
CHAPTER II. WHAT MODERNIZATION WOULD ACCOMPLISH

The Administration's strategic force modernization plan would provide for a substantial increase in nuclear weapons over the next decade. Inventories of surviving warheads--that is, the numbers expected to survive a Soviet first strike--would increase by approximately 55 percent, while surviving warheads capable of attacking hardened targets would nearly quadruple between 1983 and 1996. Older warheads would be substantially replaced by new, larger, and more accurate warheads, particularly in the submarine force. Though there would be fewer submarines in 1996 than today, most would carry the larger D-5 missile, which can deliver larger and more accurate warheads. The bomber force would also be substantially modernized, as would the ICBM force although to an uncertain degree.

All the analysis in this chapter assumes that the Administration's program would not be constrained by any arms-control limits. The Administration has, however, proposed substantial reductions in the nuclear arsenals of both sides, and the potential effects of such reductions are the subject of the next chapter.

In making this study, CBO developed several computer models, primarily to assess the potential effect of a Soviet strike on the survival prospects of U.S. forces. The assumptions used in that analysis, together with a description of the study methodology, are contained in Appendix D.

METHOD FOR MEASURING THE BUILDUP

In quantifying the nuclear buildup that would result from the Administration's plan, CBO used certain measures of effectiveness that need to be precisely defined. The study also made certain assumptions about force postures--or scenario conditions--that can greatly affect the analysis.

Specific Measures Used

The primary measures of effectiveness used in this study are numbers of warheads and numbers of hard-target warheads. ^{1/} Each is described in detail below.

1. CBO also investigated other measures for their usefulness in describing the capabilities of a nuclear arsenal. One such measure,

Warheads. One of the more elemental units of measure is warhead count, which indicates the potential number of targets that can be struck. 2/ If targets were highly susceptible to nuclear effects and not very large in area--like military supply depots--then warhead count would also serve as a final measure of destructive capability. Such targets are called "soft point" targets. But many targets are not as easily susceptible to nuclear blast. For these targets, destructive capability also depends on the yield of the warhead and the accuracy with which it is delivered. For these reasons, warhead count must be supplemented by more specialized measures. Counts of surviving warheads used in this study are provided in the context of what U.S. planners could expect to have available for use in a retaliatory strike. 3/

Hard-target Warheads. Hard-target warheads are those capable of destroying targets specifically designed to withstand nuclear effects. A substantial number of key Soviet installations could be classified as hard targets, among them ICBM silos and many command and control facilities. In this study, hard-target warheads are defined as those with at least a 50 percent probability of destroying a nominal target hardened to withstand 4,000 pounds per square inch of static overpressure. 4/ This hardness is

adjusted equivalent megatonnage (AEMT), is an estimate of the potential ability to destroy targets dispersed in area and relatively susceptible to damage by nuclear weapons. The investigation demonstrated that the mix of yields in the current and projected U.S. arsenals is such that AEMT correlates well with warhead counts, and so AEMT is not discussed further.

2. More correctly, this is "aim points" struck, since more than one target might be damaged by a properly placed weapon, or more than one weapon might be required to destroy a single target.
3. Counts of pre-attack warheads, unless otherwise noted, also take into account system availability factors.
4. This hardness value is representative of published estimates for modern Soviet ICBM silos. See Aviation Week and Space Technology (October 12, 1981), p. 22. A single-shot probability of destruction of 0.5, compounded for two weapons, provides a two-shot probability of destruction of 0.75. After allowing for the probability of weapon arrival, this would probably provide a reasonable level of damage expectancy. Testimony from the Joint Chiefs of Staff and the Department of Defense indicates that all of the U.S. weapons that CBO assumes to be hard-target weapons are indeed capable against hardened Soviet targets.

likely to characterize many Soviet military targets. Hard-target warheads may also, of course, be used against other, less fortified targets.

At times hard-target warheads are differentiated as "prompt" or "non-prompt" in an effort to distinguish other capabilities. Prompt capability usually includes weapons on land-based ICBMs that could be used in an immediate counterstrike on Soviet targets. Non-prompt weapons include those on bombers, which would take hours to travel to their destination, and some on submarines, which might be delayed because of the time required to communicate with the submarines.

Scenario Conditions

A major objective of strategic force modernization efforts is to improve the survival prospects of current and future forces. The buildup must therefore be measured in terms of the conditions likely to precede and accompany nuclear conflict. These can be summarized in "scenarios" of attack and response. In this study, CBO considered several scenarios involving a Soviet attack against U.S. forces. (Details on the scenarios are presented in Appendix D.) Two important scenario-related variables were examined:

Measurement of Weapons Inventories. Because it is U.S. policy to use strategic nuclear forces only in retaliation for a strike on the United States, post-strike inventories of weapons are an important measure of capability. Post-strike inventories not only measure expectations as to the survivability of U.S. forces but also incorporate the capabilities of attacking Soviet forces.^{5/} Pre-strike inventories are also useful, however, especially in arms-control discussions.

Warning of an Attack. A Soviet first strike might come as a total surprise, or "bolt out of the blue," though this is widely regarded in the technical community as less likely than an attack for which there has been some warning. In a surprise attack, fewer forces would survive, since fewer are on "alert"--that is, poised to react promptly to escape a Soviet attack.

-
5. The analysis assumes that U.S. ICBMs are launched neither on warning of a Soviet attack nor during the course of an attack. Since it is not U. S. policy to rely on launching its land-based missiles in such a manner--although it maintains the option to do so--this analysis assumes that the ICBMs would "ride out" the Soviet attack before retaliating. Launching sooner would likely provide more surviving capability, but at possibly greater risk of misuse.

Only about a third of the bomber force and half of the strategic submarine force is on alert in peacetime; those systems not on alert--as well as those in overhaul--would presumably be destroyed at their bases within minutes of a Soviet first strike.

It is generally considered that a nuclear attack would be more likely to come after a period of tension or perhaps limited hostilities, during which time both parties would have an opportunity to increase the readiness of their strategic forces. Under these circumstances, more U.S. forces would survive, even in the face of a larger attacking Soviet arsenal, since on-line bombers and submarines could be brought to a war footing to escape destruction. (Appendix E presents a detailed discussion of the survival prospects for the bomber force.)

Limitations of the Measures

When using numbers of warheads to assess the capabilities of forces surviving an attack--either a surprise attack or an attack with warning--some limitations should be kept in mind.

- o This study assumes that none of the U.S. strategic submarine forces at sea are destroyed in an attack. Most would agree with this assumption for the 1980s, and Administration spokesmen have indicated that it is a reasonable assumption through the 1990s. 6/
- o As is the case with most other studies of this type, CBO assumes that the command and control system would be able to direct U.S. forces to retaliate in the desired manner after a Soviet first strike. If it could not, large portions of U.S. forces could be rendered useless.
- o CBO has estimated the numbers of weapons that would be available for launch after a Soviet first strike, not those that might be expected to arrive on target. Thus, the effects of Soviet air defenses against U.S. strategic bombers are not incorporated; neither are the possible effects of antiballistic missile systems against ballistic missile warheads.

6. This assumption is based on numerous citations of this assessment. See, for example, the testimony of Secretary of the Navy John F. Lehman, Jr., before the Senate Defense Appropriations Subcommittee, March 8, 1983.

- o For the strategic bomber forces, no attempt is made to account for the effects of Soviet attack on aerial tankers. Bombers are severely restricted in their scope of action if they are unable to receive aerial refueling.

The effects of these limitations are discussed in more detail wherever they might influence the choice among alternative systems.

ASSESSING THE QUANTITATIVE EFFECTS OF THE ADMINISTRATION'S PLAN

Substantial Expansion in Capability After an Attack with Warning

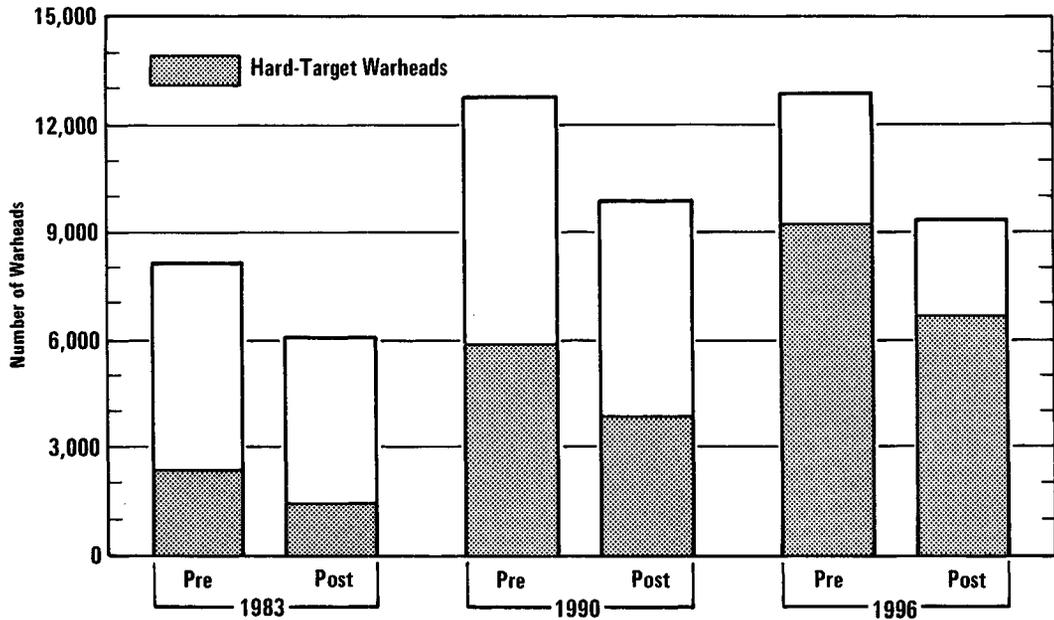
Expansion in Warheads. The increase in U.S. capability associated with the Administration's plan varies with the scenario for the nuclear conflict. As a base case, this study begins with one plausible scenario, which assumes that nuclear war starts after a period of warning that allows U.S. forces to be on alert. The Soviets launch a first-strike attack, and only warheads that survive the attack are counted.

Under this scenario, the Administration's program would substantially increase total numbers of surviving warheads available for a retaliatory strike. From a 1983 level of about 6,000, the expected number of surviving warheads would grow to 9,900 by 1990--an increase of 65 percent--and then decline slightly to 9,300 by 1996 (see Figure 1). The modest decline in the mid-1990s reflects planned retirement of some older submarines.

Along with the increase in warheads, a nearly complete modernization of weapons would take place by the end of the century. For example, by 1996 in the sea-based forces, the large accurate Trident II (D-5) missile would replace almost all currently deployed SLBMs. Trident submarines would take the place of most of the existing Poseidon submarines. The strategic bomber fleet of B-1B and Advanced Technology Bombers would replace nearly the entire current inventory of long-range bombers. And while the plan apparently does not call for a large-scale replacement in the ICBM force, more MX missiles or a new, small ICBM would eventually make up a significant fraction of that force.

Growth in Hard-Target Weapons. While warhead counts would grow sharply, a more significant increase would occur in surviving warheads able to destroy hard targets (the shaded portions in Figure 1). Surviving hard-target warheads would rise from 1,400 in 1983 to 3,900 by 1990--an increase of over 175 percent--and to 6,700 in 1996, an increase of over 375 percent. The dramatic growth from today's low levels would occur because all the

Figure 1.
 Administration's Strategic Force Buildup, 1983-1996
 (Pre- and Post-Attack, With Warning)



SOURCE: Congressional Budget Office.

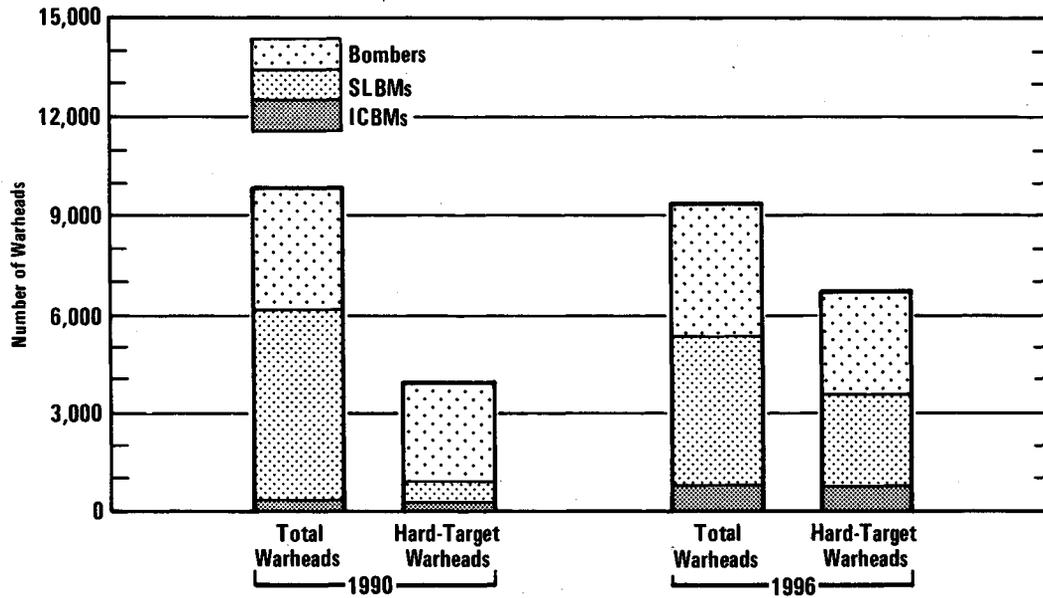
new systems noted in the first chapter--B-1B, ATB, cruise missiles, MX, SICBM, and Trident II--would be able to deliver warheads capable of destroying hard targets, and also because of the general trend toward better survivability.

As noted in Chapter I, this buildup in hard-target capability reflects both technological progress, which makes possible improving the accuracies of existing and future systems, and heightened interest in hard-target weapons as critical to deterrence in the future.

Buildup Concentrated in Bomber and SLBM Forces. The buildup in surviving warheads and in hard-target weapons would be most substantial in the bomber and submarine forces, as can be seen in Figure 2. Hard-target weapons illustrate the point. Today, virtually all surviving hard-target weapons are carried by bombers. Although about one-third of the existing Minuteman land-based missiles have weapons that could destroy hard targets, they are thought to be vulnerable to a Soviet first strike; submarines have no hard-target weapons. In contrast, by 1996 all three of the

Figure 2.

Contribution of Triad Elements Under the Administration's Program, 1990 and 1996 (Post-Attack, With Warning)



SOURCE: Congressional Budget Office.

Triad forces would provide surviving hard-target weapons, with Trident II contributing, for the first time, significant hard-target capabilities. The contribution of the land-based missile force seems likely to remain relatively small. The bulk of surviving hard-target weapons would be carried by the bomber force and submarine force.

More Substantial Expansion in Prompt Hard-target Weapons. The initial deployment of MX and subsequent land-based systems might, however, provide a larger fraction of another important measure: warheads that can destroy hardened targets and do so promptly. Weapons carried on bombers would take many hours to get to their targets. The sea-based forces would have to await the introduction of the Trident II (D-5) missile in the 1990s to achieve a hard-target capability; also, timely communication with some of these forces might be uncertain in a time-urgent situation. This slower response capability would not be acceptable if the targets were critical command centers or missile silos that could launch further attacks during the delay. Thus prompt (or time-urgent) hard-target capability might be important, especially in scenarios that involve fighting a so-called

limited nuclear war or, more importantly, deterring one. Such a war might include limited exchanges of nuclear weapons--ordered on a reactive basis--rather than one massive exchange.

Numbers of prompt, hard-target weapons surviving a Soviet first strike would increase from about 150 today to 690 by 1996 (see Table 2). This assumes an attack with warning, and that the follow-on land-based missiles ultimately supply most of this type of weapon. If Trident II missiles are assumed to have adequate communications so as to be classed as prompt, then numbers increase from 150 today to 890 by 1990 and continue to grow to 3,500 by 1996.

TABLE 2. PROMPT HARD-TARGET WEAPONS SURVIVING A SOVIET FIRST STRIKE: WITH WARNING OR WITHOUT WARNING

Force and Alert Status	1983	1990	1996
ICBMs only			
With warning	150	180	690
Without warning	150	180	690
ICBMs plus Trident II			
With warning	150	890	3,470
Without warning	150	450	1,770

Expansion in Capability After a Surprise Attack

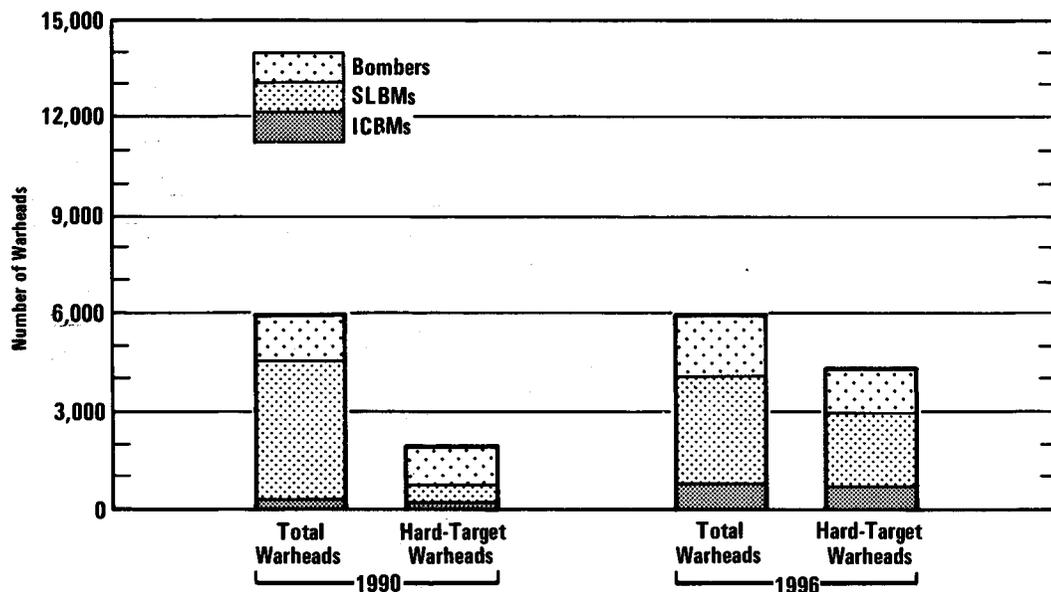
The previous discussion noted the significant increase in surviving warheads under the Administration's plan, particularly in hard-target weapons. It was assumed that U.S. commanders would have advance warning of the attack and be able to take force-survival actions by placing more bombers on alert and sending more submarines to sea where they would escape destruction.

While an attack with warning is widely felt to be the more plausible scenario, planners must also consider the possibility that a Soviet attack

might come as a complete surprise. Survivability of land-based ICBMs would not be changed appreciably by a surprise attack, but that of air and sea forces would. Only bombers on immediate alert (approximately 30 to 40 percent) and submarines at sea (about two-thirds of those not in overhaul) would be expected to survive the attack. This would lower surviving warhead counts significantly.

While the numbers of surviving warheads would be lower, the general outcome of the Administration's plan would be similar to that of an attack with warning. Sustained growth in the number of hard-target warheads would occur throughout the period (see Figure 3). Total warhead count would increase steadily through 1990, then decrease somewhat with the retirement of older systems in the mid-1990s.

Figure 3.
**Contribution of Triad Elements Under the Administration's Program,
 1990 and 1996 (Post-Attack, Without Warning)**



SOURCE: Congressional Budget Office.

The relative contributions of the parts of the triad would change under this scenario (see Figure 3). After an attack without warning, the ICBMs, including the new MX and the assumed follow-on land-based missiles, would provide a larger relative share of surviving warheads, since almost all land-based missiles are continually on alert, even in peacetime. For example, in 1990, land-based missiles would provide 5 percent of the surviving hard-target capability after an attack with warning, but about 10 percent after an attack without warning. Nevertheless, the Administration's plan would result in a substantial increase in surviving warheads on bombers and sea-based forces, even in this surprise attack scenario.

Counts of Weapons Available Before a Soviet First Strike

Yet another way of assessing the quantitative effects of the Administration's plan is to count the weapons that would be available before a Soviet first strike. These counts may be less useful than measures of retaliatory capability, but they are frequently used in public discussions of arms control, which often ignore the problem of estimating the effects of a first strike.

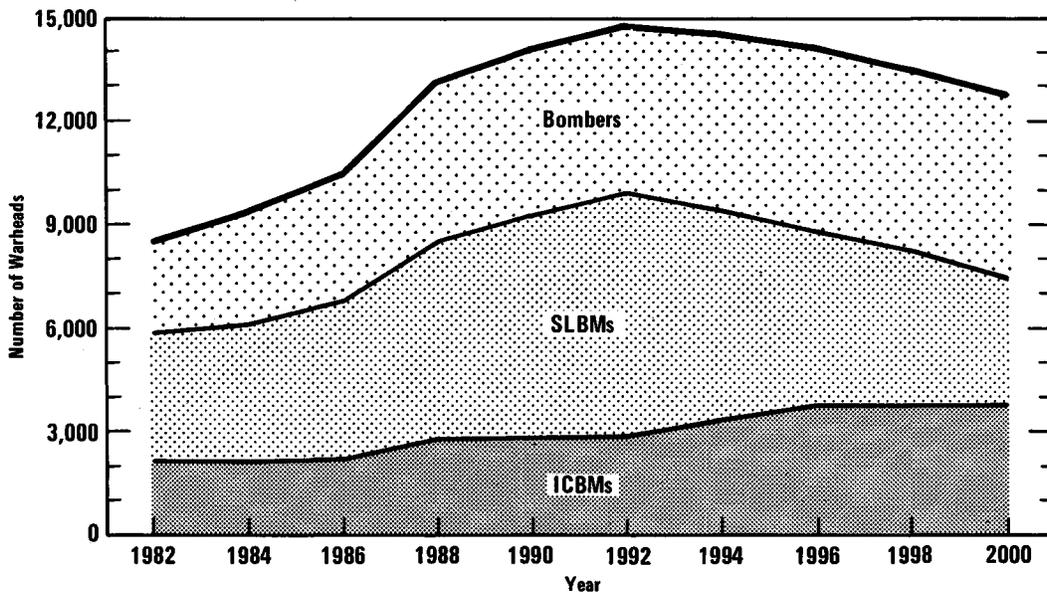
Figure 4 shows that pre-attack warhead inventories would increase, in the absence of arms control, from about 8,800 today to over 14,000 by 1990 under the Administration's plan. By 1992, the peak year of the buildup, over 14,800 warheads would be available--a 68 percent increase over 1983 levels. The number would decline afterward with retirements of older systems, but in 1996 it would still be about 60 percent higher than in 1983. The effect of arms control on these inventories is the subject of Chapter III.

QUALITATIVE FACTORS

The quantitative measures presented above do not capture all of the important features of the Administration's strategic plan. One of the major goals is to modernize all elements of the triad with newer, more capable systems. This would not only increase reliability and maintainability, with resulting lower operating costs; it would also open production lines for at least one new ICBM and two new bombers, thus leaving the United States in a better position to respond to an accelerated Soviet arms buildup.

Modern forces would also be more survivable against a Soviet first strike; a survivable triad of forces has been the goal of every administration over the past 20 years. In addition to complicating Soviet defensive problems in trying to deal with three diverse types of systems, a survivable triad of forces would also provide a hedge against the possibility of a Soviet

Figure 4.
 Evolution of Strategic Force Buildup Under the
 Administration's Program, by Triad Element, 1982-2000



SOURCE: Congressional Budget Office.

technological breakthrough that could neutralize one (or more) of the triad elements.

An overall effort to improve the strategic deterrent would also signal resoluteness on the part of the United States. Administration spokesmen argue that this would assure U.S. allies that the United States is committed to maintaining the deterrent, and also keep the Soviets negotiating in good faith toward a reduction in nuclear weapons.

Other specific qualitative advantages may accrue from individual weapons systems. Some of these are discussed more fully in Chapter IV.

CHAPTER III. ARMS CONTROL AND THE ADMINISTRATION'S PROGRAM

Like its predecessors in the nuclear age, the present Administration has incorporated the concept of arms control into its overall strategic force policy. While technically no general arms-control agreement limiting numbers of nuclear weapons is currently in effect, the Administration has committed the United States to various degrees of compliance with expired and unratified agreements and has begun negotiations with the Soviets on a new and comprehensive strategic arms control package. The current negotiations are known as the Strategic Arms Reductions Talks (START). This chapter will indicate how the Administration's program outlined in the last chapter might be altered, in both effectiveness and costs, by arms-control agreements--specifically, either START or the earlier Strategic Arms Limitation Talks (SALT).

The Administration's START Proposal

START negotiations began in late June 1982. As outlined in the President's May 9, 1982, speech, START seeks the following:

- o A first-phase reduction on both sides to fewer than 5,000 ballistic missile warheads on no more than 850 deployed ballistic missiles; no more than 2,500 of these warheads may be on ICBMs. 1/
- o These first-phase cuts would be followed by reductions in the aggregate level of ballistic missile "throwweight" to equal limits.

-
1. A key point is that the Administration's START position could adapt over time through the negotiating process. Among negotiating positions yet to be announced are the manner in which warheads and deployed missiles would be counted, whether an attempt would be made to count stored as well as deployed missiles, whether verification would rely solely on national technical means (generally meaning satellite coverage), and the expected time period over which the reductions would be made. It should be noted that the Administration proposal does not address mobility of ICBMs. Faced with a large buildup in U.S. hard-target capability, the Soviets might choose mobility as a response. There are press reports that the United States has also proposed collateral constraints on fourth-generation Soviet ICBMs.

(Throwweight is a measure of ballistic missile payload.) Further reductions in warheads and missiles could also be made. 2/

The Administration's proposals deal mainly with ballistic missiles. Some observers believe that bombers--including the Soviet Backfire--will not be treated until the second phase of the negotiations. 3/ Recent press reports indicate, however, that the Administration may have already proposed a limit of 400 bombers on each side. 4/

As with earlier talks, little official discussion of specific negotiating points is available in open sources. According to press reports, however, the Soviet Union is at present pursuing a negotiating tack based on reductions implemented through SALT-type limits, plus additional restrictions on bombers and cruise missiles. 5/

Table 3 compares current forces on both sides, including bombers, with the proposed START limits. Generally, the limits imply a reduction of about one-third in the number of warheads on deployed ballistic missiles.

Earlier SALT Agreements

While negotiating under START, the Administration has agreed not to "undercut" the provisions of two earlier agreements--SALT I and SALT II--so long as the Soviets observe the same restraint.

SALT I--signed and ratified in 1972--is an umbrella term for two major agreements. The first, a treaty of indefinite duration, limits deployments of

-
2. U. S. Senate, Committee on Foreign Relations, Report No. 97-493, "Nuclear Arms Reductions," July 12, 1982, p. 7.
 3. See, for example, Clarence A. Robinson, Jr., "U.S. to Press MX Deployment During START Talks," Aviation Week and Space Technology (June 14, 1982), p. 25.
 4. Hedrick Smith, "Movement Is Cited on Strategic Arms," New York Times, April 7, 1983, p. A14.
 5. See Leslie H. Gelb, "Offer by Moscow to Curb Bombers and Missiles Cited," New York Times, August 1, 1982, p. 1; Flora Lewis, "Soviet Arms-Control Expert Asks Nuclear Balance," New York Times, September 2, 1982, p. 3, and Gelb, "The Cruise Missile," New York Times, September 2, 1982, p. 3.

TABLE 3. COMPARISON OF CURRENT U.S. AND SOVIET STRATEGIC FORCE INVENTORIES AND THE PROPOSED START LIMITS

	United States		Soviet Union	
	Warheads	Deployed Missiles	Warheads	Deployed Missiles
Current Numbers of Missiles				
ICBMs	2,150	1,047	5,904	1,398
SLBMs	4,960	544	1,496	924
Total	7,110	1,594	7,400	2,322
START Limit	5,000	850	5,000	850
Current Number of Bombers	--	400	--	220
Assumed Bomber Limit a/	--	400	--	400

a/ The START proposal includes no bomber limits at this time. This study assumes 400 per side.

antiballistic missile (ABM) systems. The other establishes numerical limits on the number of ICBM and SLBM launchers and modern nuclear submarines; this part, the Interim Agreement, expired in 1977.

SALT II was signed in 1979 but withdrawn from active consideration for Senate ratification in 1980. It placed various numerical limitations on strategic offensive forces, including:

- o An overall limit of 2,250 on Strategic Nuclear Delivery Vehicles, including long-range heavy bombers, ICBM launchers, and SLBM launchers;
- o A sublimit of 1,320 on launchers capable of accommodating ballistic missiles with MIRVs (multiple independently targetable reentry vehicles) together with long-range heavy bombers capable of launching cruise missiles;

- o A further sublimit of 1,200 on launchers of MIRVed ballistic missiles (both land- and sea-based); and
- o A further sublimit of 820 on launchers for MIRVed land-based missiles.

EFFECTS OF START ON THE ADMINISTRATION'S PROGRAM

In order to assess the Administration's modernization plan in terms of its-arms control proposals, CBO has assumed a feasible set of outcomes for the START negotiations, recognizing that they are only an example of what could occur. CBO has assumed that:

- o The U.S. proposal is accepted, with the addition that strategic bombers are included as part of the reductions with a ceiling of 400 bombers as the ultimate goal.
- o The agreement would enter into force no earlier than the end of fiscal year 1985.
- o The reductions would be phased in over a ten-year period, beginning in 1985, and agreed data bases for counting deployed warheads and missiles would be used.
- o Phased reductions would be spread evenly over ten years. For example, if the United States possessed 8,000 ballistic missile warheads in 1985, the Defense Department would reach 5,000 by 1995 by retiring 300 a year. A similar reduction formula would apply to the bomber force.

With relatively minor adjustments to its unconstrained program--mainly, continued and timely dismantling of ex-Polaris nuclear submarines in compensation for the new Tridents--the Administration's plan would probably exceed none of the numerical limits of the SALT agreements until the end of 1985, when START is assumed to take effect. This analysis therefore takes as its 1985 point of departure the unconstrained force levels discussed in Chapter II, modified to include the Polaris dismantling.

No Effect on Modernization if a Sufficient Number of Older Systems Are Retired

Most of the limits of a START-constrained force would accommodate the full scope of the Administration's modernization efforts. Full moderni-

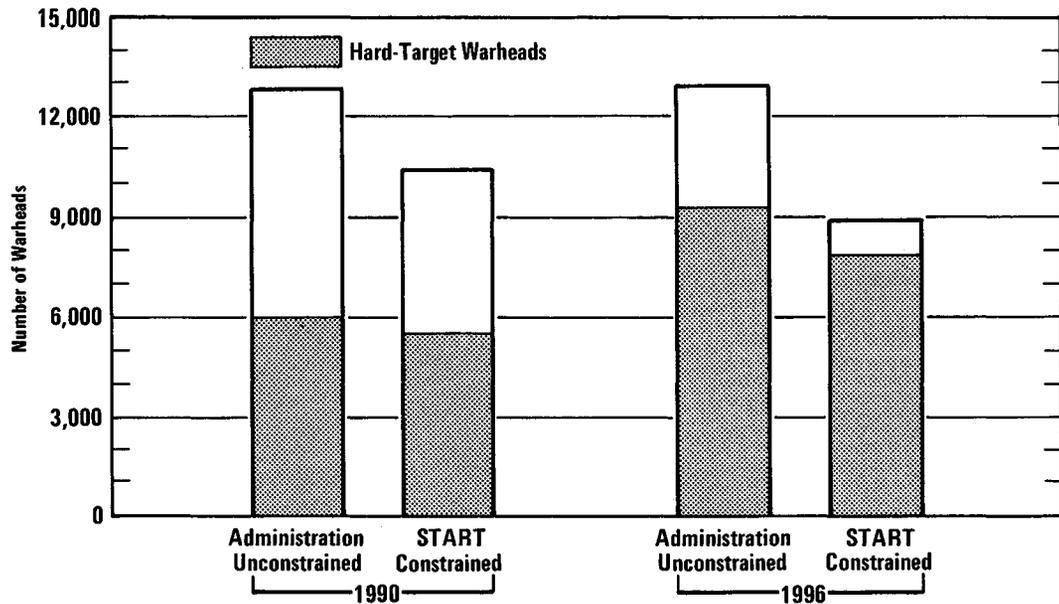
zation could result in 20 Trident submarines with Trident II (D-5) missiles plus 100 MX missiles in existing silos and, by the mid-1990s, either more MX missiles or a number of small ICBMs (SICBMs) deployed in one or more of a variety of modes. Allowing for retirements as discussed below, this force could fall within the limits of 5,000 warheads overall and 2,500 ICBM warheads. The final strategic bomber force could contain 100 B-1Bs plus 132 Advanced Technology Bombers--together with some older B-52s--and still be within the assumed limit of 400 bombers.

In contemplating the eventual deployment of the single-warhead SICBM, however, the Administration may have to amend its START position partially. The ratio of allowed warheads to missiles in START militates against the fielding of large numbers of the SICBM, something that might be necessary to ensure adequate numbers of surviving warheads. The President's Commission on Strategic Forces noted that the limit on deployed ballistic missiles was not compatible with its recommended move toward a small ICBM. To accommodate the single-warhead missiles, therefore, the Administration might have to amend the proposed limit of 850 deployed missiles, or shift emphasis to a different kind of limitation on missile capability such as missile throwweight. A review of these issues is currently underway within the Administration. New types of verification procedures on numbers of deployed missiles might also be needed. This study assumes that the limits would be increased so as to allow the deployment of the mobile force of SICBMs described in Chapter I.

Full modernization under START would necessitate retiring a larger number of existing systems than in the absence of modernization. Probably all Minuteman ICBMs and their launchers would have to be decommissioned between 1986 and 1995. No retirements of Minuteman missiles appear to be planned during this period in the absence of arms-control constraints. Under START limits, the Poseidon submarines would have to be retired, on average, around five and one-half years earlier than without arms-control limits. Should a substantial number of SICBMs be deployed, either MX missiles would need to be retired or some Trident submarines forgone in the late 1990s (for illustrative purposes CBO assumes the former). The strategic bomber force and other force elements in the Administration's program would not need to be changed.

The Administration has not indicated how it would implement a START agreement. For purposes of analysis, however, this study assumes that full modernization would continue and the older systems discussed above would be retired. This is consistent with the high priority the Administration attaches to strategic modernization.

Figure 5.
 Effect of START Constraints on the Administration's
 Strategic Force Buildup, 1990 and 1996 (Pre-Attack, With Warning)



SOURCE: Congressional Budget Office.

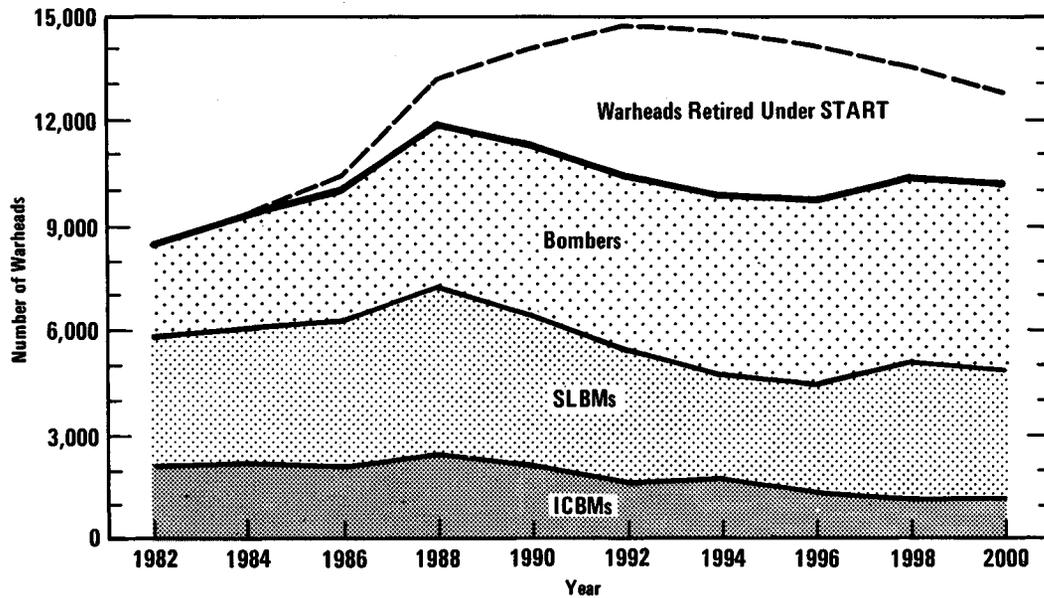
Reductions in Warheads

The primary effect of a START agreement on fully modernized strategic forces would be a reduction in the total number of warheads, with a much smaller reduction in the number of hard-target warheads. For example, in 1996 total warheads would be 32 percent fewer than without START, while hard-target warheads would be down 16 percent (see Figure 5).

Figure 6 shows the year-by-year effect on pre-attack warheads of the START limits under the assumptions discussed above. The measure used here is a simple count of warheads before any are lost to a Soviet first strike, excluding only those carried by systems in overhaul. The START-constrained force grows more modestly than the force without START. In the 1988-1992 period, it is about one-third larger than in 1983, compared to about two-thirds in the unconstrained case; by the end of the century, a 15

Figure 6.

Evolution of Strategic Force Buildup Under START Constraints, by Triad Element, 1982-2000



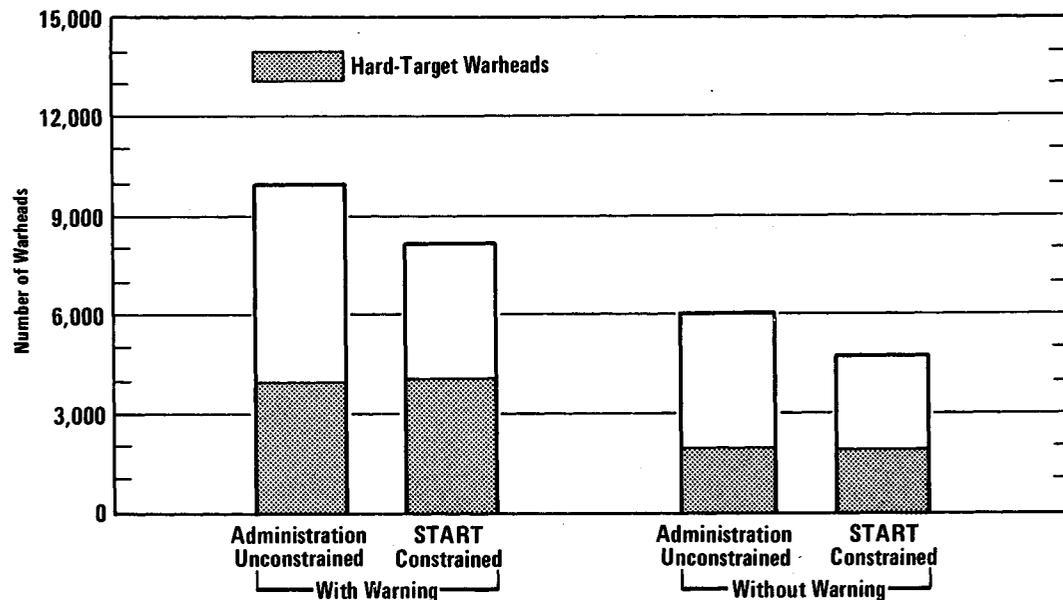
SOURCE: Congressional Budget Office.

percent increase in pre-attack warheads is sustained under START compared to 45 percent without START. The decrease in START-constrained warheads between fiscal years 1992 and 1996 is due primarily to retirement of older Poseidon submarines as Trident submarines enter the force. While warhead totals are lower, the force is still much more modern than today's force, containing mostly forces built in the 1980s and early 1990s.

Because START constraints on the ballistic missile forces would be tighter than those postulated for bombers, the START-limited posture would place increasing emphasis on the bomber portion of the triad. There would be some increase in the emphasis on bombers even in the absence of START, as Table 4 shows. By 1996, however, bombers would account for 54 percent of the pre-attack warheads under START as compared to 38 percent without START.

In terms of simple inventory counts of warheads, often used in arms-control debates, a START-constrained force would be smaller than one not

Figure 7.
Effect of START Constraints on the Administration's Strategic Force Buildup, 1990 (Post-Attack, With and Without Warning)



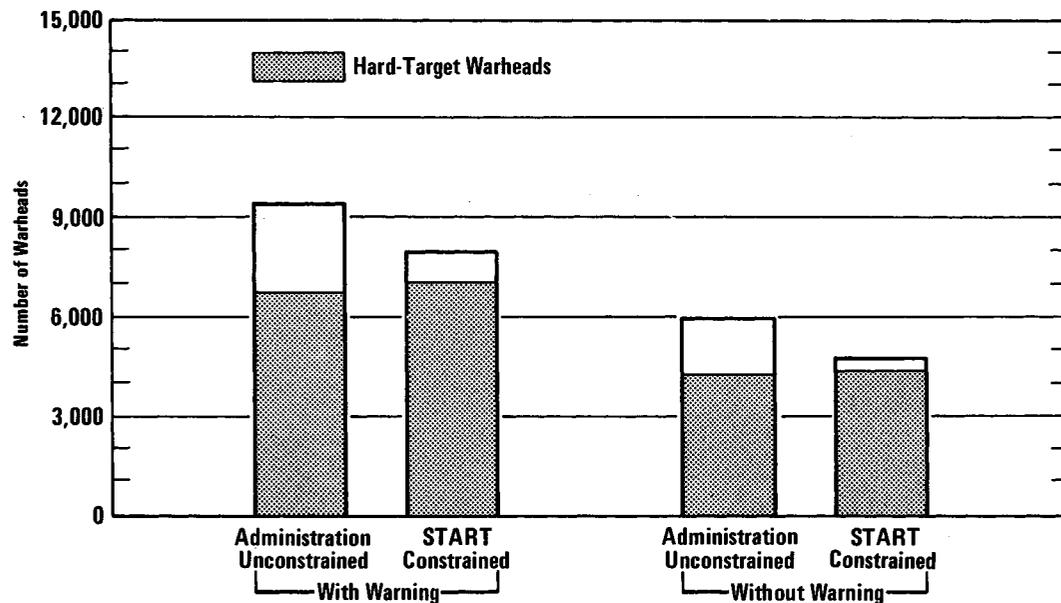
SOURCE: Congressional Budget Office.

constrained by START. Other measures, however, suggest that key capabilities would not be reduced. Figures 7 and 8 show the effect START would have on counts of warheads likely to survive a Soviet nuclear strike in 1990 and 1996, including warheads that can attack hardened targets. (The representative START-constrained Soviet force used in making these calculations is shown in Appendix C.) These counts are most influenced by

TABLE 4. PERCENTAGE OF PRE-ATTACK WARHEADS CONTRIBUTED BY EACH TRIAD ELEMENT UNDER ARMS CONSTRAINTS

	1983			1990			1996		
	ICBM	SLBM	BMR	ICBM	SLBM	BMR	ICBM	SLBM	BMR
Administration Unconstrained	24	45	31	20	46	34	27	35	38
START-Constrained	24	45	31	19	39	43	14	32	54
SALT-Constrained	24	45	31	16	46	38	21	37	42

Figure 8.
Effect of START Constraints on the Administration's Strategic Force Buildup, 1996 (Post-Attack, With and Without Warning)



SOURCE: Congressional Budget Office.

the new systems that the Administration is proposing, which are not limited by the implementation of START assumed in this analysis. The number of warheads likely to survive a Soviet first strike with warning would be 18 percent less in 1990 and 15 percent less in 1996 than for the unconstrained force, and the number of surviving hard-target capable warheads would be much the same in either year. This is true because even though by pre-attack measures the START-constrained force has been reduced, the force contains many more hard-target warheads that are survivably based.

Cost Savings Associated with START Compliance

If full modernization is pursued, START would not lower procurement costs because it would allow all programs to be carried out. START would, however, save some operating costs because it could mean retirement of the existing ICBM force and the early retirement of most of the current fleet of nuclear submarines. These savings would be reduced by the costs of