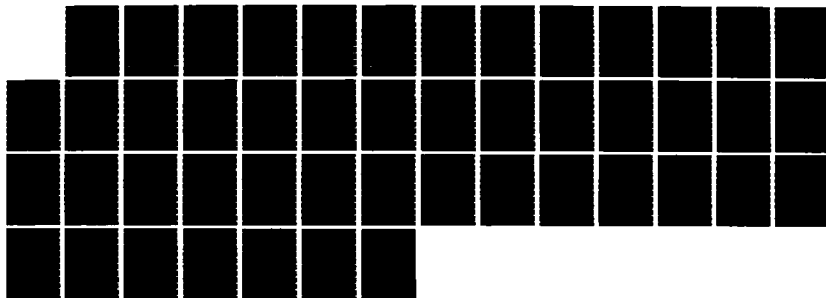
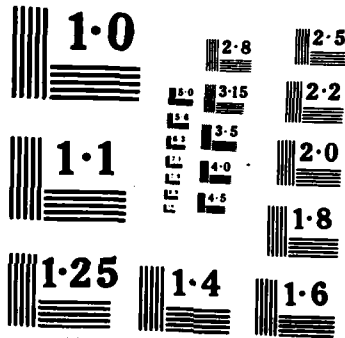


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A RAND NOTE

KEY ISSUES FOR THE STRATEGIC OFFENSIVE
FORCE REDUCTION PORTION OF THE NUCLEAR
AND SPACE TALKS IN GENEVA

Edward L. Warner III, Glenn A. Kent,
Randall J. DeValk

December 1985

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Prepared for

The United States Air Force

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This Note discusses approaches for the limitation and reduction of U.S. and Soviet strategic attack forces. It identifies three national security objectives that the United States and, arguably, the Soviet Union seek to obtain through a combination of strategic nuclear force deployments, arms control, and diplomacy: credible deterrence, strategic/crisis stability, and essential equivalence. It defines three measures that can be controlled to constrain the destructive capacity of intercontinental strategic attack forces: the amount of ballistic missile throwweight, the number of ballistic missile RVs, and the amount of bomber gross takeoff weight. It then considers an alternative approach, a "weighted" composite measure that yields a smaller initial difference between U.S. and Soviet ballistic missile forces than the pure throwweight approach, thus providing better prospects for successful compromise in negotiation. It concludes that the United States cannot reasonably expect to gain any great significant reductions in Soviet ballistic missile capabilities without being prepared to accept considerable constraints on the growth of the U.S. bomber force weapon-carrying potential.

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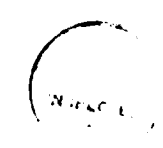
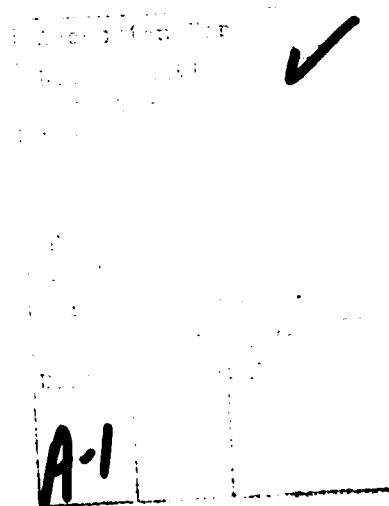
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PREFACE

This Note was prepared as part of a Project AIR FORCE research effort on arms control, sponsored by the Directorate of Plans. It was requested by the Air Staff in January 1985 to assist senior Air Force leaders in their preparations for policy debates on the renewed negotiations with the USSR on nuclear arms.

This particular Note discusses approaches for the limitation and reduction of U.S. and Soviet strategic attack forces. The views expressed in this Note are those of the authors and do not necessarily reflect the positions or policies of either the U.S. Air Force or the U.S. Government.

Hypothetical information used in the examples and text material is drawn from cited open-source information and is only for the purpose of illustration.



SUMMARY

Through a combination of strategic nuclear force deployments, arms control and diplomacy, the United States and, arguably, the Soviet Union seek to obtain three national security objectives:

Credible Deterrence: Both superpowers seek to maintain the military potential to hold at risk significant portions of the adversary's military, economic, and political assets.

Strategic/Crisis Stability: Neither superpower should want the other to feel tempted or compelled to resort to the initiation of nuclear operations, even (especially) in a time of severe political crisis.

Essential Equivalence: Each side seeks to possess roughly comparable central strategic nuclear attack capabilities.

The United States and the Soviet Union, either unilaterally or in cooperation with each other, can make certain prudent force posture decisions that greatly assist each side's effort to obtain these objectives. When both sides deploy a considerable number of weapons in "nontargetable sanctuaries," neither side would have much incentive for first strike. In these conditions, each superpower possesses the ability to carry out effective retaliatory attacks against the adversary's full range of targets, even after being subjected to a worst case, well-executed, surprise first strike.

Arms control can help to ensure that those forces currently considered "nontargetable" (bombers on alert and SLBMs on SSBNs at sea) remain so in the future and that future mobile land-based ICBM deployments are also survivable. Unconstrained growth in an adversary's potential offensive capacity could place at risk forces now considered to be in sanctuary.

The destructive capacity of a nation's intercontinental strategic attack forces can be usefully constrained by controlling three measures: the amount of ballistic missile throwweight, the number of ballistic missile RVs, and the amount of bomber gross takeoff weight.¹

Limits can be imposed on ballistic missile throwweight directly, through the establishment of an overall throwweight ceiling, or indirectly, by simply establishing a ceiling on ballistic missile RVs. The latter limit can be supplemented by subceilings directed toward those Soviet missile systems with large lifting capacities. The primary problem with using limits that focus on throwweight derives from the very great disparity in throwweight between the current U.S. (1.9 Mkg) and Soviet (5.4 Mkg) ballistic missile forces.

An alternative approach takes into account both the throwweight and the number of reentry vehicles carried by various ballistic missiles in some weighted manner within a single composite measure (strategic weapon stations or SWS). Using a "weighted" composite measure yields a smaller initial difference between U.S. and Soviet ballistic missile forces than the pure throwweight approach, thus providing better prospects for successful compromise in negotiation.

One can also lessen the large disparity between U.S. and Soviet ballistic missile forces and gain a truer picture of the central strategic balance between the superpowers by taking into account the relative capabilities of the superpowers' bomber forces, an area where the United States currently enjoys a substantial advantage in weapon carrying capacity. This also opens the way for possible tradeoffs between missiles and bombers within a common ceiling.

If throwweight is the sole index for counting ballistic missiles and one heavy bomber equipped with ALCMs equals one heavy missile (the SS-18), then the current difference in the missile force between the Soviets and the United States is equivalent to 460 heavy bombers

¹A currency of bomber weapons has significant limitations. The actual number of weapons that a given bomber may carry is difficult, if not impossible, to verify. Assigning reasonable weapon carriage capacity to bombers of varying sizes and taking into account capabilities to carry modern air-launched cruise missiles (ALCMs) gives a reasonable estimate of a nation's aggregate bomber weapon capability.

equipped with ALCMs. Using, instead, the composite strategic weapon stations approach, the difference between the two ballistic missile forces is only 220 heavy bombers equipped with ALCMs.

Regardless of the strategic offensive arms control approach eventually adopted, because of existing strategic force asymmetries, the United States cannot reasonably expect to gain any great significant reductions in Soviet ballistic missile capabilities without being prepared to accept the imposition of considerable constraints on the growth of the U.S. bomber force weapon carrying potential.

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I. SUPERPOWER INTERESTS AND OBJECTIVES

The United States and, arguably, the Soviet Union as well, seek the following national security objectives through a combination of strategic nuclear force deployments, arms control efforts, and other diplomatic initiatives.

CREDIBLE DETERRENCE

Both superpowers seek to maintain the military potential to hold at risk significant portions of the adversary's military, economic, and political assets. For the foreseeable future, neither the United States nor the Soviet Union could execute a successful counterforce first strike against the strategic attack forces of the other that would either allow a decisive shift in the strategic balance in the attacker's favor or preclude the possibility of its suffering massive (and thus "unacceptable") retaliatory damage.

Each fields a diversified strategic force posture that complicates the other's offensive and defensive force employment planning, guards against technological failure that threatens the viability of any particular component, and protects against breakthroughs in relevant adversary capabilities.

Both have the ability to use their strategic forces in a flexible manner that allows them to conduct strike operations at various levels below an all-out nuclear exchange.

STRATEGIC/CRISIS STABILITY

Neither side is likely to be sufficiently tempted or fearful to resort to the initiation of nuclear operations, even (*especially*) in a time of severe political crisis.

Neither country could escape devastating urban-industrial retaliation even if it executed a massive, surprise, would-be disarming first strike.

Neither can greatly alter this retaliatory stalemate by means of a "breakout" in attack or defense capability.

Also neither side could prudently rely upon its residual countervalue capability to deter retaliatory attacks on its own theater projection forces or its urban and industrial base after the initiator had mounted an attack limited to the other country's strategic nuclear forces.

Both superpowers are sensitive to risks of nuclear war and have been willing to establish procedures and capabilities to facilitate communications in crises and actually use these arrangements as a means of reducing the chances of direct superpower military conflict.

ESSENTIAL EQUIVALENCE IN STRATEGIC OFFENSIVE CAPABILITIES

Both sides possess, and are widely perceived to possess, roughly comparable strategic nuclear attack capabilities. Given differing historical weapon development patterns and traditions, the superpowers' intercontinental-range nuclear strike forces are not and need not be symmetrical. Rather, this general equivalence involves a rough balancing of relative strengths and weaknesses in the strategic capabilities of the two sides.

Today's approximate parity is the result of a series of offsetting asymmetries (see Table 1). The United States enjoys an advantage with regard to the overall number of strategic weapons and a qualitative edge in submarine quieting, strategic antisubmarine warfare, and bomber electronic countermeasures. The Soviets are superior in ballistic missile throwweight (as discussed further below), strategic air defense, and the hardness of their ICBM silos.

Despite occasional rhetoric to the contrary, both sides appear willing to continue to accept something resembling the current "rough parity" in the central strategic balance so long as they believe that the other side will not readily permit them to gain a clear-cut advantage. Although many on both sides would undoubtedly like strategic superiority over the other, both the United States and the Soviet Union appear strongly determined not to permit the other to acquire such an advantage. However, should the Soviets conclude that the United States

Table 1

U.S.-SOVIET STRATEGIC OFFENSIVE FORCE BALANCE, SPRING 1986

	United States	Soviet Union
ICBM	1017 (550 MIRVed) 2117 RVs 1.0 Mkg TWt	1396 (818 MIRVed) 6418 RVs 4.5 Mkg TWt
SLBM	648/37 subs (648 MIRVed) 5760 RVs 0.9 Mkg TWt	944/62 subs (336 MIRVed) 2800 RVs 1.0 Mkg TWt
Bomber	263 active B-52G/H (98 w/ALCM) 3280 weapons	180 active Bear and Bison (40 w/ALCM) 660 weapons
Totals	1928 SNDVs - 1665 ballistic missiles (1198 MIRVed) - 263 bombers (98 w/ALCM) 11157 weapons 7877 BM weapons 1.9 Mkg TWt	2520 SNDVs - 2340 ballistic missiles (1154 MIRVed) - 180 bombers (40 w/ALCM) 9878 weapons 9218 BM weapons 5.4 Mkg TWt

SOURCES: Data on the numbers and type of delivery vehicles and ballistic missile weapons taken from *Soviet Military Power* (March 1986). U.S. bomber weapon figures based on *The Military Balance, 1985-86* and publicly announced capacity of ALCM-equipped B-52s to carry 20 weapons. Soviet bomber weapon figures derived from *The Military Balance, 1985-86* and *Soviet Military Power*. Ballistic missile throwweight estimates based on *The Military Balance, 1984-85*, and *1985-86* and Paul Nitze speech, *Negotiations on Nuclear and Space Arms*, March 13, 1986, Current Policy No. 807, Bureau of Public Affairs, U.S. Department of State.

is unwilling to continue to compete effectively, they might well choose to push ahead their deployment programs for strategic offensive and defensive systems much more vigorously in the hope of gaining a substantial margin of superiority.

Both the United States and the Soviet Union appear willing to bargain seriously in Geneva regarding limitations that would perpetuate the existing rough parity at lower overall force levels. In the absence of either a new agreement to reduce central strategic offensive forces or continued mutual "no undercut" adherence to the major elements of the

SALT II Treaty, and assuming both sides are willing to match the exertions of the other, neither appears capable of upsetting this balance over the next several years.

MEASURES TO ATTAIN OBJECTIVES

The United States seeks to attain the objectives discussed above through a combination of deployments of strategic nuclear forces and negotiated agreements that result in mutual and verifiable restraint and reductions in offensive nuclear destructive potential. From a force deployment perspective, certain U.S. and Soviet strategic force postures do more to maintain deterrence and enhance crisis stability than others. When both sides have a considerable number of weapons in "nontargetable sanctuaries," neither side would have much incentive for first strike. In these conditions, each side possesses the ability to carry out effective retaliatory strikes against the adversary's full range of targets, even after being subjected to a worst case, well executed, surprise first strike.

U.S. intercontinental range weapons currently satisfying the "nontargetable" criterion, under normal day-to-day operating conditions, include those carried on strategic submarines at sea (at present some 55 percent to 60 percent of our total SSBN force) and strategic bombers on strip alert (now approximately 30 percent of our B-52 force). The number of these weapons in this "sanctuary" status can, of course, be increased substantially in routine or crisis situations by simply putting a larger number of submarines to sea and heavy bombers on quick reaction strip alert. Although U.S. ICBMs are maintained at very high (greater than 90 percent) day-to-day alert rates, they are not now considered to be survivable. Over the past few years, the Soviets have attained a sufficient combination of accuracy and yield in their large ICBM force to permit an extremely high damage expectancy against the entire U.S. silo-based missile force.

Arms control can help to ensure that those forces currently considered nontargetable remain so in the future and that future mobile land-based ICBM deployments are increasingly survivable as well. Unconstrained growth in an adversary's potential destructive capacity could, if permitted, prove to be important in placing at risk forces

that are now considered to be in sanctuary--that have excellent prelaunch survivability. Pattern bombing the escape areas adjacent to the bombers' bases could seriously endanger the safe flyout of bombers on alert. The attacker would have to expend only a few million kg of ballistic missile throwweight if U.S. bomber deployments are confined to a small number of bases or the bombers themselves are not designed to cope with substantial gusts induced by nuclear blasts.

The amount of missile throwweight available to the Soviets for barrage attacks could also come to play with regard to submarines at sea. At the present time, Soviet ASW sensors are unable to detect and localize U.S. strategic submarines on patrol. Were the Soviets able to detect and localize these submarines within 50 nautical miles, they could effectively use their ballistic missiles in barrage attacks against the U.S. SSBN force; the overall destructive capacity of the Soviet ICBM force, measured in missile throwweight, would determine their ability to carry out such an attack.

If the United States deploys additional ICBM RVs on a hardened mobile land-based erector-launcher, the imposition of an overall cap on Soviet ballistic missile throwweight could also enhance the survivability prospects for this system and directly limit the size of the area over which the Soviets could hope to mount a successful barrage attack. If the United States were to deploy on a random basis several hundred RVs on hardened transporters that were able to resist blast pressures of up to 30 psi in an area of some 10,000 square miles, the Soviets would be required to mount an attack using over 2 million kg of throwweight (250 SS-18s) to generate a barrage that seriously threatened the survivability of this force. Similarly, a few hundred missiles deceptively emplaced in an array of 500 redundant very hard silos located a few thousand feet from one another would require the Soviets to expend the equivalent of 250 SS-18s targeted on the individual shelters to neutralize this force.

Unilateral survivability measures coupled with constraints (or reductions) on Soviet destructive capacity would ensure that the Soviets cannot pay the price to strike all of our strategic attack forces simultaneously, even though they might be able to pay the price for effective attacks against individual elements. In particular, the

United States must seek to constrain and reduce Soviet destructive potential and thus their ability to conduct barrage attacks against U.S. bombers on alert, submarines at sea, and land-mobile ICBM transporters.

METRIC FOR DESTRUCTIVE CAPACITY

The destructive capacity of a nation's intercontinental strategic attack forces can be usefully constrained by controlling three measures: the amount of ballistic missile throwweight, the number of ballistic missile RVs (actually, counted weapons release "stations" on counted missiles), and the amount of bomber takeoff gross weight. A currency of bomber weapons, as such, presents significant difficulties as a primary limitation parameter since the actual number of weapons a given bomber may carry is difficult, if not impossible, to verify. Nonetheless, a useful estimate of a country's aggregate bomber weapons capability, which can help in gauging the effect of a particular treaty proposal, can be made by assigning reasonable weapon carriage capacity to bombers of differing sizes. The dimensions of a bomber that relate to gross takeoff weight, which are readily observable using national technical means, can be used to determine the "size" of various bomber classes. Then, taking into account the greatly increased loadings of those bombers equipped with modern air-launched cruise missiles, one can simply sum these assigned weapons capacities across each side's bomber force.

To impose limits on ballistic missile throwweight one could simply establish a ceiling on the total throwweight permitted for the ballistic missile forces of the two sides. This total may be expressed in millions of pounds or kilograms of throwweight or, as one recent proposal has suggested, in terms of "equivalent SS-18s." That measure is readily calculated by dividing the overall throwweight of each side's missile force in kilograms by the throwweight of the Soviet SS-18 ICBM (7600 kg).

Alternatively, one could constrain overall ballistic missile throwweight indirectly, simply by establishing a ceiling on ballistic missile RVs. If the total number of missile RVs permitted is in the 5000-6000 range and collateral constraints are used to prevent the Soviets from replacing current RVs with much larger new ones, such

indirect limits can yield a reduction in Soviet ballistic missile throwweight from the current level of 5.4 million kg to somewhere in the range of 3.2 to 3.8 million kg. If the total RV limit is set at 7000 or more, however, and there are no additional subceilings that constrain the number of ICBM RVs below 4500 or so, this approach is correspondingly less effective in compelling a large reduction in Soviet ballistic missile throwweight. A single aggregate of 7000 ballistic missile RVs would allow the Soviets to retain most of their heavier SS-18 and SS-19 weapons while also keeping a substantial number of lighter RVs on SLBMs and still having the opportunity to deploy the rail mobile version of the new, roughly MX-sized SS-X-24 ICBM and their new "small" road mobile SS-X-25 ICBM.

A new Soviet proposal on strategic arms reductions presented to the United States in October 1985, although clearly unacceptable in its original form, contains a potentially promising approach for deep cuts in central strategic systems. The Soviets have proposed that the "strategic" weapon inventories on both sides be drastically reduced from present levels to a common ceiling of 6000 "nuclear charges"/weapons. They have also proposed a supplementary "force concentration rule" that would permit each side to deploy no more than 60 percent of the 6000 weapons on a single force component--that is, ICBMs, SLBMs, or heavy bombers. Unfortunately, the Soviets have seriously contaminated this proposal by demanding that the United States include within the 6000 aggregate not only the weapons on its intercontinental-range ICBMs, SLBMs, and heavy bombers but also those carried on its medium-range Pershing II and GLCM missiles being deployed in Europe and its nuclear-capable fighter-bombers forward-based in Europe and Asia and on aircraft carriers. Their grounds are that all of these U.S. systems are capable of conducting strikes against Soviet territory. The Soviet Union, in contrast, is called upon to count and reduce only its intercontinental-range central strategic systems.

Assuming that the Soviets can be persuaded to drop this blatantly one-sided and self-serving approach to a force inclusion (as they did during both the SALT I and SALT II negotiations when they tried this tactic previously), if this new two-tiered approach were confined solely to central systems, it could yield useful constraints on the potential

destructive capacity of the superpowers' strategic arsenals. Should the Soviets choose to deploy 3600 RVs on ICBMs, 1600 RVs on SLBMs, and the remaining 800 weapons on heavy bombers, for example, the Soviet ballistic missile force would be capable of launching from 2.7 to 3.2 million kg of throwweight, a very substantial cut from the 5.4 million kg carried by current Soviet ICBMs and SLBMs. Other Soviet force postures within these constraints marked by less emphasis on their increasingly vulnerable silo-based ICBMs, could readily cut the Soviet throwweight capability to 2.2-2.6 million kg. A U.S. strategic force that included some 2800 RVs on SLBMs, 1400 RVs on ICBMs, and the remaining 1800 weapons on heavy bombers would result in a ballistic missile throwweight capability of some 1.3 million kg, down from the present U.S. level of 1.9 million kg.

A month after the presentation of the Soviet October initiative and just three weeks prior to the Reagan-Gorbachev summit in Geneva, the United States tabled its own counterproposal.¹ The new U.S. offer represents a significant modification of the previous American position and includes provisions that resemble key elements of the Soviet October 1985 package. The United States proposes that each side be allowed to deploy a maximum of 4500 ICBM and SLBM RVs, with no more than 3000 of these weapons carried on ICBMs. These new ceilings represent adjustments from the earlier limits proposed by the United States in 1982 of 5000 total ballistic missile RVs and 2500 ICBM RVs. The 3000 RV sublimit for ICBMs is 600 less, however, than the 3600 ICBM RVs that would be permitted by the 6000 nuclear charges and 60 percent force concentration approach proposed by the Soviets in October 1985.

In addition, the United States proposes that each side deploy no more than 1500 ALCMs. In terms of the number of ALCMs allowed this represents a major departure from the original American START position. Taken together, the 4500 limit on ballistic missile RVs and the 1500 ceiling on ALCMs add up to a U.S. offer that, like the Soviet offer, calls for reductions to 6000 weapons. The U.S. 6000 total, however, does not include gravity bombs or short-range attack missiles carried by heavy

¹See Paul H. Nitze, "Negotiations on Nuclear and Space Arms Control," Current Policy No. 807, U.S. Department of State, Bureau of Public Affairs, Washington, D.C., 1986.

bombers. Finally, the United States also proposes that each side be allowed to deploy up to 350 heavy bombers--down from 400 such bombers permitted under the earlier U.S. offer. This ceiling would establish an indirect limit on the weapons carried by each side's bomber force. Assuming that the 1500 ALCMs permitted were carried on 75 of these bombers, this would mean that each side could deploy an additional 275 non-ALCM heavy bombers. If each of these bombers were carrying a "reasonable" load of 8 gravity bombs and short-range attack missiles, this would provide an additional 2200 weapons in the strategic arsenals of the superpowers.

Thus the U.S. proposal of November 1985 would indirectly establish an overall limit of approximately 8200 strategic weapons--up to 4500 ICBM and SLBM RVs, 1500 ALCM, and plausibly some 2200 gravity bombs and SRAMs. This represents a dramatic reduction from the 13,000 weapons that could have been deployed by both sides under the earlier U.S. START proposal--5000 ICBM and SLBM RVs and 8000 weapons on 400 bombers--and "deep cuts" from the current and projected superpower inventories. The throwweight implications of the focused constraints on ballistic missile RVs would also be very substantial. Under the U.S. November proposal the Soviet missile force would likely carry some 2.0-2.3 million kilograms of ballistic missile throwweight, while the U.S. ICBMs and SLBMs would carry approximately 1.4 million kilograms.

With regard to either the recent U.S. or Soviet proposals, if one wished to tighten further the indirect restrictions on ballistic missile throwweight, one could add focused subceiling reductions on those Soviet ICBMs, SS-18 and SS-19 class missile, that currently carry the heavier RVs.

To retain a continuing constraint on overall missile throwweight, when relying either on a ballistic missile warhead ceiling or additional subceilings directed against ICBMs with heavier RVs, one would also need to prohibit the fielding of new missile RVs that are heavier than a given modest standard. The United States reportedly proposed a version of the indirect but focused approach during the initial rounds of the START negotiations in 1982-83. This proposal purportedly called for each side to retain no more than 5000 total ballistic missile RVs, only half of which could be carried by ICBMs, and would have imposed

additional ceilings of 210 MIRVed ICBM launchers and 110 modern, large ballistic missile (SS-18) launchers.²

And finally, one can also develop approaches that take into consideration both the throwweight and the number of reentry vehicles carried by various ballistic missiles in some weighted manner within a single composite measure. Such is the nature of the "strategic weapons stations" approach that rates ICBMs and SLBMs in terms of whichever is larger: the maximum RVs tested on a given type of missile or the missile throwweight in kilograms divided by a given constant--400 kg for MIRVed missiles (500 kg for a single RV system). Using this approach, a Soviet SS-18 would be valued at 19 strategic weapons stations--7600 kg divided by 400 kg--while a Poseidon/C-3 SLBM would be rated at 14, the maximum number of RVs tested in that missile. This method controls both the number of RVs and the amount of missile throwweight. It would encourage both sides to move toward the fielding of missiles carrying "modern" RVs that have no more than 400 to 500 kg of throwweight associated with each RV by levying a "multiple charge" on those missiles whose throwweight per RV exceeds this standard.³

An alternative composite measure approach, seeking to take into account both the demonstrated weapon carriage and throwweight capacity of ballistic missiles, proposes that missiles be assigned values according to a formula that rates missiles by the sum of their throwweight divided by a constant plus the number of RVs carried. A Soviet SS-18, for example, would be assigned a rating of 25, which is derived by adding its maximum SALT allowable RV loading 10, to its throwweight in kg divided by 500 ($7600/500 = 15$), for a total value of 25. A Poseidon/C-3 would be rated at 14, the maximum number RVs tested on this missile, + $1500/500$ kg for a total value of 17.

²Detailed accounts of the U.S. proposal can be found in several sources. Among these are "Arms Control," U.S. Arms Control and Disarmament Agency, 1984, pp. 3-8 and "Nuclear Arms Control Choices," Harold Brown and Lynn Davis, SAIS Papers on International Affairs, No. 5, Westview Press, Boulder, CO, 1984, pp. 11-12.

³For a complete description of this metric see Glenn A. Kent et al., *A New Approach to Arms Control*, The Rand Corporation, R-3140-FF/RC, June 1984.

The primary problem with using direct throwweight limits in a U.S.-Soviet START agreement derives from the very great disparity in throwweight that marks the current U.S. and Soviet ballistic missile forces. The Soviet ICBM and SLBM forces today are capable of lifting about 5.4 million kg of throwweight, and the U.S. ballistic missile force can lift approximately 1.9 million kg. The United States has no plans to greatly raise this capability. Consequently, an agreement that is supposed to eliminate this pronounced Soviet advantage would have to call for very large Soviet reductions accompanied, in many cases, by permitted U.S. growth. This is unlikely to prove negotiable.

A primary advantage of using a weighted composite measure is that such an approach yields a smaller difference between the U.S. and Soviet ballistic missile forces than the pure throwweight approach. The weighted approach assesses the destructive potential of U.S. and Soviet missiles on the basis of both their throwweight *and* the numbers of RVs, and the missile forces of the two sides carry roughly the same number of RVs.

One can mitigate this disparity still further and more accurately assess the overall central strategic balance between the United States and the Soviet Union by factoring in the relative capabilities of the superpowers' bomber forces, where the United States currently enjoys a substantial advantage in weapon carrying capacity. This more comprehensive approach would open the way for the negotiation of possible tradeoffs within a common ceiling. (Section III contains a further discussion of U.S. and Soviet bombers and their role in the strategic offensive force reduction portion of the ongoing Geneva negotiations.) This approach is most workable if one is prepared to: (1) exclude from the strategic offensive force portion of these talks (and include in the intermediate nuclear force portion instead) the controversial Soviet Backfire bomber, whose range puts it on the margin for inclusion as an intercontinental attack system; (2) factor in the current U.S. advantage in the ability to carry small, modern air-launched cruise missiles by rating B-52s equipped with ALCMs as capable of carrying 20 weapons, while B-52s without ALCMs carry only eight, and (3) count missiles by both RVs and throwweight rather than strictly on the basis of throwweight.

If one used throwweight as the sole index for counting ballistic missiles and assumed one heavy bomber equipped with ALCMs equaled one heavy missile (the SS-18), then the Soviet advantage over the United States in missile force is equivalent to 460 heavy bombers equipped with ALCMs. Using the "strategic weapons stations" approach, the difference between the two ballistic missile forces is only 220 heavy bombers equipped with ALCMs.

Having at least followed suggestions (2) and (3), a common currency can be used to facilitate useful tradeoffs between ballistic missiles and bombers. With the benefit of this approach, an aggregate limit on destructive capacity can be set that allows at least some freedom to mix between ballistic missile and bomber weapon potential. To enforce a large reduction in Soviet missile RVs, it would be useful to accompany this limit with a separate ceiling on ballistic missile RVs substantially below the level of roughly 9000, currently possessed by the Soviet Union. The appropriate tradeoff "equivalence" between missiles and bombers is, in our view, that one heavy MIRVed missile (SS-18 class) be considered as equal to one heavy bomber (B-52 size) equipped with ALCMs. This standard reflects, among other things, the assumption that B-52 class bombers continue to carry no more than 20 air-launched cruise missiles as stipulated in the SALT II Treaty and the belief that the SS-18 could readily carry approximately 20 weapons whose destructive power would be similar to 20 modern ALCMs.

The steps involved in utilizing a composite measure have unfortunately been judged too complex by many in the Washington community. A less sophisticated approach developed on the basis of recent Soviet suggestions offers considerable promise and could yield a 30 percent reduction in total "nuclear charges" (from 11,157 to approximately 8000 missile RVs and bomber weapons). If accompanied by a 50 percent "force concentration" rule, it would also offer a probable reduction in Soviet ballistic missile throwweight from 5.4 to approximately 3.4 million kg.

II. FOUR BROAD ALTERNATIVE FORCE LEVEL OUTCOMES

It is useful to evaluate various specific proposals to constrain U.S. and Soviet strategic nuclear forces in terms of the number of weapons and throwweight allowed by a given restraint regime. One additional criterion for assessing an arms control proposal is whether it offers a tradeoff between allowable bomber and ballistic missile capabilities. Use of these criteria permit ready identification of the overall effects of various strategic offensive force reduction packages.

A first step in making these evaluations is to examine the various proposals and then design reasonable and allowable U.S. and Soviet force postures for each arms control approach. The figures for the amount of U.S. and Soviet throwweight reasonably possible under a given proposal were reached by simply summing up the throwweight of U.S. or Soviet missiles in each hypothetical force posture. If the proposal would compel both sides to trade off the number of bombers against the size of its ballistic missile force, we then note whether the United States or the Soviet Union had to sacrifice some portion of its bomber force to reach the figure shown for maximum amount of throwweight allowed.

To calculate the maximum number of ballistic missile reentry vehicles and bomber weapons--bombs and air-launched missiles--associated with various proposals to reduce strategic offensive forces, one need only establish standard counting rules and apply them consistently.

For our purposes we have used the following rules in making such evaluations:

1. Number of Ballistic Missile Reentry Vehicles (RVs)

- o All missiles of a given type are charged the maximum number of RVs ever tested with that type of missile.
- o Sum up the RV totals associated with the number of ballistic missiles of the various types to arrive at the overall aggregate force capability.

2. Number of Bomber Weapons

- o Each ALCM-equipped heavy bomber of roughly the same size--B-52s converted for ALCM, Bear H, potentially the B-1B and presumably the Blackjack--would be rated as carrying the allowable ALCM maximum for types of bombers in existence at the time of the signing of SALT II--that is, 20 ALCMs.
- o Non-ALCM bombers would be charged at a reasonable gravity bomb and air-to-surface missile (not ALCMs) loading of eight weapons for a B-52 size bomber.
- o Bombers included among the intercontinental range bombers but being either decidedly smaller or larger than the B-52 would be charged the ratio of their size (gross takeoff weight) to that of the B-52 multiplied times the standard ALCM or non-ALCM loading of the B-52, 20 and eight respectively. A non-ALCM Backfire, if counted as a central strategic system, would, for example, be rated at 270,000 lb (its gross takeoff weight) divided by 472,000 lb (the gross takeoff weight of the B-52) times eight internally carried weapons for a rating of 4.6 weapons.
- o Sum up the maximum ALCM and internal weapons carrying capacities across the various bomber types to arrive at the aggregate bomber force weapons capacity.

These simple counting rules have been applied to various official and unofficial strategic offensive force reduction proposals put forward over the past few years, and it is possible to group these proposals into four categories relative to the current U.S. strategic weapon inventory, which numbers 11,157 weapons (spring 1986). These four groupings include:

- I: Deep cuts below the current U.S. weapons level--less than 9000 total weapons;
- II: Modest cuts--9,500 to 10,500 total weapons;

III: Stop at approximately the current U.S. level--11,000 to 12,000 total weapons; and

IV. Modest growth--13,000 to 14,500 total weapons.

Proposals that fall within these groupings include the following:

Level I--Deep cuts below the current U.S. weapon level--less than 9000 weapons.

- A. An agreement building on the constructive elements in the Soviet proposal tabled at Geneva in October 1985.
 - o 6000 "nuclear charges"/weapons on U.S. and Soviet central strategic systems--ICBMs, SLBMs, and heavy bombers. (Assumes that the Soviets agree to drop their demand that the United States also include its weapons on INF missiles in Europe, and forward-based nuclear-capable fighter-bombers in Europe, Asia, and on aircraft carriers within this aggregate limit.)
 - o A "force concentration" rule that prohibits any single element (ICBMs, SLBMs or bombers) from carrying more than 60 percent of the total authorized inventory of 6000 central strategic weapons. Thus no single element can carry more than 3600 weapons, be they missile RVs or a combination of ALCMs, other air-to-surface missiles, and gravity bombs carried by heavy bombers.
 - o May include a 50 percent reduction from existing levels in strategic nuclear delivery vehicles.
 - If applied to current U.S. and Soviet SNDV levels for central systems individually, this would mean a Soviet reduction from 2520 to 1260 and a U.S. cut from 1928 to 964 SNDVs.
 - Alternatively, both sides could be called upon to reduce to the higher of the two values the 1260 derived from the reduction in Soviet systems.
 - o Combination of the 6000 aggregate weapons limit and the 3600 weapon "force concentration" maximum would probably reduce Soviet ballistic missile throwweight to the 2.5-3.2 million kg range and U.S. throwweight to approximately 1.2-1.3 million kg.

B. An agreement based on the new U.S. proposal presented at Geneva in November 1985.

- o 1250-1450 ICBMs and SLBMs.
- o 4500 ballistic missile RVs.
 - No more than 3000 RVs on ICBMs.
- o 1500 ALCMs on heavy bombers.
- o 350 heavy bombers.
 - 75 carrying 20 ALCM each for the 1500 authorized ALCM.
 - Remaining 275 can reasonably carry 8 gravity bombs and short-range attack missiles each ($275 \times 8 = 2200$ weapons).
 - 3700 bomber weapons.
- o 8200 total weapons.
- o Combination of the 4500 ballistic missile RV limit and the 3000 subceiling on ICBM RVs would reduce Soviet ballistic missile throwweight to the 2.0-2.3 million kilograms range while U.S. ballistic missile throwweight would likely be around 1.4 million kilograms.

C. "Overall Equivalence."¹

- o 6000 ballistic missile RVs.
 - Based on standard counting rules described above.
- o 6500 "equivalent weapons."
 - Each ballistic missile RV counts as one equivalent weapon.
 - Equivalent bomber weapons--ALCMs and gravity bombs-- included within this total are calculated on the basis of the counting rules for bombers described above but then discounted by 50 percent because bomber defenses on both sides are unconstrained.
 - Thus the United States could field a ballistic missile force carrying 5000 RVs and bombers equipped with 3000 bombs and ALCMs for a total of 8000 total weapons and still stay within the 6500 "equivalent weapons" ceiling.

¹See Harold Brown and Lynn Davis, *Nuclear Arms Control Choices*, pp. 19-24.

- o 9.0 million lb of "equivalent throwweight." This third ceiling provides an additional restraint on the numbers of heavy missiles and large bombers either side could deploy. Under this limit ballistic missiles are rated in terms of their demonstrated throwweight capability, B-52 size bombers are rated at 20,000 lb, and smaller bombers are assigned lower ratings in proportion to this takeoff gross weight relative to that of the B-52.
 - o Offers possible tradeoffs and freedom to mix between bombers and ballistic missiles.
 - Under this proposal, the United States is likely to deploy approximately 1.0 Mkg TWt and roughly 280 bombers, 120 of which could be equipped to carry ALCMs. The Soviets may choose to deploy up to 3.2 Mkg throwweight but would not be allowed also to build a bomber force equal in size to that of the United States.
- D. "Double Builddown."²
- o 5000 ballistic missile RVs.
 - Counting rules described above.
 - o 8500 strategic weapons stations (SWS).
 - Strategic weapon stations ratings for ICBMs and SLBMs reflect the maximum number of RVs announced or flight tested on individual missile types or the missile throwweight (in kg) of these missiles divided by a 400 kg "standard," whichever is larger.
 - SWS ratings for bombers per the counting rules described above.
 - o Maximum of 8500 weapons. This weapons total will be less if either side chooses to retain or newly deploy "heavy" ballistic missile RVs with more than 400 kg of associated throwweight, because these RVs will each be counted as more than one SWS according to the ratio of the missile throwweight divided by 400 kg.

²Glenn A. Kent with Edward L. Warner III and Randall J. DeValck, *A New Approach to Arms Control*, The Rand Corporation, R-3140-FF/RC, June 1984.

- o Offers possible tradeoffs and freedom to mix between bombers and ballistic missiles.
 - The United States is allowed roughly 1.4 Mkg of missile throwweight and 275 bombers, 100 of which could be ALCM equipped. The United States would have to reduce the size of its bomber force if it wishes to increase the lifting power of its ballistic missile force beyond the 1.4 Mkg.
 - This proposal limits the Soviet force to around 3.2-3.4 Mkg of ballistic missile throwweight and a bomber force of not more than 50 heavy bombers not equipped with ALCMs. If the Soviets desire a larger bomber force they would have to reduce their throwweight still further.

Level II--Modest cuts below the current U.S. weapon level--9,500-10,500 weapons.

A. A Comprehensive Approach.

- o 1800-2000 strategic nuclear delivery vehicles.
- o 5500 or 6000 ballistic missile RVs.
- o 300 heavy bombers, 150 carrying ALCMs, remainder carry gravity bombs and short-range attack missiles.

150 x 8 = 1200

150 x 20 = 3000

4200 bomber weapons

- o 9,700-10,200 total weapons.
- o No tradeoff between bombers and missile throwweight.
 - Soviet ballistic missile throwweight will be reduced to 3.3-3.8 Mkg and U.S. throwweight to 1.3-1.5 Mkg.

Level III--Stop at approximately current U.S. weapons level--11,000 12,000 weapons.

A. Focus on Ballistic Missile RVs and ALCMs.³

- o 1800 strategic nuclear delivery vehicles.
- o 7000 ballistic missile RVs.
- o 9000 ballistic missile RVs and ALCMs.

³Zbigniew Brzezinski, "Moving from Standoff to an Interim Accord," *New York Times*. January 29, 1984.

- o Gravity bombs and short-range attack missiles would be only indirectly and very loosely controlled in that the bombers that carry them must simply fit within the 1800 aggregate ceiling on SNDVs. These bombers could readily carry 2000-3000 bombs and attack missiles.
- o 11,000-12,000 total weapons.
- o No tradeoff between bombers and missile throwweight.
 - Under this proposal, U.S. ballistic missile throwweight would fall to roughly 1.4-1.7 Mkg and Soviet throwweight would be reduced to 3.6-4.0 Mkg. The United States and the Soviet Union would also be able to deploy up to 300-350 bombers, 100 of which could be equipped with ALCMs (assuming a force loading of 20 ALCMs per heavy bomber).

Level IV--Modest growth beyond current U.S. force levels--13,000 or more total weapons.

- A. Initial U.S. START proposal, summer 1982.
 - o 5000 ballistic missile RVs.
 - o 400 bombers, with no sub-limit on the number that could be equipped to carry up to 20 ALCM
 - o Total weapons:
 - 5000 RVs
 - + 400 bombers x 20 = 8000 weapons
 - 13,000 weapons
 - o No tradeoff between bombers and missile throwweight.⁴
 - Soviet ballistic missile throwweight would probably be reduced to 2.1-2.5 Mkg and U.S. throwweight to 1.0-1.1 Mkg. Although the United States does not plan to deploy a force carrying anywhere near 8000 bomber weapons and the Soviet Union is very unlikely to have such plans, both sides would theoretically be allowed to deploy up to 400 bombers each carrying 20 weapons.

⁴The United States subsequently announced a willingness to consider trade-offs between areas of U.S. and Soviet relative advantage.

B. Initial Soviet START proposal, summer 1982.⁵

- o 1800 SNDVs.
- o 1200 MIRVed ICBMs and SLBMs + ALCM-equipped bombers.
- o 1080 MIRVed ICBMs and SLBMs.
- o 680 MIRVed ICBMs.
- o Total weapons.

Soviet force example--Mid-1990s

1000 ICBMs (680 MIRVed SS-18, -19 and -24) = 6,700 RVs
600 SLBMs (400 MIRVed SS-N-20 and -23) = 3,300 RVs
200 bombers (120 carrying 20 ALCMs each) = 3,200 weapons
13,200 weapons

U.S. force example--Mid-1990s

900 ICBMs (350 MIRVed Minuteman III and
100 MX) = 2,500 RVs
600 SLBMs, all MIRVed Trident I (C-4)
and II (D-5) = 4,800 RVs
300 bombers (150 carrying 20 ALCMs each) = 4,500 weapons
11,800 weapons

(The Soviets would be likely to field a somewhat larger central strategic force measured in terms of total weapons within these constraints largely because of their projected deployment of a larger number--some 680 SS-18s, -19s, and -24s versus 100 U.S. MXs--of highly fractionated ICBMs carrying six to ten warheads apiece. The expected U.S. lead in ALCMs deployed on heavy bombers would not be sufficient to offset this Soviet advantage in ICBM RVs.)

- o Limited tradeoffs between bombers and ballistic missile capabilities.
- The Soviets could reasonably be expected to deploy between 4.8 and 5.2 Mkg of missile throwweight and the U.S. total

⁵Arms Control and Disarmament Agency, *Arms Control*, 1984, pp. 3-8.

would probably vary between 1.8 and 2.0 Mkg. Each side is allowed some limited freedom under the various ceilings to mix between bombers and ballistic missiles. However, the effect of such mixing on the Soviet and U.S. throwweight levels described above is likely to be marginal.

III. BOMBER LIMITS

The United States currently has a pronounced advantage over the Soviets in long-range strategic bomber capability, largely because of the vastly superior weapons loading capacity of the B-52 (eight weapons internal + 12 external for ALCM) over the Bear (two weapons each), Bison (four weapons each) and Backfire (4 four weapons each) and, most recently, the Bear H ALCM carrier (4 to 8 ALCMs).

	United States	Soviet Union
Active Bombers	263 B-52 [+66 FB-111]	180 Bear & Bison [+270 Backfire]
Bombers w/ALCM	98 B-52G	40 Bear-H
Bomber Weapons	3280 [+264 on FB-111]	660 [+1080 on Backfire]

Both sides apparently have plans to expand their bomber capability substantially.

- The United States plans to convert 96 B-52Hs for ALCM (20 each), to produce 100 B-1Bs, which will eventually be capable of carrying up to 22 ALCM, and to deploy some 132 advanced technology (stealth) bombers.¹
- Soviets have begun deploying the AS-15 ALCM on the Bear-H cruise missile carrier and probably also intend to deploy it on the new Blackjack bomber, which is somewhat larger than the B-1B, in the late 1980s and early 1990s.

¹"Modernizing U.S. Strategic Offensive Forces: The Administration's Program and Alternatives," CBO, May 1983, p. 9.

The Soviets have far more extensive and capable strategic air defenses.

	United States	Soviet Union
Surface-to-air missiles	None	10,000
Interceptors	261	2,500

The United States has increasingly come to recognize the unique contribution to our strategic nuclear strike potential that can be made by penetrating bombers having on-the-scene crew judgment. Manned bombers, if equipped with the appropriate on-board sensors and weapons, are uniquely suited to hold at risk imprecisely located or relocatable targets such as the maneuver units of the Red Army out of garrison and the Soviet Strategic Rocket Forces' mobile ICBMs (SS-25s) and IRBMs (SS-20s).

The United States also seeks to maintain and expand its capability to use long-range strategic bombers as a global, theater projection force armed with conventional weapons: 69 non-ALCM B-52s are currently earmarked for this role, and the 100 B-1Bs will further augment this capability as will the ATB at a later date.

The size and weapon carrying potential of the U.S. bomber force over the decade will turn on the rate at which B-52Hs are converted for ALCM, the schedules for adding the 100 B-1Bs and subsequently the same 130 advanced technology or stealth bombers to the inventory, and the retirement schedule for the B-52Gs and possibly the B-52Hs.

Were the United States to convert the 96 B-52Hs for ALCM in 1985-87, to add the 100 B-1Bs with demonstrated ALCM carriage capability in 1986-88, to deploy the 132 ATBs without ALCM carriage in 1991-97, and not retire any B-52s, by the late 1990s, it would have a force of

- 495 bombers
- 294 bombers with ALCM
- a total bomber weapon potential of nearly 7,300 weapons

Should the United States choose instead to delay equipping the B-1B with ALCM until the ATBs begin to come on line in the 1990s and then phase in the ALCM conversions of the B-1Bs with the retirement of ALCM-equipped B-52Gs, the late 1990s force could include

- 398 total bombers (132 ATBs, 100 B-1Bs, 96 B-52Hs, 69 non-ALCM B-52Gs for conventional bombing missions)
- 196 bombers with ALCM (96 B-52Hs and 100 B-1Bs)
- a total weapons potential of approximately 5,500 weapons

Finally, should the United States prove willing to constrain its bomber force growth as the primary *quid pro quo* for large reductions in Soviet ballistic missile warheads and throwweight by moving forward its phased retirements of the B-52Gs and Hs as the B-1B and ATB are deployed, the late 1990s U.S. bomber force could include

- 301 total bombers (132 ATBs, 100 B-1Bs, 69 B-52Gs or Hs)
- 100 or 150 bombers with ALCM (100 B-1Bs and possibly 50 B-52Gs or Hs)
- a total potential of some 3600 to 4200 weapons.

In negotiating bomber limits in the strategic offensive force reduction portion of the current Geneva negotiations it would be useful to perpetuate the SALT II precedent of making distinctions between ALCM-equipped and non-ALCM bombers within a given bomber type. If a new agreement is reached that includes this distinction, given plans to convert some 194 B-52Gs and Hs for ALCM carriage, we should avoid converting B-1Bs for ALCM carriage until some time in the 1990s. When we begin to convert the B-1B to the cruise missile carrier role, we should seek to follow the B-52 ALCM conversion precedent. The conversion process should be phased over a period of several years, and

bombers equipped with ALCMs should be identifiable as such on the basis of "observable differences" that can be detected with national technical means. In this manner, the B-1B could gradually transition to the ALCM carrier role while B-52Gs or Hs are drawn down accordingly. In addition, if the United States should agree in the strategic offensive force reduction portion of the nuclear and space talks to put a subceiling of 100 to 150 on the number of ALCM-equipped bombers, it would be wise not to convert the entire 96 B-52H force for ALCM.

The United States cannot reasonably expect to gain any considerable reductions in Soviet ballistic missile capabilities--that is, reductions in ballistic missile RVs from the current levels of 9218 actuals to a 5500-7000 RV level, let alone a reduction in Soviet ballistic missile throwweight from the current level of 5.4 Mkg to levels in the 3.2-4.0 Mkg range *without* being prepared to impose constraints on the growth of the weapons carrying potential of the U.S. bomber force from its current level of approximately 3280 weapons (3544 if FB-111s are counted). Put differently, the United States cannot protect the option to deploy a strategic bomber force of 300-350 bombers, with 200-250 of these carrying ALCM, and expect to cause a meaningful reduction in the potential destructive capacity of the Soviet ballistic missile force. If we want even *modest* reductions in Soviet missile capabilities we will have to forgo some part of our more ambitious bomber expansion opportunities.

IV. RESTRAINTS ON STRATEGIC MODERNIZATION

In addition to limits on the overall size of their strategic offensive forces, U.S.-Soviet strategic arms limitation negotiations have included discussions and some agreements on limitations regarding the introduction of new strategic weapon systems. During SALT II, the superpowers discussed at length the possibility of imposing limits on the number and character of new ICBMs and SLBMs that each side would be permitted to test and deploy and the Soviets sought to ban the deployment of any air-launched, sea-launched or ground-launched cruise missiles with ranges over 600 km. In the end the superpowers agreed only to limit each side to the testing and deployment of a single "new type" of ICBM, which could be as large as the Soviet SS-19 missile and could carry up to 10 MIRVs, during the life of the SALT II Treaty (until the end of 1985). They also agreed to prohibit the deployment of sea-launched or ground-launched cruise missiles with ranges over 600 km until the expiration of the treaty's protocol at the end of 1981. The latter restriction had little real effect, because the United States from the outset fully intended to and did in fact proceed with GLCM and SLCM deployments after the unratified protocol had nominally expired.

The agreed limit on new types of ICBMs has also proved less useful than expected. While the United States to this point has fully complied with its commitment not to undercut provisions of the unratified SALT II Treaty, the Soviet Union has not. The Soviet Union's commitment not to undercut the SALT II agreement entailed a commitment not to increase their strategic nuclear delivery vehicles (SNDVs) above the level they possessed at the signing of the agreement, i.e., 2504; they have violated that commitment. The United States has accused the Soviets of also violating the unratified treaty in several other areas, the most serious of which are alleged Soviet violations of the prohibition on encryption of telemetry required to monitor the character of ballistic missiles during their flight tests and of the prohibitions on flight testing more than one permitted "new type" of ICBM, as discussed below.

Each superpower informed the other when they began flight testing the U.S. MX and the roughly comparable Soviet SS-X-24. The Soviets, however, also began to flight test another ICBM (the small, solid-fueled SS-X-25) a few months later. U.S. spokesmen have claimed that the SS-X-25 is also a "new" missile, substantially different in size and character from any previous Soviet ICBM. The Soviets have denied this allegation while continuing their flight tests, claiming instead that the SS-X-25 is a "modification" of the older SS-13 missile which was flight tested and deployed in small numbers (only 60 were emplaced) in the mid-1960s. The SALT II Treaty permits "modifications" designed to improve the performance of existing ICBMs so long as these changes remain short of specified thresholds, $\pm$ 5 percent change in the length, diameter, launch weight, and throwweight of the modified missile. Changes beyond these limits would qualify the missile in question as a new, not modified ICBM. These events have not strengthened the hands of those favoring new constraints in the strategic offensive force reduction portion of the Geneva negotiations.

During the opening rounds of the START negotiations, the United States and the Soviet Union adopted greatly differing approaches to this question. The Soviets renewed their call for a ban on SLCMs with a range greater than 600 km within START while pressing for a similar total ban on GLCMs with a range greater than 600 km in the Intermediate Range Nuclear Force negotiations. Moreover, they also proposed an immediate "freeze" on the introduction of any new types of ICBMs, SLBMs, and bombers during the negotiations. The United States has rejected both the specific bans on SLCM and GLCM and the Soviet freeze proposal. Instead, the Reagan administration has made clear to the Soviets and to freeze advocates in the United States that it intends to move ahead with the testing and deployment of several new systems that are deemed necessary to strengthen the U.S. deterrent and to regain parity in the strategic balance. These new U.S. systems include the MX and Midgetman ICBMs, the Trident I/C-4 and Trident II/D-5 SLBMs, and the B-1B and advanced technology bombers as well as two types of ALCMs, a family of Tomahawk SLCMs and the Tomahawk GLCM. The Soviets have strikingly similar counterparts to most of these U.S. programs at various stages of

development and deployment (see Table 2) and they too are likely to move forward to deployment unless both sides agree to some reciprocal restraints.

At this juncture, the only restraints on the modernization that the United States might have any interest in supporting would be those that would slow or halt the introduction of new systems after the last of the currently planned systems in each category--the Midgetman ICBM, the Trident II/D-5, and the advanced technology bomber--are deployed. U.S. planners should at least consider seeking provisions that would ban the testing and deployment of any new systems for either side after their rounds of deployment in the early 1990s. A similar approach could be used in the cruise missile area as well, but that would probably entail much more challenging problems of verification. Our recent experience with the "new" versus "modified" missile problem in the SS-X-25 should alert us to the problems of making such a ban effective as long as modifications are permitted.

Table 2

U.S. AND SOVIET INTERCONTINENTAL AND INTERMEDIATE-RANGE
NUCLEAR ATTACK SYSTEMS CURRENTLY BEING DEPLOYED AND
PROJECTED FOR DEPLOYMENT OVER THE NEXT DECADE

	United States	Soviet Union
ICBMs	MX, Peacekeeper (10 RVs) Silo-based, IOC-1986	SS-X-24 (10 RVs) Rail mobile and perhaps silo IOCs-1986 and late 1980s respectively
	Small ICBM (Midgetman) (1 RV) hardened mobile launcher and possibly silos, IOC-1992	SS-X-25 (1 RV) Transporter-erector-launcher and silos, IOC-1985
Strategic Submarines/ SLBMs	Ohio-class/Trident sub, IOC-1981	Typhoon-class sub, IOC-1983
	Trident I/C-4 SLBM On converted Poseidon and Trident subs, IOC-1981	SS-N-20 On Typhoon subs, IOC-1984
	Trident II/D-5 SLBM On Trident subs, IOC-1989	No known counterpart
	No counterpart	SS-NX-23 On Delta IV subs, IOC-1986-87
Heavy Bombers	B-1B, IOC-1986	Blackjack, IOC-1987 or 1988
	Advanced Technology (Stealth) Bomber IOC-early 1990s	No known counterpart
	Air-Launched Cruise Missile (ALCM-B) IOC-1982	AS-15 IOC-1984
	Advanced Cruise Missile (ACM) IOC-mid-to-late 1980s	No known counterpart
SLCM	Tomahawk land-attack missile with a nuclear warhead (TLAM-N) IOC-1984	SS-NX-21 IOC-1985
		SS-NX-24 IOC-1987
Intermediate Range Missiles	Pershing II (1 RV) mobile transporter, IOC-1983	SS-20 (3 RVs) mobile transporter, IOC-1977
	Ground-Launched Cruise Missile (GLCM) (1 RV) mobile transporter, IOC-1983	SSC-X-4 (1 RV) mobile transporter, IOC-1986
		Large GLCM (1 RV), IOC-?
Intermediate Range Bombers	FB-111, IOC 1969	Backfire, IOC-1974

Data on the IOCs of Soviet systems taken from Soviet Military Power 1982, 1983, 1984, 1985, and 1986. U.S. system IOCs appeared in various sources including U.S. Military Posture FY 85, FY 86, and FY 87 and a CBO report "Modernizing U.S. Strategic Offensive Forces: The Administration's Program and Alternatives."

Appendix

MAJOR LIMITATION PARAMETERS

CEILING ON STRATEGIC NUCLEAR DELIVERY VEHICLES

- The currency of SALT II--ICBM launchers (silos and potentially transport-erector-launchers [TELs] for mobile ICBMs), launch tubes on missile-carrying subs (SSBNs), and heavy bombers.
- Commonly agreed to be an inadequate constraint in and of itself because of the great disparity in the sizes of the various missiles and bombers. Thus SNDV limits are generally accompanied by supplemental constraints on those launchers carrying multiple weapons--MIRVed ballistic missiles and ALCM-carrying bombers and/or on the total number of weapons.

CEILING/SUBCEILING ON MIRVed BALLISTIC MISSILES (ICBMs AND SLBMs)

- Separate subceilings on MIRVed ballistic missiles (1200) and MIRVed ICBMs (820) were agreed on in the SALT II Treaty.
- When combined with a fractionation limit specifying the maximum number of RVs on a given SLBM or ICBM type, this produced an indirect, although exceptionally high, cap on the number of RVs/weapons either side can deploy on its counted missile launchers.

SUBCEILING ON A "HEAVY"/MODERN LARGE BALLISTIC MISSILE

- Unilateral right to 308 such heavy missiles (SS-9 and SS-18 class) granted to the Soviets in SALT I and SALT II.

CEILING ON HEAVY BOMBERS

- Not yet used in SALT I or SALT II (The SALT I Interim Agreement had no limits on bombers, SALT II got at this by means an overall limit on strategic launchers/SNDVs.)

CEILING/SUBCEILING ON ALCM-EQUIPPED HEAVY BOMBERS/CRUISE MISSILE CARRIERS (CMCs)

- Embodied, in part, in the SALT II 1320 aggregate ceiling on MIRVed ballistic missiles and ALCM-equipped bombers.
- Yet this approach allowed either side to build up to a theoretical maximum of 1320 ALCM-equipped bombers, *if* one was willing to forgo the deployment of *any* MIRVed ICBMs and SLBMs.

CEILING ON BALLISTIC MISSILE (ICBM AND SLBM) RVs/WEAPONS/WARHEADS

- Not contained directly in SALT I or SALT II.
- Proposed by United States in START (5000 BM RVs, no more than 2500 on ICBMs).
- An approximate indirect ceiling on ballistic missile weapons was contained in the SALT II Treaty in that the combination of the agreed fractionation caps for each ICBM and SLBM type, the launcher-type rule that would have every missile of a given class charged the agreed maximum number of RVs tested, and the limits on MIRVed ICBMs and SLBMs could all be combined to yield an overall limit on the RVs carried on MIRVed ballistic missiles.

AGGREGATE CEILING ON TOTAL STRATEGIC WEAPONS, INCLUDING BOTH ICBM AND SLBM RVs AND WEAPONS (BOMBS, ALCMs, ASMs/SRAMs) CARRIED ON HEAVY BOMBERS, SOMETIMES EXPRESSED AS 'EQUIVALENT WEAPONS'

- Not applied in SALT I or SALT II.
- A key aspect of the new Soviet proposal tabled at the Nuclear Weapons and Space Talks in Geneva in October 1985. (In this proposal the Soviets sought, unfairly, to capture U.S. INF missiles and forward-based fighter-bombers in a single strategic weapons aggregate, while including only their intercontinental-range ICBMs, SLBMs, and heavy bombers.)
- Impossible to verify actual bomber weapons loading with national technical means.
- Practices between United States and Soviet Union vary widely with Soviet non-ALCM heavy bombers apparently carrying only two to four weapons today; U.S. non-ALCM B-52s carry up to 10. Addition of ALCM brings U.S. B-52 capacity to 20, an agreed maximum for this type in SALT II; the Soviet Bear H apparently carries 4 to 8 ALCMs.
- Best hope appears to be setting an arbitrary but reasonable standard for large bombers of B-52 and B-1B size of, say, eight weapons for non-ALCM carriers and 20 weapons for ALCM-equipped bombers and then scaling all bombers off this agreed value according to their readily observable size probably converted into estimated gross takeoff weight.
- Many suggest that the number of weapons carried on bombers applying counting rules like those discussed above should be discounted by half to compensate for the fact that bombers face unconstrained strategic air defenses and to reflect their slower flight time which poses a lesser danger of their successful use in a disarming first strike. Such discounting is likely to prove exceptionally difficult to negotiate and would probably introduce considerations regarding the relative capabilities of the superpowers' homeland air defenses.

AGGREGATE LIMIT ON BALLISTIC MISSILE (ICBM AND SLBM) THROWWEIGHT (BALLISTIC MISSILE/THROWWEIGHT)

- Not applied in SALT I or SALT II.
- Can be calculated by simply summing up the throwweights of ballistic missiles on counted launchers (expressed in lb or kg), using agreed values for each missile class as proposed by Harold Brown and Lynn Davis.
- Can be gotten at indirectly by means of nested sublimits as in the initial U.S. START proposal which through a combination of ceilings and subceilings--5000 ballistic missile RVs, 2500 ICBM RVs, 210 MIRVed ICBMs, and 110 MIRVed heavy missiles--could be expected to reduce Soviet ballistic missile throwweight from the current level of 5.4 million Mkg to approximately 2.3 to 2.7 Mkg.
- Glenn Kent, Edward Warner, and Randall DeValk have proposed to rate ballistic missiles in terms of "strategic weapon stations," which takes into account both the number of weapons carried and the throwweight of the missiles. One can take missile throwweight into account for "heavy" systems while continuing to rate missiles in terms of the number of weapons they are likely to carry if they are armed with RVs whose associated throwweight falls at or below a standard value. Individual missile types are rated according to the highest value from among the following: the maximum number of RVs flight tested on a missile type; the number of RVs declared for a given missile by the deploying side; or a rating derived by dividing the missile throwweight in kg by an appropriate constant--400 kg for MIRVed missiles or 500 kg for single RV missiles. These constants represent the throwweight associated with modern "standard" RVs for MIRVed and unMIRVed missiles.

SINGLE AGGREGATE LIMIT ON BALLISTIC MISSILE THROWWEIGHT AND BOMBER PAYLOAD

- Calculate ballistic missile throwweight in pounds or kilograms by summing the throwweight of each side's missile forces as described above and then add in an "equivalent throwweight" figure for heavy bombers. Brown and Davis propose to calculate the latter by assigning B-52-size bombers a value of 20,000 lb each (a figure often cited as approximately the usable payload of such bombers) and then rating other bombers in terms of the ratio of their size in terms of gross takeoff weight to that of the B-52 (approximately 480,000 lb) times the 20,000 pound standard. This method rates the B-52 at roughly the same level as the largest ICBM, the Soviet SS-18, which carries some 17,600 lb of throwweight. Further discrimination in this approach could involve rating bombers equipped with ALCM according to the 20,000 pound standard while charging non-ALCM bombers, whose weapons carriage capacity is considerably lower, at only half this value. Alton Frye¹ proposed a similar set of counting rules.
- Some analysts have recently applied this same approach but expressed their aggregate throwweight in terms of "equivalent SS-18s." This method values SS-18s and ALCM-equipped B-52-size bombers equally as one "equivalent SS-18" and then rates other ballistic missiles and smaller non-ALCM-equipped bombers as some fraction of an SS-18.
- Kent, Warner, and DeValk have proposed to aggregate missiles and bombers and take into account ballistic missile throwweight through their "strategic weapon stations" (SWS) currency, whose application to missiles is described above. Their approach rates bomber weapon capacity in SWS by dividing the bomber's gross takeoff weight, measured in lb, by a constant of 25,000

¹Alton Frye, "Strategic Builddown: A Context for Restraint," *Foreign Affairs*, Winter 1983/1984, pp. 310-312, Council on Foreign Relations, Inc.

lb, if the bomber is equipped to carry ALCMs and 50,000 lb if it is not ALCM-capable. This method yields a rating of approximately 20 for B-52 converted to carry ALCM and 10 for a B-52 without cruise missile carriage. Their methodology would thus roughly equate an ALCM-equipped B-52-size bomber with an SS-18 ICBM, whose SWS rating is also roughly 20.

END

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