

## A Perspective on START

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Prepared Statement  
for the Hearing on START of the  
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I would like to start with a brief discussion of the basics.

### The U.S.-USSR Mutual-Hostage Relationship

Currently, the U.S. and USSR each have over 10,000 deployed strategic nuclear warheads with a destructive capacity equivalent to over 4,000 one megaton bombs. Of these, the equivalent of about 1500 equivalent megatons would survive a worst-case first strike that destroyed ballistic-missile submarines in port, bombers not on alert and most ICBMs (see Figure 2<sup>1</sup>).

For comparison, the equivalent of fifty one-megaton bombs dropped on the urban areas of the U.S. or USSR could kill 25-50 million people. Two hundred such weapons could kill 50-110 million people. (See Figure 1.)<sup>2</sup>

The U.S. and USSR therefore each have about ten times as many weapons as they need to hold each other hostage -- a situation that will not be significantly altered by the reductions envisioned in the draft START Treaty.\*

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\* The reductions will also not alter the impracticality of strategic defense. A 50-percent effective defense against an adversary with the technological capabilities of the Soviet Union would be an enormous achievement -- but virtually ineffective in terms of the real protection that it offered.

## Counterforce Strategies

We have so many strategic warheads because we tried to get more out of nuclear weapons than a mutual nuclear-hostage relationship with the Soviet Union. Specifically, we tried to develop "counterforce" capabilities to destroy the Soviet Union's capabilities for nuclear and conventional attack. This seemed more moral than threatening to destroy Soviet cities and also a more credible deterrent to a Soviet invasion of Western Europe. Soviet planners similarly made U.S. strategic forces their primary targets.

These strategies have not altered the fundamental fact, however, that neither side can destroy enough of the other's strategic forces to remove itself from the mutual nuclear-hostage relationship. Furthermore, as figures 3-7 show,<sup>3</sup> a strategic counterforce attack would cause tens of millions of "colateral" deaths -- making such attacks just as incredible as deliberate attacks on cities.

## Implications of START

START was designed before the Soviet Union began its withdrawal from Eastern Europe and committed itself to reduce its conventional forces west of the Urals below the level of those of NATO. It was therefore designed at a time when U.S. thought that credible nuclear threats were needed to guarantee the security of Western Europe. The cuts to levels of less than 4900 ballistic-missile warheads on each side envisioned in START, while significant,<sup>\*</sup> are therefore very conservative.

Times have changed, however. The Soviet conventional threat to Western Europe is being eliminated and the Soviet government and people are preoccupied by enormous internal problems. In this context, the main remaining nuclear danger seems to be that of accidental nuclear war. This danger is unnecessarily exacerbated by the fact that the U.S. and USSR each have huge numbers of nuclear weapons targeted on each other and therefore on hair trigger.

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\* About 5,000 Soviet and 3,000 U.S. deployed ballistic-missile warheads will have to be retired to get below the required ceiling of 4900 ballistic missile warheads on each side (see Table 1). The effect of START on bomber-carried warheads is less clear because of discounts in its "counting rules."

For these reasons and because of our budget problems, there is now a growing consensus in the strategic weapons community that much deeper cuts could be made to levels ranging from 1000-4000 *total* strategic warheads on each side.<sup>4</sup> Certainly, we could have a stable and verifiable mutual-hostage relationship at a level of 2,000 warheads each.\* (I would like to submit for the record an article which describes and analyses such deep cuts in some detail.<sup>5</sup>)

START takes a first step toward a stable nuclear balance at lower levels by eliminating half of the Soviet heavy SS-18 ICBMs and discouraging further U.S. deployment of the equally threatening and vulnerable MX. It has also already had the effect of limiting the buildup of ballistic-missile submarines loaded with heavy SLBMs.\*\*

The elaborate verification protocols of the START Treaty will also be very useful if we wish to go forward to deeper cuts.

But we will not be able to build on the foundation laid by the START talks unless we cement it with a Treaty. There are many ways in which START could be improved.<sup>6</sup> But Edward Shevardnadze is gone and many in the Soviet military think that he accepted inequitable cuts. The Treaty could begin to unravel if we open it up to accommodate both sides' second thoughts. Better to lock in our progress thus far.

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\* Further reductions to a stable balance would be possible at a level of 1000 on each side would be possible but would probably require collateral limitations on British, French and Chinese nuclear forces.

\*\* In apparent anticipation of the START agreement, the USSR has limited itself to six Typhoon submarines and the U.S. is limiting itself to 18 Trident submarines.



## References

1. Frank N. von Hippel, Barbara G. Levi, Theodore A. Postol and William H. Daugherty, "Civilian Casualties from Counterforce Attacks," *Scientific American*, September 1988, pp. 36-42.
2. *ibid*
3. *ibid.*
4. A partial list: Richard Garwin, "A Blueprint for Radical Weapons Cuts," *Bulletin of the Atomic Scientists*, March 1988, pp. 10-13; Michael M. May, George F. Bing, and John D. Steinbruner, "Strategic Arsenals After START," *International Security* 13, Summer 1988, pp. 90-133; William W. Kaufman, *Glasnost, Perestroika, and U.S. Defense Spending* (Washington, D.C.: The Brookings Institution, 1989); Harold Brown, "Navigating the Security Sea Change," *Arms Control Today*, May 1990, pp. 3-7; Richard C. Davis and Jon Wolfsthal, *Potential START II Outcomes and Their Implications: Report of a Workshop* (McLean, VA: Science Applications Inc., 1990); and Roger D. Speed, *Strategic Forces: Future Requirements and Options* (Lawrence Livermore National Laboratory report CTS-07-90 (1990).
5. Harold A. Feiveson and Frank von Hippel, "Beyond START: How to Make Much Deeper Cuts," *International Security* 15 (Summer 1990), pp. 154-180.
6. For example, arrangements could be made for the destruction of the warheads whose delivery vehicles are to be eliminated. In the Fiscal Year 1991 Defense Authorization bill (section 3151), the Congress instructed the President to

"prepare a comprehensive technical report on...the on-site monitoring techniques, inspection arrangements, and national technical means that could be used by the United States to verify the actions of other nations with respect to...a) dismantling of nuclear warheads...b) a mutual United States-Soviet ban, leading to a multilateral, global ban, on the production of additional quantities of plutonium and highly-enriched uranium for nuclear weapons [and] c) the end use or ultimate disposal of any plutonium or highly enriched uranium recovered from the dismantlement of nuclear warheads."

This report is due on 30 April.

Independently, the research arm of the Federation of American Scientists has been preparing a report on these questions with the collaboration of Soviet scientists (*Ending the Production of Fissile Materials for Weapons and Verifying the Dismantlement of Nuclear Warheads: The Technical Basis for Action*, to be published).

Table 1. DEPLOYED U.S. AND USSR STRATEGIC WARHEADS (end 1990)\*

	<u>Missiles/Bombers</u>	<u>Warheads</u>
<u>U.S.</u>		
<b>ICBMs</b>		
Minuteman II	450	450
Minuteman III	500	1500
MX	50	500
<b>SLBMs</b>		
Poseidon	176	1760
Trident I	384	3072
Trident II	48	384
<i>Total Ballistic Missiles</i>	<i>1608</i>	<i>7666</i>
<b>Bombers</b>		
B-52 G/H	154	2844
<u>B-1B</u>	<u>90</u>	<u>1440</u>
<b>TOTALS</b>	<b>1852</b>	<b>11950</b>
 <u>USSR</u> (U.S. Designations)		
<b>ICBMs</b>		
SS-11	310	310**
SS-13	30	30
SS-17	50	200
SS-18	308	3080
SS-19	250	1500
SS-24	86	860
SS-25	300	300
<b>SLBMs</b>		
SS-N-6	176	176**
SS-N-8	286	286
SS-N-17	12	12
SS-N-18	224	1568
SS-N-20	120	1200
<u>SS-N-23</u>	<u>96</u>	<u>384</u>
<i>Total Ballistic Missiles</i>	<i>2248</i>	<i>9906</i>
<b>Bombers</b>		
Bear-H (Tu-142)	85	510
<u>Blackjack (Tu-160)</u>	<u>21</u>	<u>252</u>
<b>TOTALS</b>	<b>2354</b>	<b>10668</b>
<b>Surface-to-Air Missiles</b>	<b>2620</b>	<b>3000</b>
<b>Anti-Ballistic Missiles</b>	<b>100</b>	<b>100</b>

\* Robert S. Norris, Richard W. Fieldhouse, Thomas B. Cochran and William M. Arkin, *World Armaments and Disarmament: SIPRI Yearbook 1991* pp. 16, 18. Numbers for bomber loadings from H.A. Feiveson and F.N. von Hippel, *International Security* 15 (Summer 1990), p. 163.

\*\* Some have multiple but non independently targetable reentry vehicles.

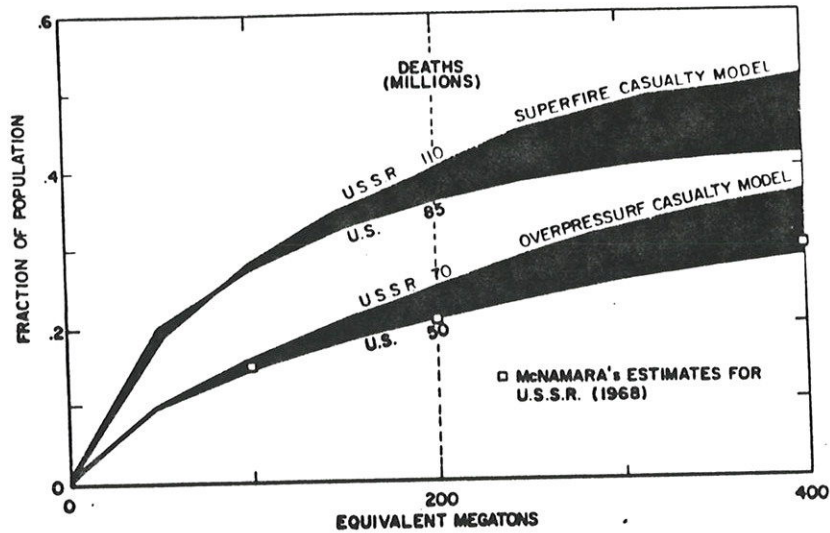


FIG. 1. How many nuclear weapons does it take to deter a nuclear attack? According to the "assured destruction" criterion first laid out in the 1960s by Secretary of Defense Robert S. McNamara, the capability of detonating—in a retaliatory attack—200 equivalent megatons over Soviet cities would effectively deter the USSR. The authors' calculations show that such an attack on the United States or on the Soviet Union would result in prompt fatalities amounting to as much as 40 percent of the population (about 100 million people) if the lethal effects of the superfires are taken into account.

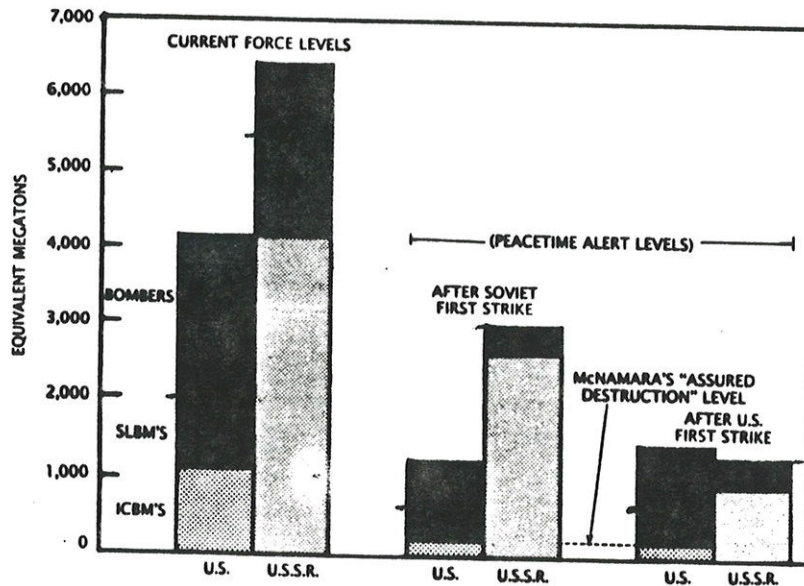
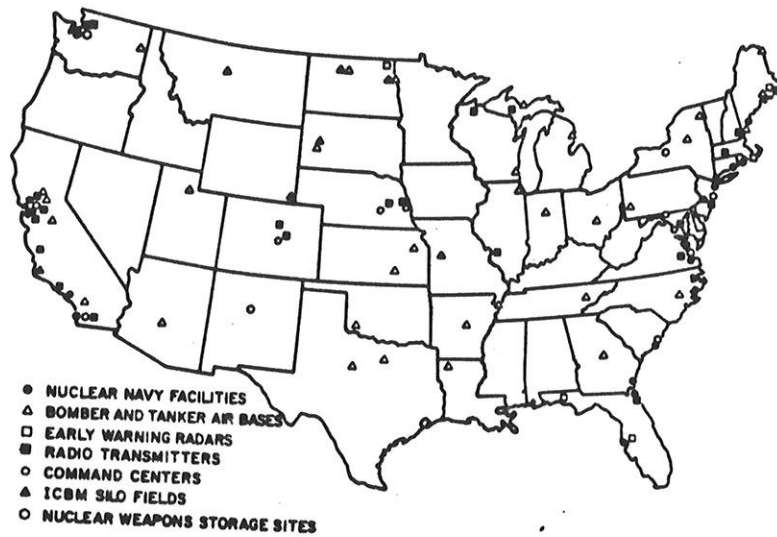


FIG. 2. Both the U.S. and the USSR have substantially more equivalent megatons in their respective strategic arsenals than are necessary to meet McNamara's assured-destruction criterion—even after their strategic forces have suffered a "worst case" nuclear attack. The excess weapons are justified largely on the grounds that they are required to execute "counterforce" attacks on military facilities, in particular those associated with the nuclear forces of the other side.

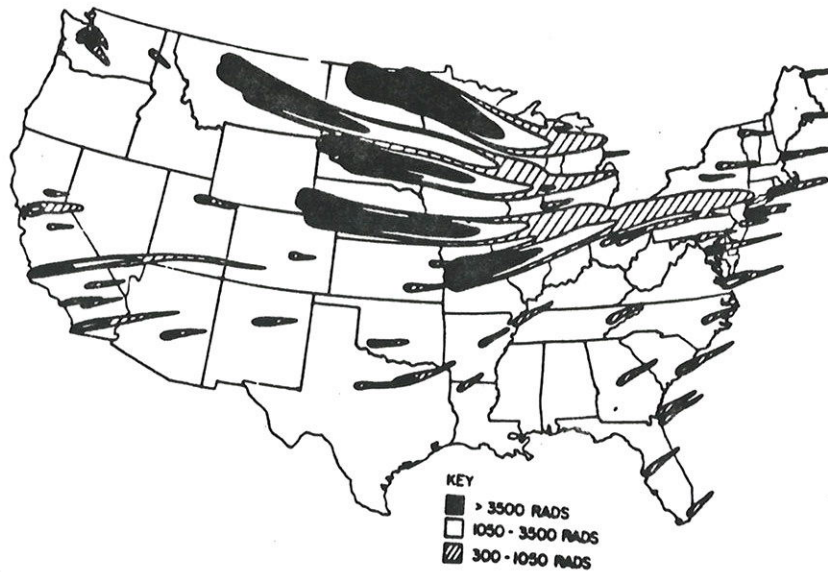




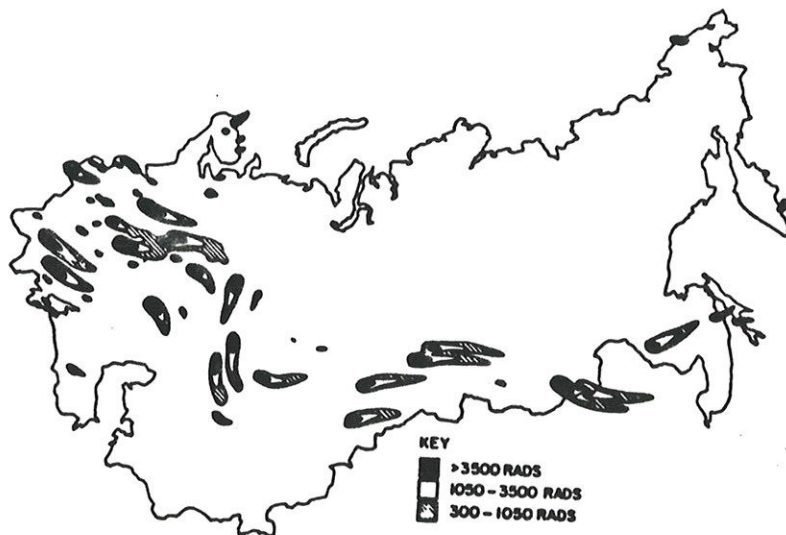
**FIG. 3.** Strategic nuclear facilities in the United States. Many of these are located near urban centers or are upwind of populated areas. As a result there are likely to be tens of millions of civilian deaths from the blast fire and radioactive fallout from a counterforce attack, even though only military facilities (and not cities per se) are the targets.



**FIG. 4.** Strategic and intermediate-range nuclear facilities in the Soviet Union.

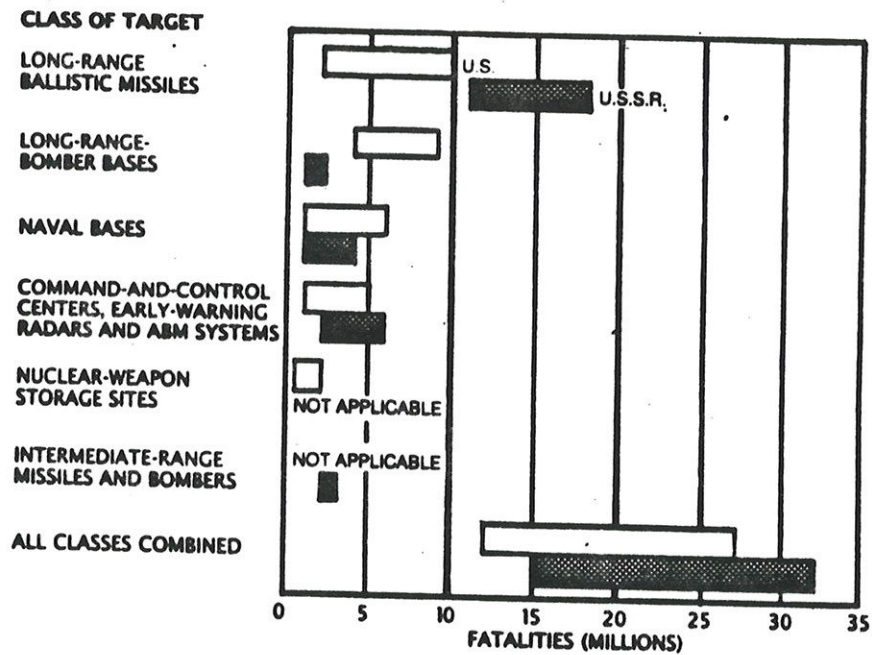


**FIG. 5.** *Fallout from a nuclear attack on the strategic nuclear facilities in the United States would expose millions of people to lethal doses of gamma radiation. If the median lethal dose is taken to be 3.5 of the units called grays, most people who were not in the shelters within the outermost radiation-level contours would suffer severe radiation sickness. Even people sheltered in windowless cellars would die within the innermost contours.*



**FIG. 6.** *Fallout pattern from a nuclear attack on the strategic and intermediate-range nuclear facilities in the Soviet Union.*





**FIG. 7.** Ranges of civilian fatalities that can be expected as a direct consequence of counterforce attacks on various classes of military targets. The fatalities associated with a counterforce attack on all targets do not equal the sums of the fatalities for attacks on individual classes of targets, because there is some overlap in the areas affected and because the lower and upper values of the fatality ranges apply to different months in different attacks.

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**Research:** Civilian casualties from nuclear attacks; stability and verifiability of the U.S.-USSR nuclear balance after deep cuts; future of nuclear testing; controls of nuclear warheads and fissile materials; alternative futures for nuclear power; the potential for automobile fuel efficiency improvements.

**Education:** B.S. (MIT, 1959), Rhodes Scholar (1959); D.Phil. in theoretical physics (Oxford, 1962).

**Previous Positions:** Researcher, University of Chicago and Cornell University; Faculty member, Stanford University; Sloan Fellow, Lawrence Berkeley Laboratory; Researcher, Argonne National Laboratory; Resident fellow, National Academy of Sciences.

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