CBO TESTIMONY

Statement of
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NOTICE

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I appreciate the opportunity to testify today about the costs and other effects of reducing U.S. nuclear forces. This testimony is based on a forthcoming Congressional Budget Office (CBO) study of nuclear forces prepared at the request of the Chairman of the Subcommittee on European Affairs.

To deter military attacks, the United States and the Soviet Union each deployed tens of thousands of nuclear warheads during the Cold War, including long-range or "strategic" warheads as well as shorter-range or "theater" warheads.[1] But the Soviet Union has changed drastically in recent months, most importantly in its attitudes and its willingness to work with the United States on issues of foreign policy. In view of these new developments, it seems incongruous that both countries continue to aim huge numbers of the most destructive weapons ever invented at each other.

If ratified and carried out, the Strategic Arms Reduction Talks (START) treaty would reduce the strategic arsenals of both countries, but only to levels that existed in 1982 when the START negotiations began. The relatively limited scope of the START treaty has led some policymakers to argue for a post-START treaty, or for other types of limitations, that would achieve much larger reductions in nuclear forces.

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1. This testimony continues to use the term "Soviet Union" until the new name for the country becomes clear.

This testimony examines the costs and other effects of the START treaty and a wide range of post-START options. In the process, it reaches several key conclusions:

- The Administration's current plan for U.S. nuclear forces, which may have been proposed partly in anticipation of the START treaty, has already reduced the average cost of nuclear forces by nearly $7 billion a year over the next 15 years.

- The START treaty would, at most, save an additional few hundred million dollars a year.

- The post-START options identified in this testimony could result in substantial savings, perhaps as much as $17 billion a year if the United States reduced its forces to 1,000 total warheads (strategic and theater) rather than the roughly 20,000 total warheads likely to be deployed under START.

- Adopting the post-START options would require fundamental changes in views about how many warheads are needed to deter war, but the options would preserve substantial retaliatory

capability and would not require a return to a strategy of "city-busting."

SAVINGS UNDER START

Complying with the START treaty would not guarantee significant reductions in U.S. defense spending. Compared with the Administration's current plan for nuclear weapons, there would be savings of only a few hundred million dollars in the costs to operate nuclear forces. The Department of Energy might also enjoy reduced costs to build and maintain nuclear warheads.

However, additional costs associated with monitoring and complying with the treaty could wholly or partially offset these savings. Indeed, because of relatively high costs for monitoring and compliance during the treaty's first few years, START might not produce any savings whatsoever for several years. Overall, total U.S. spending on nuclear forces under START would be likely to remain nearly constant at about $50 billion per year. (All costs in this testimony are expressed in 1992 dollars of budget authority.)

One might reasonably ask why projected savings would be relatively modest. In fact, the Administration's current plan for nuclear forces

anticipates most of the reductions that the treaty requires. Under that current plan, the United States is assumed to purchase and deploy 75 B-2 bombers, 18 Trident submarines equipped with the new Trident II missile, and 500 of the new land-based missile, the Small Intercontinental Ballistic Missile or SICBM (see Table A-l in Appendix A for details).[2] Substantial numbers of older systems would be retired as these new systems are deployed, resulting in a gradual decline in the actual numbers of U.S. strategic warheads from today's level of about 12,900 warheads to about 11,500 warheads (see Table 1). Theater weapons would add roughly 10,000 warheads to these numbers.

Complying with the START treaty is likely to require additional reductions of only about 1,000 warheads and, eventually, about 150 missiles. The United States has not formally announced how it will achieve these cuts. For purposes of estimating costs, we assume the reductions are achieved by reducing (or "downloading") the number of warheads carried on remaining Minuteman III missiles (see Table A-l for details). As the new SICBM land-based missile is deployed, compliance with START would be maintained by retiring some existing Minuteman III missiles. These assumptions seem consistent with the Administration's efforts to continue modernizing nuclear systems.

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2. The Administration continues to develop the SICBM, but has not yet committed itself to its deployment.

Progress at the START negotiations may have allowed the Administration to propose reductions in U.S. forces even before the treaty was completed. If so, the savings associated with START might be better measured by comparing it with earlier plans, although some cuts could also have resulted from fiscal pressure. Compared with the January 1990 plan for nuclear forces, for example, complying with the START limits would save the United States an average of nearly $7 billion a year over the next 15 years. The savings occur because, under the January 1990 plan, the Administration envisioned buying and operating 132 B-2 bombers and at least 23 Trident submarines as well as moving the 50 silo-based MX missiles to rails. The January 1990 plan would also have kept in service a larger number of older Minuteman II land-based missiles.

Savings under START could also be larger if, in the process of carrying out the treaty, the United States decides not to deploy a system of defenses against strategic nuclear warheads. As part of its Strategic Defense Initiative (SDI), the Administration intends to deploy a larger system of defenses, perhaps shortly after the year 2000. Known as Phase I, this larger system would be designed to intercept up to 1,500 warheads. In the interim, the Administration proposes to deploy a smaller system, the Global Protection Against Limited Strikes (GPALS) system, which is designed to defend the

country against accidental or unauthorized attacks consisting of about 200 or fewer nuclear warheads.

The START treaty does not limit defensive systems. However, during the START negotiations, the Soviet Union strongly opposed deploying strategic defenses and reserved the right to exceed the treaty's numerical limits on warheads if the United States abrogated the existing Anti-Ballistic Missile (ABM) Treaty and deployed defenses. If strategic defenses are not deployed under START, annual savings compared with the Administration's current plan could amount to over $5 billion a year, though it would be difficult to determine how much of these savings would be attributable to the START treaty.

POST-START OPTIONS

What reductions might follow the START treaty? Because of uncertainty about what forces will be judged necessary to deter war in the face of improved U.S.-Soviet relations, CBO examined a wide range of options. The four options vary in the number of strategic (long-range) warheads, the number of theater (shorter-range) warheads, and the nature of defenses against strategic missiles. Although deploying strategic defenses is a highly

controversial issue, defenses have been included as a variable for each option to provide a complete assessment of costs. As insurance against unforeseen technical breakthroughs, all the post-START options discussed here would maintain a triad of U.S. weapons systems (land-based missiles, submarine-based missiles, and weapons deployed on bombers), each designed to be able to withstand a Soviet first-strike attack.

Option I. Ban Heavy Missiles and Limit Defenses

Under Option I, which assumes the least far-reaching changes, the total number of U.S. and Soviet warheads would remain at the START level, but the so-called "heavy" types of land-based missiles--large missiles that can carry substantial payloads--would be banned (see Table 1). This ban would only affect the Soviet Union since the United States has no heavy missiles. Prohibiting heavy missiles would reduce the total payload or throwweight of Soviet missiles and so reduce the risk that the Soviet Union could alter the military balance significantly by "breaking out" of an arms limitation treaty and quickly adding warheads to its large missiles.

Because the Soviet Union would be unlikely to accept an agreement that limits only its forces, this option also assumes limits on any deployment

TABLE 1. U.S. FORCE POSTURES AND THEIR MAIN CHARACTERISTICS

Option	Warheads		Deployed Strategic Defenses[a]
	Strategic	Theater	
Early 1991 Forces	12,900	10,000	None
Administration's Plan and Variations[b]			
Administration's Current Plan	11,500	10,000	GPALS, Phase I[c]
Administration's Plan with START	10,500	10,000	GPALS, Phase I
Post-START Options			
I. Ban Heavy ICBMs, Limit Defenses	10,500	10,000	GPALS
n. Reduce Strategic Warheads to 6,000	6,000	4,000	GPALS, no space defense
III. Reduce Strategic Warheads to 3,000	3,000	2,000	1/2 GPALS, no space
IV. Reduce Strategic Warheads to 1,000	1,000	0	1/4 GPALS, no space

SOURCE: Congressional Budget Office.

NOTE: GPALS = Global Protection Against Limited Strikes system; ICBMs = intercontinental ballistic missiles.

a. All plans include the entire Administration Program for the Tactical Missile Defense Initiative (TMDI). The references to GPALS in the table refer not to TMDI but to the strategic components of the program.

b. The Administration's plan is an amalgamation of formal Department of Defense plans for the next six years and CBO projections of what the Administration's plans are likely to include after that date. The START-compliant Administration plan is CBO's estimate of how the Administration's plan might be modified in order to comply with START treaty limitations that seem likely to enter into force as of this writing (September 1991). This latter approach is presented both with and without a Phase I SDI deployment, reflecting the uncertainty intrinsic to the START treaty.

c. The Administration has not recently reaffirmed its commitment to Phase I, but neither has it disavowed its intention to deploy large defenses.

of large defenses against strategic missiles. The option would ban large systems of defenses, such as the Phase I system that the Administration apparently intends to deploy, but would permit deploying smaller systems such as GPALS (see Table A-2).

Option II. Reduce Strategic Warheads to 6.000

Option II assumes a limit of 6,000 on the actual number of strategic nuclear warheads each side could deploy, which would result in a reduction of over 40 percent in U.S. warheads compared with the START level. The START treaty contains the same limit of 6,000 warheads. However, because of counting rules that exempt some weapons carried on bombers and other delivery platforms, the treaty would actually permit the United States to maintain over 10,000 strategic warheads.

The United States could comply in many ways with the limits on strategic warheads imposed under this option. For purposes of estimating costs, it is assumed that, compared with the Administration's plan, the United States under this option would buy fewer of the new B-2 bomber and SICBM land-based missiles (see Table A-1). In addition, under this option (and in Options III and IV), the first eight Trident submarines, which carry the older

C4 missile, would not be modified to carry the new D5 missile, resulting in procurement of fewer D5 missiles. The United States would also retire some existing systems that are now planned to continue in service, including some Minuteman III land-based missiles and B-52 bombers.

This option also assumes retiring older theater nuclear systems and so reduces the inventory of theater warheads by over half, from about 10,000 warheads today to 4,000 warheads (see Table A-3). Defenses would also be limited. Under the Administration's plan, the GPALS system of limited defenses would consist of ground-based interceptors as well as interceptors based in space, but under this approach the space-based interceptors would be banned. Such a ban would make it difficult to develop the capability to defend against large-scale attacks, a capability that some analysts believe could fuel a new arms race or contribute to instability in a period of crisis.

Option III. Reduce Strategic Warheads to 3,000

Option III would limit the United States and the Soviet Union to 3,000 strategic nuclear warheads each, a reduction of over two-thirds from the likely number under the START treaty. For purposes of estimating costs, we assumed that limits on strategic warheads would be achieved by terminating

production of the B-2 bomber and buying fewer SICBM land-based missiles. Some existing systems, such as B-52 bombers and most Minuteman III land-based missiles, would be retired. Fewer of the new D5 missile would be purchased, and warheads would be downloaded on submarine-based D5 and C4 missiles (from eight to three).

Theater nuclear forces would be limited to 2,000 warheads under this option. Strategic defenses would also face tighter limits. In addition to banning space-based interceptors, ground-based interceptors would be limited to no more than 400 systems deployed at no more than five sites. In contrast, the Administration's planned GPALS system would deploy about 750 ground-based interceptors at six sites. Smaller defenses may be adequate under this option because the reduced number of strategic warheads per delivery platform would mean that accidental or unauthorized launches would probably consist of fewer warheads.

Option IV. Reduce Strategic Warheads to 1.000

The final post-START option assumes that strategic warheads on each side are limited to 1,000. Several prominent military analysts--for example, Harold Brown, a former Secretary of Defense; and a group of NAS scientists led by

Michael May and Wolfgang Panofsky--have proposed forces of this size. According to their views, a deterrent force could consist of a small number of warheads deployed on delivery platforms that have a high probability of surviving an enemy attack, which reduces the incentive to undertake a first-strike attack and so avoids instability in a crisis. Each platform should also be equipped with only a small number of warheads. This policy means that an attacker would have to use almost as many warheads as would be destroyed, which further limits the advantage associated with a first-strike attack. Option IV embodies the essence of these proposals by deploying U.S. warheads on platforms that are likely to survive a first-strike attack (submarines, bombers, and mobile ground-based systems) and by deploying only one warhead on each missile.

Consistent with its far-reaching nature, Option IV bans all theater warheads. Eliminating all such weapons would simplify verification, improve safety, and avoid contentious political issues such as which countries should have theater weapons deployed on their soil.

Defenses, if they were deployed, would be limited to no more than 100 interceptors at no more than five sites. Such a small system might still be able to protect against accidental or unauthorized launches, which would be small in size since all missiles would have only one warhead. Among all the

options considered, the defenses permitted under Option IV would require the fewest changes to the ABM treaty.

SAVINGS UNDER POST-START OPTIONS

Some of the post-START options could significantly reduce U.S. defense spending. To capture long-term effects on costs, CBO's estimates of savings reflect the average annual reductions that would be achieved over the next 15 years, the longest period of time during which future plans can be anticipated with reasonable confidence. The estimates attempt to capture all the reductions that would be likely under the options, including reductions in the cost to buy and operate forces as well as reductions in costs of overhead activities such as intelligence and production of nuclear warheads. Estimated savings are net of the added costs to monitor and comply with arms treaties.

Total Savings

Compared with the Administration's current plan, the option that assumes a reduction to 1,000 strategic nuclear warheads (Option IV) would reduce the average costs for nuclear forces over the next 15 years by about $16.7 billion

a year (see the bottom line in Table 2). Under this option, the United States would spend about $33 billion a year for nuclear forces compared with about $50 billion under the Administration's current plan.

Other post-START options would save sums that are smaller but still substantial. A reduction to 3,000 strategic warheads (Option III) would reduce the average costs for nuclear forces over the next 15 years by about $14.3 billion a year, and a reduction to 6,000 strategic warheads would save about $9.3 billion a year. Only one of the post-START approaches, the one that bans heavy missiles and limits defenses (Option I), would save a markedly smaller sum. That option would save only about $2.3 billion a year.

Although most of the post-START options result in substantial savings, the cost reductions are not proportional to the reductions in warheads. Option IV, for example, reduces strategic warheads below today's levels by more than 90 percent but achieves savings of only about one-third. Savings are less than proportional partly because some costs, such as those for the cleanup of nuclear waste sites, are assumed not to fall as forces are reduced. Also, the number of delivery platforms does not decline in proportion to warheads under the options, and more of the platforms that remain are mobile. These mobile platforms contribute greatly to stability, but at an increased cost.

TABLE 2. AVERAGE ANNUAL COSTS AND SAVINGS UNDER POST-START OPTIONS OVER THE NEXT 15 YEARS (In billions of 1992 dollars)

Cost Category	Cost of Administration's Current Plan	Savings Under Post-START Options I. Ban Heavy ICBMs, Limit Defenses	II. Reduce Strategic Warheads to 6,000	III. Reduce Strategic Warheads to 3,000	IV. Reduce Strategic Warheads to 1,000
All Nuclear Related Programs Except Deployed Strategic Defenses					
Strategic Offense	16.1	0.2	4.6	7.4	7.9
Theater Offense	1.6	0	0.7	1.0	1.6
Nuclear Warheads	13.4	0.2	1.1	2.0	2.3
Nuclear C³I	8.0	0	0.2	1.2	1.5
Arms Control Compliance and Monitoring	0.2	-0.3	-0.6	-0.9	-0.9
Air Defenses	2.0	0	0	0	0
Defenses--Research and TMDI	3.0	0	0	0	0
Subtotal	44.3	0.1	6.0	10.7	12.4
Deployed Strategic Defenses					
SDI--GPALS Only[a]	3.1	0	1.1	1.4	2.1
SDI--Phase I	2.2	2.2	2.2	2.2	2.2
Subtotal	5.3	2.2	3.3	3.6	4.3
Total with Deployed Strategic Defenses					
Total	49.6	2.3	9.3	14.3	16.7

SOURCE: Congressional Budget Office.

NOTE: C³I refers to command, control, communications, and intelligence. TMDI refers to the Tactical Missile Defense Initiative.

a. Includes funds for the strategic component of the Global Protection Against Limited Strikes (GPALS) system, a part of the Strategic Defense Initiative (SDI).

Components of Savings

Compared with the Administration's plan, the post-START options assume deploying smaller, less costly systems of defenses against strategic missiles. The portion of savings associated with deploying smaller defenses ranges from $2.2 billion under Option I to $4.3 billion under Option IV (see Table 2). However, the future of defenses is uncertain, particularly since deploying any system that offers significant nationwide protection against a missile attack would require abrogation or renegotiation of the ABM treaty. If the Administration chooses not to deploy defenses, CBO assumes that defenses would also not be deployed for the other options. In that case, the savings from post-START options would be reduced (see the Total line in Table 2).

The remainder of the savings stems from several sources identified in Table 2. For most of the options, the greatest portion of remaining savings is the result of reductions in the cost to develop, buy, and operate strategic offensive forces. Substantial savings occur because of reductions in other costs--for example, the costs to develop and maintain nuclear warheads, which the Department of Energy bears, and the costs to gather and analyze strategic intelligence. Actually, savings associated with buying and operating theater

offensive forces are relatively small. Estimated savings are net of the added costs associated with compliance and monitoring of arms control treaties.

Bear in mind that important uncertainties are associated with these cost estimates. For instance, the timing of the force reductions could affect our estimates of savings under the post-START options, and technically advanced programs such as the Strategic Defense Initiative and the B-2 bomber could experience cost escalation. Appendix B discusses these uncertainties and briefly describes the methods that CBO used to estimate costs.

OTHER ISSUES: DETERRENCE, U.S. COMMITMENTS TO ITS ALLIES, AND NONPROLIFERATION

Cost savings are important, and I have focused on them up to this point. However, we must consider other important issues in any debate over the future of U.S. nuclear forces.

The ability of the United States to deter nuclear war is the key standard against which we must measure the smaller forces of the post-START options. To the extent that deterrence continues to rely on offensive nuclear weapons, most analysts believe that U.S. forces must be capable of

surviving a Soviet first-strike attack and still holding at risk a substantial number of important targets in the Soviet Union. To a large extent, the number and the types of targets in the country's nuclear war plans determine the appropriate size of the nuclear arsenal.

The Administration and many military officials believe that, with the deep cuts proposed under some post-START options, U.S. forces could not hold enough targets at risk to deter a Soviet attack. Current war plans apparently anticipate striking about 8,000 Soviet targets, although this number could decrease if the size of the Soviet military is reduced. With today's forces, or those that would be available under START, such a massive attack could occur only if most U.S. forces were on alert before a Soviet first-strike attack, or if the United States attacked first. Under most of the post-START options, however, an attack against this many targets would not be possible under any circumstances.

Although they could not strike all 8,000 targets, the smaller forces available under the post-START options would still provide the United States with substantial ability to absorb a Soviet first-strike attack and then retaliate against a wide variety of targets. For example, even if the United States and the Soviet Union each had only 1,000 strategic warheads, as in Option IV, about 600 U.S. warheads would be expected to survive a Soviet attack. If so,

the United States could retaliate against a wide range of targets, including most major Soviet military installations, military storage facilities, oil refineries, electrical generating plants, and metals factories. Thus, the United States would not be limited to retaliating against Soviet cities, an action this country might be reluctant to undertake for moral reasons and for fear of inviting retaliation against U.S. cities.

Moreover, even under the option that reduces U.S. strategic forces to 1,000 warheads, the United States would retain more strategic warheads and more modern delivery systems than any country has today other than the Soviet Union. Thus, to the extent that nuclear weapons remain an important instrument of influence and power, the post-START options should not call into question U.S. superpower status. Nor should lower levels of nuclear forces necessarily embolden other countries to act more aggressively in the international arena, if the United States retains its commitment to using its conventional military forces for deterrence and global security. Finally, a U.S.-Soviet decision to scale back nuclear arsenals significantly might buttress U.S. efforts to stem nuclear proliferation.

After considering these various factors, which are discussed more fully in CBO's forthcoming study, the United States might conclude that it would have adequate deterrent capability under one of the post-START options in

this study. It is important to acknowledge, however, that adopting the more far-reaching of the post-START options would require fundamental changes in the views this Administration, as well as many other groups and individuals, holds about what level of forces are necessary for deterrence.

VERIFICATION

The Soviet Union could cheat, either under the START treaty or under a treaty embodying any of the post-START options. Verification procedures can never be perfectly effective, and there is always the risk that any cheating could go undetected for months or years. Thus, CBO cannot conclude that a particular treaty is or is not verifiable. Such a judgment would depend on the degree of uncertainty the United States is willing to accept in order to achieve the benefits offered by arms control.

The United States could, however, minimize the uncertainty associated with verification by negotiating and instituting additional verification procedures in connection with any treaty that enforced a post-START option. The costs of some of those procedures--which might include limiting and monitoring all nondeployed missiles as well as monitoring warheads and fissile materials--are included in the cost estimates.

The nature of the U.S. nuclear forces that are assumed to be maintained under the post-START options would also offer security against cheating. Those forces are assumed to be deployed on a substantial number of delivery platforms that are highly mobile. Acquiring and maintaining mobile platforms is not cheap. That is one reason why, as noted earlier, cost savings are not proportional to reductions in warheads. But mobile forces are very difficult to destroy. Thus, massive cheating, even if undetected for months or even years, would not permit the Soviet Union to destroy all or even most U.S. warheads.

CONCLUSION

The question of what nuclear forces are needed to deter war is partly military, partly political, and partly philosophical. During the Cold War, the United States and the Soviet Union assessed these various factors and elected to maintain tens of thousands of nuclear warheads. The tremendous changes now taking place in the world could alter that decision drastically. In the process, the U.S. defense budget could be reduced significantly, perhaps by about $17 billion a year if the United States eventually reduces its strategic arsenal to 1,000 warheads.

APPENDIX A. SUPPLEMENTARY TABLES

These tables provide details of the **U.S.** forces assumed under the options.

TABLE A-1. U.S. STRATEGIC OFFENSIVE FORCES UNDER ALTERNATIVE FORCE POSTURES

	MX		MM		Trident	
	Rail	Silo	III	SICBM	D5	C4
Forces as of Early 1991[a]	0	50 (10)	500 (3)	0 (1)	3 (8)	8 (8)
Administration's Plan and Variations[b]						
Administration's Current Plan	0	50	500	500	18	0
Administration's Plan with START	0	50	316/35° (1/3)	500	18	0
Post-START Options						
I. Ban Heavy ICBMs, Limit Defenses	0	50	316/35 (1/3)	500	18	0
n Reduce Strategic Warheads to 6,000	0	50	86 (1)	200	10	8
III Reduce Strategic Warheads to 3,000	0	0	141 (3)	200	10 (3)	8 (3)
IV. Reduce Strategic Warheads to 1,000	0	0	0	200	10 (1)	8 (1)

(Continued)

SOURCE: Congressional Budget Office based on Department of Defense data.

NOTES: The numbers in parentheses indicate the number of warheads on each launcher. This number is repeated only when the number changes from previous options.

Soviet Union is assumed to make corresponding reductions.

ICBMs = intercontinental ballistic missiles; MMIII = Minuteman III missile; SICBM = small ICBM, also called the Midgetman.

a. Other systems not shown: 450 Minuteman n, 12 Poseidon submarines with 16 C4 missiles each, 10 Poseidon submarines with 16 C3 missiles each, 77 B-52G bombers. The Minuteman n, C4, and C3 missiles carry 1, 8, and 10 warheads, respectively. The B-52G bombers carry 12 warheads.

TABLE A-1. Continued

	B-2	B-1	B-52	Deployed Launchers	Deployed Warheads	Throw-weight (10^6 kg)
Forces as of Early 1991[a]	0 (18)	97 (24)	95 (20)	1,885	12,850	2.0
Administration's Plan and Variations[b]						
Administration's Current Plan	75	97	95	1,749	11,534	2.1
Administration's Plan With START	75	97	95	1,600	10,455[d]	1.9
Post-START Options						
I. Ban Heavy ICBMs, Limit Defenses	75	97	95	1,600	10.455	1.9
II Reduce Strategic Warheads to 6,000	33	97 (12)	0	898	6,000	1.2
III. Reduce Strategic Warheads to 3,000	0	90	0	863	2,999	1.1
IV Reduce Strategic Warheads to 1,000	0	90 (4)	0	722	992	1.0

b. The Administration plan is an amalgamation of formal Department of Defense plans for the next six years and CBO projections of what the Administration's plans are likely to include after that date. The START-compliant Administration plan is CBO'a estimate of how the Administration's plan might be modified in order to comply with START treaty limitations that seem likely to enter into force as of this writing (September 1991).

c. It is assumed under START and Option I that the United States is allowed to reduce the Minuteman III, and reduces 316 of them, although this would not be necessary unless the SICBM is deployed.

d. The number of START-countable warheads is 5,999 for this START force and Option I.

TABLE A-2. DEFENSIVE SYSTEMS UNDER ALTERNATIVE FORCE POSTURES

	Type of Defense	Number of Interceptors: Space-Based	Number of Interceptors: Ground-Based[a]	Space-Based Sensors[b]	Pursue Phase I?
Administration's Plan and Variations					
Administration's Current Plan	Large-Scale[c]	More Than 4,000	2,000	260	Yes
Administration's Plan with START Full defenses	Large-Scale	More Than 4,000	2,000	260	Yes
Post-START Options					
I. Ban Heavy ICBMs, Limit Defenses	Limited	1,000	750	60	No
II. Reduce Strategic Warheads to 6,000	Limited	0	750	40 to 50	No
ra. Reduce Strategic Warheads to 3,000	Limited	0	400	30 to 40	No
IV. Reduce Strategic Warheads to 1,000	Limited	0	100	30 to 40	No

SOURCE: Congressional Budget Office based on Department of Defense data.

NOTE: ICBMs = intercontinental ballistic missiles.

a. Ground-based interceptors to be deployed at six sites.

b. If concerns about space-based sensors emerge, ground-based suborbital sensors launched during an attack could be substituted for Options I through IV. These sensors could be similar to the ground-based surveillance and tracking system (GSTS) proposed by the Strategic Defense Initiative Organization.

c. The Administration's current plan and the Administration's plan with START also deploy a limited defense similar to Option I before deploying a large-scale defense.

TABLE A-3. THEATER OFFENSIVE SYSTEMS UNDER ALTERNATIVE FORCE POSTURES (In thousands of warheads)

	Artillery Shells	Tactical Short-Range Attack Missiles	Bombs on Air Force Tactical Aircraft	Bombs on Carrier-based Aircraft
Administration's Plan and Variations				
Administration's Current Plan	2.0	0.5	2.0	1.5
Administration's Plan With START	2.0	0.5	2.0	1.5
Post-START Options				
I. Ban Heavy ICBMs, Limit Defense	2.0	0.5	2.0	1.5
II Reduce Strategic Warheads to 6,000	0	0.5	1.0	1.0
III. Reduce Strategic Warheads to 3,000	0	0.5	0.8	0
IV. Reduce Strategic Warheads to 1,000	0	0	0	0

(Continued)

SOURCE: Congressional Budget Office based on data from Theodore B. Taylor, "Warhead Dismantlement and Fissile-Material Disposal," in Frank von Hippel and Roald Z. Sagdeev, *Reversing the Arms Race* (New York: Gordon and Breach, 1990), p. 93.

NOTE: ICBMs = intercontinental ballistic missiles.

TABLE A-3. Continued

	Anti-submarine Bombs	Sea-Launched Cruise Missiles	Total Theater Warheads[a]	Total All Warheads
Administration's Plan and Variations				
Administration's Current Plan	1.8	0.6	10	22
Administration's Plan with START	1.8	0.6	10	21
Post-START Options				
I. Ban Heavy ICBMs, Limit Defense	1.8	0.6	10	21
II. Reduce Strategic Warheads to 6,000	1.0	0.4	4	10
III. Reduce Strategic Warheads to 3,000	0.6	0	2	5
IV. Reduce Strategic Warheads to 1,000	0	0	0	1

a. The totals for theater systems include spares and stockpiled weapons.

APPENDIX B. COST METHODS AND UNCERTAINTIES

This appendix describes the methods that CBO used to estimate costs and discusses the uncertainties associated with these costs.

Methods Used to Estimate Savings

The methods used to estimate savings vary according to the type of costs. Costs associated with strategic offensive forces were generally estimated based on the number and types of systems assumed under each option.

For theater offensive forces, CBO first estimated the portion of costs associated with this type of system under the Administration's plan and then reduced those costs in proportion to the assumed reduction in the number of theater warheads. Savings associated with intelligence were estimated based on assumed reductions in the satellites that gather intelligence and the personnel that process the information. Estimates of savings associated with buying and maintaining nuclear warheads were based on a breakdown of the Department of Energy budget into functional categories such as weapons production and research. Each category was reduced to a greater or lesser

degree, depending on its nature. The added costs of compliance and monitoring arms treaties were estimated by analyzing the types of systems and inspection activities that might be required.

Estimates of the costs of defenses were generally based on Administration figures. For Options II through IV, which assume smaller numbers of ground-based interceptors, Administration estimates are not available. In this case, CBO isolated the portion of costs associated with ground-based interceptors and then reduced the procurement costs in proportion to the reduction in the number of ground-based interceptors.

Some types of costs are not assumed to change as nuclear forces are reduced. Costs associated with environmental cleanup of nuclear waste sites are not reduced. Costs for command, control, and communications are assumed to be unchanged because of the need to maintain secure and effective coordination of U.S. actions. Nor do any of the options assume reductions in the costs for defenses against theater ballistic missiles (such as the Iraqi Scud missiles) or in funds for basic research on methods to defend against strategic missiles.

Cost Uncertainties

Important uncertainties are associated with these estimates of costs. Costs to develop and buy new strategic systems are generally based on Administration estimates, and actual costs often exceeded these estimates in the past. Costs for technically ambitious Administration programs such as the B-2 bomber and deployed strategic defenses also could increase substantially if previous weapons programs prove to be reliable precedents. For savings associated with producing and maintaining nuclear warheads and for costs associated with strategic intelligence, CBO made assumptions about how these categories of costs would vary as nuclear forces become smaller. Those assumptions could prove inaccurate, as could CBO's assumptions about the numbers of systems and personnel that will be required for compliance and monitoring of arms treaties.

The timing of changes in strategic forces could also affect these cost estimates. The 15-year averages used here cover the period between 1992 and 2006. To avoid arbitrary assumptions about the timing of changes, the averages assume that all procurement changes associated with a particular post-START option (for example, terminating the B-2 bomber) are made effective in fiscal year 1992; retirement of existing systems is assumed to take place over a seven-year period beginning in 1992. If it takes 10 years to

negotiate a post-START treaty, as it did to negotiate START, the estimates presented here would greatly overstate near-term savings.

However, in view of the rapid pace of world events, the timing assumed here may be realistic. Changes in strategic forces are likely to take place more quickly in the future, perhaps through the use of informal agreements rather than formal treaties. Also, if a post-START option begins to appear a realistic possibility, fiscal pressures may cause the force changes associated with the option to be carried out even before a treaty or agreement is completed.