategic Deterrence: The U.S. Air Force Perspective," *International Security*, vol. 15, no. 1 (Summer 1990): pp. 121-125.

g. Procurement costs for a 75 bomber B-2 program are derived from Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2d sess., p. 390. Annual O&S costs are derived from note f above. However, the Air Force during the major aircraft review stated that O&S costs for the B-2 would actually drop to $8.0 million a year per aircraft; see Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 1, 101st Cong., 2d sess., p. 827. This author finds an estimate of $8 million highly unreasonable for the reasons cited in note f. An estimate of $22 million per aircraft was used.

TABLE 9--Continued

NOTES.

h. Procurement costs includes upgrading the B-1B's electronic systems and modifications for future use as a cruise missile platform ($2.2 billion), the ACM program ($5-7 billion), KC-135R tanker modifications ($.9 billion), and the costs to terminate the B-2 program following fiscal year 1991 ($9.4 billion). Annual O&S costs are estimated at $17 million per B-1B (97 aircraft) and $5.6 million per KC-135R (150 aircraft). B-2 O&S costs estimates are the author's and expected to be a minimum of $30 million per aircraft because fewer B-2 bombers is likely to result in a higher per unit costs for specialized logistics. See Congressional Budget Office, *The B-1B Bomber and Options for Enhancements* (Washington, D.C: Congressional Budget Office, August 1988), p. 67; Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1990 and 1991*, part 6, 101st Cong., 1st sess., p. 375; Michael E. Brown, "The U.S. Manned Bomber and Strategic Deterrence in the 1990s," *International Security* vol. 14, no. 2, (Fall 1989): Table 4, notes c and d, and General Accounting Office, *Strategic Missiles: Uncertainties Persist in the Advanced Cruise Missile Program*, GAO/NSIAD-91-35 (Washington, D.C.: General Accounting Office, November 1990).

i. The estimate for procuring the first 500 silo-based SICBM and associated O&S costs is derived from Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2nd sess., pp. 103, 104. The estimate for the next 1000 is the author's. This deployment option includes placing the missiles in superhardened silos. The costs for silo construction alone is estimated to be $8.5 billion per 100 silos and is derived from Senate Appropriations Committee, Subcommittee on the Department of Defense, *Department of Defense Appropriations for Fiscal Year 1986*, part 2, 99th Cong., 1st sess., pp. 493, 501, 502.

TABLE 9--Continued

NOTES.

O&S costs for silo-based missiles have a wide variance. In 1982, the Air Force reported that it cost $493 million annually to maintain the 1000 missile Minuteman force. From Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1991*, part 7, 101st Cong., 2nd sess., pp. 103, 104, the SICBM in silo would have an annual O&S of $409 million to maintain a 500 missile force. The author used the most recent estimate as the basis for both the SICBM and Peacekeeper O&S costs in silo. See also Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1982*, part 7, 97th Cong., 1st sess., pp. 3992, 4002, 4337.

j. With the Peacekeeper's RDT&E essentially complete, this basing option would require procurement, basing, and O&S costs. To procure an additional 50 missiles would cost $8.0 billion while procuring 100 missiles would cost $12.1 billion. See Senate Armed Services Committee, *Department of Defense Authorization for Appropriations for Fiscal Year 1983*, part 2, 97th Cong., 2d sess., p. 1048; Senate Armed Services Committee, *Strategic Force Modernization Programs*, 97th Cong., 1st sess., p. 155; and Senate Armed Services Committee, *MX Missile Basing System and Related Issues*, 98th Cong., 1st sess., p. 170.

**TABLE 10**
**COSTS TO ACQUIRE AND OPERATE**
**U.S. STRATEGIC FORCES IN THE 1990s**

| Program | Procurement[a] | Annual Operations and Support (O & S)[b] |
|---|---|---|
| Trident D-5 | 10.4 | 1.85 |
| 75 B-2 | 34.0 (through 1997) | 1.65[c] |
| 97 B-1B Mods | 2.2 | 1.65 |
| 482 KC-135R | .9 | 2.7 |
| 84 B-52 | n/a | 1.26 |
| SRAM II | 2.0 | n/a |
| ACM | 6.0 | n/a |
| 500 Mobile SICBM | 26.8 | .29 (starting 1997)[c] |
| 50 silo Peacekeeper | n/a | .041 |
| 800-1000 Minuteman | n/a | .493[c] |
| GPALS[d] | 22.3 | n/a |
| **TOTAL** | **104.6** | **9.9** |

NOTES.

a. In $ billions, fiscal year 1991, and includes research, development, testing, and production costs which have yet to be spent on the program from 1 January 1991. The dollars from other fiscal years were converted to fiscal year 1991 using the conversion numbers in Department of Defense, *Annual Report to the President and the Congress, January 1990, Report to the Congress Fiscal Year 1986*, and *Report to the Congress Fiscal Year 1983* (Washington, D.C.: GPO, 1982, 1985, 1990). This figure represents the costs to complete and deploy the system or modification and does not consider the funds already spent.

**TABLE 10--Continued**

NOTES.

b. In $ billions, fiscal year 1991, the costs of operations, (including fuel), maintenance (including spare parts), civilian and military personnel, training, and direct and indirect base support.

c. This figure is the O&S for a fully deployed program and represents the maximum expected expenditure. In most years, actual costs would likely be less.

d. This number is derived form the original SDI Phase I estimates minus the 20 percent expected reduction as cited in Department of Defense, *Annual Report to the President and the Congress, January 1991* (Washington, D.C.: GPO, 1991), pp. 59, 60. The costs estimates for the Phase I SDI program, according to the General Accounting Office, were optimistic. If so, then some trade offs between strategic force modernization and GPALS may be required depending on the priorities of the Bush and future administrations.

SOURCE:

Author from Table 10; Department of Defense, *Annual Report to the President and the Congress, January 1991* (Washington, D.C.: GPO, 1991), pp. 52-55 and Table C-1; General Accounting Office, *Strategic Weapons: Long-Term Costs Are Not Reported to the Congress*, GAO/NSIAD-90-226 (Washington, D.C.: General Accounting Office, August 1990); and General Accounting Office, *Strategic Defense Initiative Program: Basis for Reductions in Estimated Cost of Phase I*, GAO/NSIAD-90-173 (Washington, D.C.: General Accounting Office, May 1990).

## TABLE 11
## PROJECTED STRATEGIC FORCES OF THE MAJOR NUCLEAR POWERS IN 2005--2010

### UNITED KINGDOM

| Type | Range (nmi) | Yield (Mt) | #RVs/ Weapon | Total # of Weapons/ of launchers | Total# of RVs |
|---|---|---|---|---|---|
| SLBM | | | | | |
| Trident II | 6000 | .475 | 8 (MIRV) | 64/4 | 512 |
| AIRCRAFT | | | | | |
| Tornado GR-1 | 800 | | | | |
| SRAM | 300 | .200 | 1 | 200/200 | 200 |
| | | | | **total weapons** | **712** |

### FRANCE

| Type | Range (nmi) | Yield (Mt) | #RVs/ Weapon | Total # of Weapons/of launchers | Total# of RVs |
|---|---|---|---|---|---|
| SLBM | | | | | |
| M4 | 2400-3000 | .150 | 6 (MRV) | 80/5 | 80 |
| M45 | 3000-3600 | .150 | 6 (MRV)[a] | 48/3 | 288 |
| M5 | 6600-7000 | .150 | 12 (MRV)[a] | 48/3 | 576 |
| IRBM/ICBM | | | | | |
| S4[b] | 2000 | .300 | 1-3 (MRV)[a] | 33-36 | 33-108 |
| M5[b] | 7000 | .150 | 12 (MRV)[a] | 18 | 216 |
| AIRCRAFT | | | | | |
| Mirage 2000N | 900 | | | | |
| SRAM | 300-400 | .200-.300 | 1 | 36/36 | 36 |
| | | | | **total weapons** | **1150-1250** |

TABLE 11--Continued

PEOPLE'S REPUBLIC OF CHINA

| Type | Range (nmi) | Yield (Mt) | #RVs/ Weapon | Total # of Weapons/ of launchers | Total# of RVs |
|---|---|---|---|---|---|
| *SLBM* | | | | | |
| CSS-N-3 | 2000 | .2-1.0 | 1 | 48/4 | 48 |
| IRBMs/ICBMs | | | | | |
| CSS-2 | 1600 | 1.0-3.0 | 1 | 80 | 80 |
| CSS-3 | 2900-4200 | 1.0-3.0 | 1 | 10 | 10 |
| CSS-4 | 7800 | 4.0-5.0 | 1 | 10 | 10 |
| AIRCRAFT | | | | | |
| H-5 (Beagle) | 1200 | .02-3.0 | 1 | 20/20 | 20 |
| H-6 (Badger) | 3600 | .02-3.0 | 1-3 | 130-390/130 | 130-390 |
| | | | | **total weapons** | **300-560** |
| | | | | TOTAL WEAPONS--OTHER NUCLEAR POWERS | **2162-2522** |

NOTES:

a. French warheads are currently assessed to lack a MIRV capability. But if so desired, France could MIRV its strategic weapons given its technological capability.

b. Possible replacements for the present S3 IRBM which is scheduled for retirement prior to the year 2000. S4 yield could range from 20 to 300 kilotons.

SOURCE:

Robert S. Norris and others, "Nuclear Weapons," in *SIPRI Yearbook 1990: World Armaments and Disarmaments* (New York: Oxford University Press, 1990), pp. 36-50 and Duncan Lennox, ed. *Jane's Strategic Weapons Systems*, (Coulsdon, Surrey, England: Jane's Information Group, 1990).

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