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MAINTAINING
SALT II

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TAUNTING PANDORA: ABANDONING SALT II AND PRESSING STAR WARS

With only fourteen months to go before SALT II expires, the Administration has shown no particular interest in maintaining the SALT II limits thereafter—as was done with SALT I when it expired in 1977.

On the contrary, with its Star Wars program of defensive systems, the Administration is giving the Soviet Union every incentive to build new offensive nuclear weapons in an era of offensive overkill that would otherwise provide no such incentive.

This is obviously the wrong thing to do for those who want to end the arms race. Less obviously, but shown clearly by this study, it would prove a military miscalculation for those who wish to continue the arms competition with the Soviet Union.

The reason is simple. The Soviet Union is in a much better position to exploit any lapse in the SALT II limits. It is the Soviet Union which is stressing quantitative factors which, on the whole, are the essence of what SALT II limits. By contrast, it is the United States which stresses those qualitative and technological innovations which are the loopholes of SALT II. Moreover, it is the Soviet Union that is most closely bumping up against the SALT II limits already.

The enclosed study shows that, in the absence of these limits, the Soviet Union is relatively better positioned: to build more new types of ICBM—and greater numbers of them; to more substantially expand its bomber force; and to more substantially upgrade its submarine missile force.

By comparison, little of lasting value is provided the United States program by edging slightly over the SALT II limits in those sea-based missiles and air-launched cruise missiles which are at issue.

Ronald Reagan has gone from calling SALT II

“fatally flawed” to recognizing the utility of SALT II and deciding, once in office, to do nothing that would “undercut it”. We predict that in the Administration’s next moment of strategic lucidity—when and if it has one—it will recognize that the United States has an urgent interest in hanging onto these limits.

America always has a tendency to overplay its strategic hand. Because we are Americans, we tend to assume that America can win any competition. But in a quantitative arms race, which is what SALT II controls, there is every reason to think that America will lose.

After all, the United States has trouble siting a few hundred MX missiles while the Soviet Union enjoys civic passivity. We reject overkill while they traditionally favor it—out of an historical experience that relies upon numbers to offset technological inferiority. They need military power to be influential abroad and see a certain value in numbers; we have, happily, other drawing cards to win influence. In the end, with strategic weapons which are not in the overall defense budget that expensive, the more determined is likely to win out over the merely richer. And while the U.S. cannot afford Star Wars, the Soviet Union can afford the enhanced offensive strategic weapons program which Star Wars will seem to have provoked.

All things considered, it is therefore strategic lunacy to let the SALT II limits lapse if it can possibly be avoided. And it is especially foolish to do it while threatening to build a defense against Soviet strategic weapons.

Accordingly, even more important than which candidate would, and which would not, raise taxes is the question: which of these candidates is going to do what about the SALT II limits? This is the question posed by the study within.

SALT II FOR TEN MORE YEARS?

As this Report shows, the U.S. strategic defense program could easily accommodate itself to adhering to SALT II for the next ten years. In the absence of such adherence, however, we could face real problems. For a summary of the situation with and without SALT, the reader is encouraged to turn to pages 10-12 of this staff study by FAS staffers Jonathan Rich and John Pike.

Continuing SALT II will not only save us the cost of keeping up with the nuclear Joneses but also provide important strategic advantages such as preventing windows of vulnerability in the 1990s when the Soviets would other-

wise get sea-based counterforce capabilities.

We are sending this study to FAS members in part because we want and need their help in raising this issue with Government officials. Members are urged to send this Report to their Congressmen and to other Administration officials with a request for their response and their views on adhering to SALT II after it officially expires in December, 1985. Send us any responses you receive. (A more detailed version of this analysis will be available later this year.) □

SHOULD SALT II BE CONTINUED?

Since 1979, when Senate ratification of the SALT II Treaty was postponed indefinitely, it has been the official policy of both the United States and the Soviet Union not to undercut either of the SALT agreements. On May 31, 1982 President Reagan stated that "As for existing strategic arms agreements, we will refrain from actions which undercut them so long as the Soviet Union shows equal restraint." In early 1984 this commitment was reaffirmed by both President Reagan and Secretary of State Schultz.

The Administration has expressed ambivalence, however, concerning its commitment to continued adherence to the SALT II limits after the Treaty officially expires in December 1985. Administration officials have indicated that a decision to let SALT II lapse might be taken as a response to alleged Soviet arms control violations or its unwillingness to meet in Geneva. It is thus not clear whether the Administration will take actions to offset the introduction of the seventh Trident submarine in September, 1985, which would otherwise place the United States over the SALT ceiling of 1200 MIRVed missiles.

A decision to exceed the SALT limits could have very serious consequences for American national security. After three years of fruitless negotiations on both strategic and intermediate-range weapons, the importance of SALT in maintaining significant limitations on offensive weapons has increased. The two SALT treaties have restricted—and could continue to restrict—Soviet force modernization and expansion. In addition to allowing unlimited offensive expansion, the abandonment of these agreements could put added political pressure on the increasingly beleaguered ABM treaty.

This report sets out to determine the military and political ramifications of the abrogation of SALT limits. After describing the two treaties and their past impact on U.S. and Soviet nuclear forces, it provides a description and analysis of the emerging force structures of both countries with SALT and what might happen in its absence. Finally, we note two specific dangers of permitting a Soviet buildup beyond SALT: the development of Soviet sea-based counterforce and still further difficulties in U.S. maintenance of a secure land-based missile force.

The study was undertaken out of concern that important actors within the executive and legislative branches have underestimated the effect—both past and present—of the SALT agreements on Soviet forces, as well as the likely consequences of abrogation. Any decision to reverse the current policy of no-undercut should be based on a clear understanding of the comparative risks and gains of removing the existing framework of offensive arms control.

SALT I—THE RECORD

Signed in 1972, the SALT I Interim Agreement froze at existing levels the number of strategic ballistic missile launchers, operational or under construction, on each side, and permitted an increase in SLBM launchers up to an agreed level for each party if accompanied by the dismantling or

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destruction of a corresponding number of older ICBM or SLBM launchers. Although SALT I expired after five years, both the United States and the Soviet Union have continued to observe its numerical ceilings.

SALT I limited the Soviet Union to approximately 1,600 ICBM launchers and 950 SLBM launchers on 62 nuclear-powered submarines. It also stipulated that Soviet SLBM launchers in excess of 740 launchers might become operational only as replacements for older ICBM and SLBM launchers. Since 1974, these requirements have forced the Soviets to dismantle more than 200 SS-7 and SS-8 ICBMs in order to compensate for increases in the Soviet submarine force. More recently, the Soviets have dismantled ten YANKEE I SSBNs, carrying 160 SS-N-6 SLBMs, in order to remain under the SALT I limits as they add new DELTA and Typhoon submarines.

More important, SALT I's restriction of the Soviets to 308 launchers for "heavy" ICBMs (such as the SS-9 or SS-18) and the prohibition on additional fixed ICBM launchers, both of which were reaffirmed by SALT II, have forced the Soviet Union to dismantle hundreds of older operational missiles as it deployed its newest generation of MIRVed ICBMs. Since 1972, the Soviets have completely dismantled their force of 308 heavy SS-9 ICBMs to allow the introduction of the SS-18s. Since 1974, the Soviet force of 1030 SS-11 ICBMs has been reduced to 520 in order to accommodate the deployment of SS-17s and SS-19s.

With one minor exception, the USSR has adhered to the SALT I numerical limits. By early 1976 the Soviets had developed a requirement to dismantle 51 older launchers to compensate for new submarine construction. It soon became apparent to the United States that the Soviets would probably not complete all the required dismantling action on all of the launchers on time. Yet before this matter was raised at the Standing Consultative Commission, the Soviets acknowledged that the dismantling of 41 older ICBM launchers had not been completed in the required time period. The Soviets stated that all the dismantling action could be completed by June 1, 1976, and agreed to the American request that no more submarines with replacement SLBM launchers begin sea trials before such completion. Both conditions were met.

In contrast, SALT I had relatively little effect on American force levels. The interim agreement held the United States to the level of 1054 operational ICBMs and a base level of 41 submarines with 656 SLBM launchers. The United States was allowed to reach a ceiling of 44 submarines with 710 SLBMs by retiring 54 older ICBM launchers. The introduction of the first four Ohio-class Trident submarines required the United States to dismantle six Polaris submarines, in keeping with the SALT I allowance of 41 submarines and 656 SLBM launchers. However, all of these Polaris submarines had already been withdrawn from use as strategic launchers. The recent introduction of the fifth Trident and scheduled deployment of the sixth Trident in January, 1985 are being compensated for by the deactivation of 52 old Titan ICBMs, as allowed under SALT I.

SALT II IN BRIEF

SALT II was negotiated by the Carter Administration and its predecessors to have—as the Joint Chiefs of Staff later testified—only a "nominal" effect on the U.S. program; it is because the Reagan modernization program is not much different from the Carter program that U.S. adherence to the SALT II limits over the next ten years would not much affect the U.S. program.

Indeed, the SALT II negotiators designed SALT II to be a series of "nested" limits so that still greater "freedom to mix" would be available. Thus the overall limit of 2400 total of bombers and missiles permitted shifts in the composition of bombers and missiles. And the limit of 1200 sea-based and land-based MIRVed missiles permitted shifts in that mix as well. Bombers with cruise missiles were treated as "MIRVed" bombers and a special sublimit of 1320 combined the total of such MIRVed bombers when added to the total of 1200 strategic ICBMs and SLBMs.

SALT II RESTRICTIONS AND COMPLIANCE

Signed in 1979, SALT II added a number of crucial subceilings within the framework of aggregate limits agreed to under the SALT I Interim Agreement.

Numerical limitations include:

- 2,400 strategic nuclear delivery vehicles, including ICBM and SLBM launchers and heavy bombers. This ceiling would have been reduced to 2,250 by 1981 had the Treaty been ratified;

- 1,320 multiple warhead launchers, including MIRVed ballistic missiles and heavy bombers with long-range (over 600km.) cruise missiles;

- 1,200 MIRVed ballistic missile launchers;

- 820 MIRVed ICBM launchers;

- 308 heavy ICBMs;

- No additional fixed launchers.

Quantitative limitations include:

- no increase in the maximum number of warheads on existing types of ICBMs;

- 10 warheads on the one new type of ICBM permitted to each party;

- 14 warheads maximum for SLBMs.

Although SALT II remains unratified, both sides have pledged not to take any actions that would undercut the agreement. This policy includes definite political and psychological, as well as legal, commitments. Under customary international law, a state that has signed a treaty is obligated not to undercut the treaty prior to ratification by conducting any irreversible acts that would defeat the object and purpose of the treaty. In a strict sense, this would apply only to the testing of new missiles and other systems, since the addition of extra existing missiles, unlike the knowledge gained by the testing of missiles, could theoretically be reversed to comply with the treaty.

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However, the declaration not to undercut SALT also implies a political commitment not to exceed the crucial SALT II MIRV limits. A decision to exceed these limits would shake the fragile trust that the other side intends to abide by the most important treaty restraints, rather than engage in a unilateral expansion of forces. In contrast to the case of Soviet launcher levels, which were above the SALT limits when the Treaty was signed—and which have remained above them pending ratification of the treaty—a decision to surpass the MIRV ceilings would represent a deliberate act of commission on the part of the United States, and one that would presumably be matched by the Soviets.

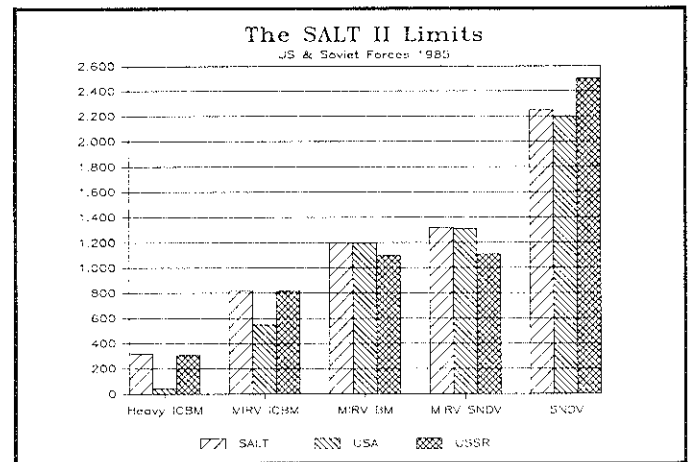
The Soviets have thus far observed all the crucial MIRV-ed launcher and MIRVed ICBM ceilings. Soviet compliance with SALT II subceilings on MIRVs has already constrained their force expansion. By 1980 the Soviets had already deployed almost 700 of the 820 MIRVed ICBMs allowed under SALT II. In 1983, the introduction of 30 SS-19s in old SS-11 silos brought the level of Soviet MIRV-ed ICBMs to 818, or just under the limit of 820.

The Administration's recent report on Soviet compliance with arms control agreements has raised questions as to whether the Soviets are observing SALT II. Of the three activities relating to SALT—encryption of telemetry, the SS-16 ICBM, and testing of the SS-X-25 ICBM—only the encryption issue appears to be a source of serious concern. However, resolution of this issue is complicated by an American interest in not compromising sensitive intelligence collection capabilities. Neither the SS-X-25 nor the SS-16 is characterized as a definite violation in the Reagan Administration compliance report, and the basis for concern on these issues appears minimal at this point.

Thus far both parties have generally adhered to the provisions of SALT II. To the extent that Soviet actions have been of concern to the United States, resolution of these concerns would have to take place within the context of continued adherence to SALT. Neither side will have any incentive to cooperate on such matters if it appears that offensive arms limitation will end with the expiration of SALT in 1985. Thus Soviet activities alone cannot be used as a basis for the United States reversing the present no-undercut policy.

SOME ASSUMPTIONS

Assessment of the political and military implications of continued adherence to the SALT regime depends in part on projections of future American and Soviet force levels. Under SALT these can be predicted with fairly high confidence. Indeed, the ability to anticipate the characteristics of the other country's forces is an important aspect of the force planning process, and one of the frequently overlooked benefits of the SALT regime. In contrast, in the absence of SALT, American force planning must proceed on the basis of assessments of Soviet production capabilities, assessments that are prone to over-estimation and worst-case projections. However, in the absence of negotiated limits on forces, this approach is difficult to avoid.



The Soviets are at the limits of permitted numbers of heavy ICBMs, and ICBMs with multiple warheads. They could only add about 100 MIRVed SLBMs before reaching the MIRV ballistic missile limit, and 120 bombers with cruise missiles before reaching the MIRV strategic nuclear delivery vehicle (SNDV) limit.

American Forces Under SALT

For the United States under SALT, we have assumed planned deployments of all current weapons systems, except in those cases (SLBMs, ALCMs) where SALT limits dictate a reduced program. Although the status of the MX is now precarious, we have assumed the full numbers to demonstrate maximum potential deployments under SALT. We have not included Midgetman deployments, as its inclusion would constitute a prohibited, second new missile type under SALT II.

American Forces Without SALT

For the United States without SALT, we have discussed mainly the full implementation of the Reagan Administration's strategic force modernization program. We have done this for two reasons. First, in determining the costs and benefits to the United States of letting SALT lapse, what is of interest is the comparison between the force levels allowed under SALT and those that are desired—presumably those that would exist if current programs are completed without being constrained by the SALT limits.

Second, although we discuss, on pages 11-12, the results of an arms race outside the SALT II limits, such allocations would only exist in a new and different political context. Even at the current level of defense expenditure, there exists increasing competition between conventional and nuclear systems. As the MX, B-1B and Trident II all reach full production in the next several years, production rates are more likely to be stretched than accelerated. Above all, ICBMs face rising and proven public antipathy that discourages their deployment while the further addition of SLBM warheads or cruise missile warheads will seem of marginal value when so many thousands are already deployed.

The principal difference from the with-SALT case is the deployment of the Midgetman ICBM. In practice, we would anticipate that the continued observance of SALT limits will result in a new agreement allowing the deploy-

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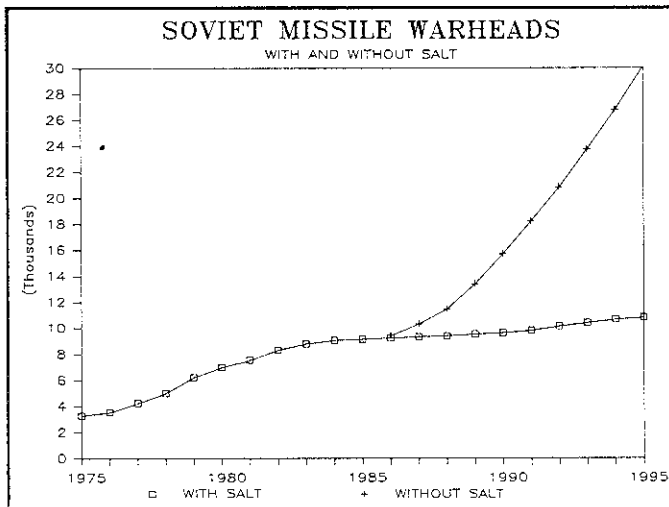
ment of new single-warhead ICBMs in conjunction with reductions in larger MIRVs. If 1,000 Midgetmen were thus deployed instead of 100 MX (or a reduced combination of both) the effect on U.S. missile capabilities would be nearly identical.

Soviet Forces With SALT

For the Soviets, we have projected maximum deployments of MIRVed ICBMs, SLBMs and cruise missile carriers allowed under SALT. With Soviet MIRVed ICBMs already constrained by SALT ceilings, and Soviet MIRVed SLBMs within 120 launchers of the limit on total MIRVed missiles allowed under SALT, this is a reasonable assumption, shared by Department of Defense assessments. Given the large amount of information now available on most Soviet strategic developments, the transition to new systems can be projected with a fair degree of accuracy. The specific characteristics of some new systems, such as the number of warheads on the new SS-X-24 or number of cruise missiles on the Blackjack bomber, have been estimated from reported figures on missile throw-weight and bomber payload, but cannot be predicted with as much certainty.

Soviet Forces Without SALT

Projecting future Soviet weapon systems and force levels in the absence of SALT is a less certain task, in which varying assumptions can yield divergent results. The projections in this study are not a prediction of a "most probable" outcome, but rather an illustration of what the Soviets could realistically achieve in the absence of offensive arms control. A U.S. decision to exceed crucial SALT limits may only elicit a restrained response from the Soviet Union, at least in the short-term. It is more likely, however, to prompt a more extensive Soviet reaction, particularly if accompanied by the simultaneous pursuit of President Reagan's Strategic Defense Initiative, which would provide considerable incentive for large-scale Soviet offensive expansion.



Under SALT, the number of Soviet missile warheads could increase from 9,000 to 11,000. But without SALT, this number could increase to as many as 30,000.

Although projections are on the high end of the threat spectrum, they are consistent with the pattern of past Soviet deployment trends and current production and economic capabilities. It should be noted that in many cases, Soviet expansion would simply involve introducing already planned systems without removing older ones, as would be required under SALT. Thus, the Soviets would deploy the new SS-X-24 without retiring SS-17s and SS-19s, and could introduce a fleet of Typhoon submarines without retiring any YANKEEs or DELTA IIIs. Given the Soviet penchant for retaining older systems even after obsolescence, this is not an unreasonable assumption.

AMERICAN FORCES AND SALT II

Under SALT, the majority of the Reagan Administration's strategic force modernization initiatives could proceed without modification. A decision to undercut SALT would yield small—and then only temporary—increments in American force levels if it were done only to incorporate the existing program. Thus the United States could modify planned bomber and submarine programs in a manner consistent with SALT II with little long-term effect. These modifications would also preserve the option of returning to the original program schedules should circumstances dictate.

US ICBM and Bomber Forces

Under SALT, the Reagan Administration's program for the MX could proceed without modification. Current plans to deploy 100 MX in 100 Minuteman III silos would result in an increase in offensive capability while maintaining the same number of MIRVed ICBM launchers, because Minuteman III is itself MIRVed. Similarly, the US will be able to add hundreds of new B-1B and Stealth bombers within the ceiling of 2,400 total strategic launchers.

The testing and deployment of the single-warhead ICBM, or "Midgetman," would be inconsistent with the SALT II restriction of one "new-type" of ICBM for each side, since the MX is the one new missile type permitted for the US. Midgetman testing, however, is not scheduled to begin until 1987, by which time a new agreement, allowing new single-warhead missiles in conjunction with reductions in MIRVs, could presumably be reached.

US Sea-based Forces

The current U.S. program for Trident submarine missiles (when coupled with existing MIRV ICBM deployments) will exceed the SALT ceiling of 1200 MIRV-ed delivery vehicles by 1985 and thereafter but only by a peak of 160 missiles and that only by 1992. The United States strategic submarine force currently consists of 31 Poseidon boats, each with 16 missiles, and as of May 1984, five Trident (Ohio) submarines, each with 24 missiles. The introduction of the seventh Trident submarine in September 1985 will place the United States over the 1200 MIRV-ed ballistic missile limit. The subsequent annual addition of approximately one new Trident, unless offset by the retirement of Poseidons, will further push the United States over this important ceiling.

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This excess of U.S. MIRVs, however, will be neither impressive nor long-lived. Under the current five-year plan, the Navy will continue receiving one Ohio submarine a year until 1994, when the 15th submarine will be delivered. Offsetting these increases, the existing force of 31 Poseidons is currently scheduled for retirement between 1993 and 1998, when they reach the end of their thirty-year operational life. Even if Ohio deliveries are increased to two submarines a year, U.S. SLBM levels would thus probably peak at a maximum level of 808 SLBMs in the early 1990s. This would give the United States a maximum total of 1360 MIRVed missiles, assuming ICBM levels stay constant. This excess of about 160 missiles (carrying approximately 1,300 warheads) will be eliminated by 1995 due to the retirement of aging Poseidon submarines.

US Bombers and Air Launched Cruise Missiles

The U.S. Air Force is currently modifying 99 B-52Gs to carry 12 cruise missiles on external wing racks. This process will be completed by 1985, at which point the 96 B-52Hs will begin modifications to receive wing racks to carry 12 ALCM-Bs, and later, in 1988, to carry internal rotary launchers to carry eight additional cruise missiles and cruise missile carriers. By 1986 the number of B-52/ALCM carriers would exceed the limit of 120 heavy bombers with cruise missiles that SALT II permits (unless, of course, reductions in American MIRVed missiles such as the Minuteman III are made to keep the total of ballistic missiles and bombers with cruise missiles under the overall limit of 1320).

But a decision to undercut SALT would yield only temporary increments in American bomber force levels. B-1B and B-2 Stealth bomber deployments will remain the same as under SALT—the only difference will be in the number of bombers with ALCMs in the late 1980s and early 1990s. If the United States proceeds with current plans to retrofit 195 B-52s with cruise missiles, total ALCMs and ACMs deployed will reach 2900 by 1992, approximately 45% more than would be deployed under SALT. But as the B-52 Gs are retired in the early 1990s, this advantage will evaporate. Moreover, by 1995 the United States will be able to deploy 196 B-52H and B-1B bombers carrying cruise missiles due to the reduction in total American SLBMs which will occur when Poseidon submarines begin to be phased out in the early 1990s. Thus, the projected level of approximately 3,000 ALCMs and ACMs deployed on B-1B and B-52H bombers by 1995 is the same in our study with or without SALT.

In sum, the United States can pursue significant quantitative and qualitative expansion of its strategic forces within the confines of SALT II. By 1990, the replacement of 100 Minuteman IIIs by the MX and the deployment of the new D-5 (Trident II) missile on three Ohio submarines could give the US 1276 additional hard-target warheads. The introduction or retrofitting of up to twelve Ohios with the D-5 missile could increase this number to almost 3,000 by 1995. Combined with 450 Minuteman III ICBMs, the American arsenal could thus field approximately 4250 counterforce warheads by 1995 alone. By 1995, the United

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MIDGETMAN SURVIVABILITY

Soviet deployment of thousands of additional high-yield warheads would tend to frustrate current American efforts to enhance the survivability of its land-based ICBM force through the development of the new single ICBM, or Midgetman. The U.S. Air Force currently plans to base up to 1,000 Midgetman missiles on mobile launchers roaming over bases in the southwest and western United States. This basing mode has been chosen to provide improved force survivability and security without inciting local public opposition.

Midgetman mobile launcher survivability is a function of total expected megatonnage within a given basing area, and the hardness and numbers of the launch vehicles. The more capable the mobile launchers are of withstanding the effects of nuclear blast (i.e., the "harder" they are), the less land is required to ensure an adequate percentage of survivability against a Soviet nuclear barrage. For example, if the Soviets launched most of their large SS-18s, carrying as many as 3000 500-kiloton warheads, Midgetman launchers would have to be hardened to withstand overpressure blasts of at least 30 pounds per square inch (PSI) in order to assure even a minimal level of survivability within the currently projected basing area of about 12,000 square miles.

Attaining hardness levels of 30 PSI and more presents a considerable, though not unattainable, technical challenge. An M-60 tank, for example, can be incapacitated by an overpressure of only 10 PSI. The viability of mobile launchers will hinge largely on the ability to prevent a turnover caused by the blast wave passage and the high-velocity winds accompanying a nuclear detonation. But even if the desired hardness is attained, limitations on the size of the attacking Soviet force, such as provided by SALT, would be a prerequisite for the long-term security of an economical Midgetman force.

Without the SALT limits, even the most optimistically achievable levels of launcher hardness and durability would be overwhelmed by potential future Soviet forces. Significant or unlimited deployments of the Soviet's SS-X-24 and SS-X-26 ICBMs—in addition to its existing force of SS-17s, SS-18s and SS-19s—would pose a severe threat to a mobile or stationary Midgetman force. The doubling in the number of warheads that the Soviets could target against mobile launchers could reduce a fifty percent survivability ratio to almost zero. An expansion in Soviet strategic capability could also endanger hardened or superhardened silos. The combination of increased accuracy and yield that could be allocated per target would probably counter any potential gains in harder silo construction. □

(Continued from page 6)

States could also deploy a full contingent of 132 B-2 Stealth bombers, as well as 100 B-1B bombers and 96 B-52s with cruise missiles.

SOVIET FORCES UNDER SALT

SALT II has been criticized for allowing the Soviets to continue a large-scale expansion in their strategic capabilities. Since 1979, the USSR has substantially increased its number of ballistic missile warheads, notably through the completion of SS-17, SS-18 and SS-19 ICBM deployments. During that period the Soviets have also expanded the numbers of their first MIRVed SLBM, the SS-N-18, deployed on DELTA III submarines, while introducing the new strategic submarine, the Typhoon, with its SS-N-20 MIRVed system. Between 1979 and 1984, total Soviet ballistic missile warheads have thus increased from approximately 6800 to 9200.

Although SALT did not preclude these developments, continued adherence to the SALT limits will force the Soviets to exercise considerable restraint in the future. In all areas except for bombers, the Soviets have already built up to, or near, the most important SALT ceilings. (See pg. 4).

Continued adherence to SALT would permit only modest increases in Soviet strategic force levels and capabilities. The Soviets would have 120 more sea-based MIRVed missiles, and 120 heavy bombers with cruise missiles. Total Soviet ballistic missile warhead levels would only increase by about 2,000 warheads to a total of a little less than 11,000 by 1995. Total throw-weight and megatonnage would show similarly marginal increases, although the accuracy and destructive capability of Soviet weapons will have improved.

Soviet ICBMs

With 818 MIRVed ICBMs, and only 820 allowed, the USSR will have to dismantle fairly new SS-17 or SS-19 missiles in order to deploy the new SS-X-24 under SALT. The first Soviet solid-fuel MIRVed ICBM, the SS-X-24, has experienced developmental difficulties, and will probably not reach deployment until the late 1980s. The eventual introduction of this missile will allow the Soviets to slightly increase the number of ICBM warheads within the confines of SALT. However, the SALT II limits on new missile throw-weight should prevent the SS-24 from carrying any more than six (and perhaps, later, eight) high-yield warheads. More important, the extension of SALT would prevent the full testing or deployment of another, larger Soviet MIRVed ICBM, the SS-X-26, which would clearly constitute a second, and therefore prohibited, new missile.

Under SALT, the Soviets would probably retire all but approximately 40 of their SS-17 and SS-19 mod 2s, which carry high-yield single warheads with yields of six and ten megatons respectively. The replacement of SS-17s and SS-19s with the SS-X-24 would add fewer than 300 extra warheads to the Soviet arsenal by 1990, and less than 1000 by 1995. Although the SS-X-25 should represent a significant improvement over the SS-17, the larger-scale replacement of the very capable SS-19 with the SS-X-24 would not

significantly enhance the capability of the Soviet ICBM force.

Under SALT, the Soviets could also be expected to replace their remaining force of 520 SS-11s and 60 SS-13s with the new single-warhead SS-X-25. The Soviet Union maintains that this missile is a permitted modification of their older SS-13, while the Reagan Administration considers it a second new missile, and has charged the Soviets with a probable violation of the SALT II limit on the introduction of only one new type of missile.

Available intelligence data on the throw-weight and other characteristics of the SS-13, which was tested in the mid-1960s, do not permit an unambiguous determination of whether the SS-X-25 is actually inconsistent with SALT II. The American charge that the weight of the missile's reentry vehicle is only 40 to 50 percent of the total missile throw-weight, and thus in violation of a SALT provision designed to prevent either side from acquiring a capability to "break out" of the treaty by adding additional warheads, is also technically uncertain. In any case, an RV that exploits at least 40 percent of the total missile throw-weight would not permit more than one, if any, additional warhead to be added to the missile.

The introduction of the modern, solid-fuel SS-X-25 will represent a qualitative improvement over the aging SS-11s and SS-13s. The replacement process will not, however, involve additional warheads to the Soviet force. Moreover, the Soviet move toward less vulnerable and less threatening single-warhead mobile missiles has been advocated by many government officials and defense analysts, including the Scowcroft Commission.

Soviet Sea-Based Forces

As of 1984, the Soviet SLBM force included 62 modern strategic submarines fitted with some 924 missiles. As the Soviets continue to deploy their new Typhoon submarines, they will be required to continue the retirement of YANKEE I submarines in order to remain within the SALT I submarine and launcher limits. In contrast to U.S. Poseidons, most of the remaining YANKEEs were built after 1970. By the end of 1984 the Soviet forces included only 264 MIRVed SLBMs deployed aboard 14 DELTA III and two Typhoon subs. Although Typhoon production will probably reach a rate of approximately one submarine a year by the mid 1980s, the USSR would be able to deploy only five or six more of these boats before exceeding the SALT II ceiling of 1200 MIRVed missiles. If the Soviets decide to deploy more than 118 new MIRVed SLBMs, they will be required to retire DELTA III submarines (with the MIRVed SS-N-18) or to reduce their land-based MIRVed ICBMs.

Although SALT will maintain quantitative restraints on the number of Soviet SLBMs, the USSR will be free to pursue qualitative advancements, particularly as it improves the accuracy and yield-to-weight ratios of its sea-based forces. Under SALT, the Soviets will be permitted to replace the SS-N-18 SLBM on DELTA III submarines with the new SS-NX-23, which was first tested in late 1983. The SS-NX-23 is expected to carry a larger number of more

(Continued on page 8)

(Continued from page 7)

capable warheads than its predecessor. However, judging from reports that this missile is less accurate than the SS-N-20, it is unlikely the SS-NX-23 will have a significant counterforce capability. Under SALT, the Soviets would also be expected to introduce more accurate and powerful modifications of the SS-N-20 on Typhoon submarines. Finally, by the mid-1990s, the Soviets will be in a position to introduce their own counter-force-capable equivalent of the Trident II.

Soviet Bombers and Air Launched Cruise Missiles

The most notable expansion the Soviets might undertake under SALT is in the area of heavy bombers and cruise missiles. The first Soviet long-range ALCMs will probably be operational by the end of 1984, on the new H version of the Bear bomber, reportedly in production since 1982. The new Blackjack bomber, which will become operational in the late 1980s, will also be configured to carry cruise missiles. Under SALT II, the USSR will be able to deploy a force of 120 Bear or Blackjack bombers armed with ALCMs. The SALT limits would, however, preclude the creation of a larger force of cruise missile bombers in the absence of unlikely reductions in the number of ballistic missiles. SALT would also preclude the possible arming of Backfire bombers with long-range cruise missiles, a modification that would give this controversial bomber definite intercontinental attack capability.

SOVIET EXPANSION WITHOUT SALT

Without the constraints of SALT I and II, the Soviet Union would have both the capacity and motivation to engage in a substantial and immediate buildup. The Soviets are likely to regard an American decision to exceed crucial SALT II limits as final proof that the Reagan Administration is an unreliable partner that is not interested in any form of arms control, leading the Soviets to rely entirely on their own means to protect their security interests. At a minimum, an accelerated Soviet arms build-up could be seen as a way to develop leverage to induce the Americans to return to the negotiating process, and to ex-

tract concessions should negotiations resume. An immediate build-up would also insulate Soviet bureaucratic actors from the vagaries of future negotiations and internal resource allocation disputes.

President Reagan's Strategic Defense Initiative could provide a further, and major, incentive for large-scale Soviet offensive expansion. American demonstrations of advanced ABM technologies, particularly demonstrations that are seen as inconsistent with the ABM Treaty, will almost certainly spur the deployment of additional Soviet forces in coming years, as a hedge against the eventual American deployment of an antimissile system. Such a Soviet build-up could serve to discourage limited American ABM deployments, and provide a running start to cope with more elaborate defenses.

Soviet ICBM Forces

In an unrestrained arms competition, the Soviet Union could implement significant increases in the capabilities of its ICBM forces. The Soviet Union could deploy yet another modification of the SS-18 that took full advantage of this missile's enormous throw-weight. During the SALT II negotiations, Pentagon defense analysts calculated that the SS-18 might be upgraded to carry between 25 and 40 warheads, rather than the 10 it is restricted to under SALT. In practice, however, the SS-18 would most likely be upgraded to carry about 14 high-yield warheads, to enable the missile to continue its probable coverage of American ICBM silos and other hard targets, as well as barrage the mobile ICBMs of the future. Likewise, the SS-19 could be modified to carry up to eight warheads, an option the Soviet Union unsuccessfully attempted to preserve during SALT.

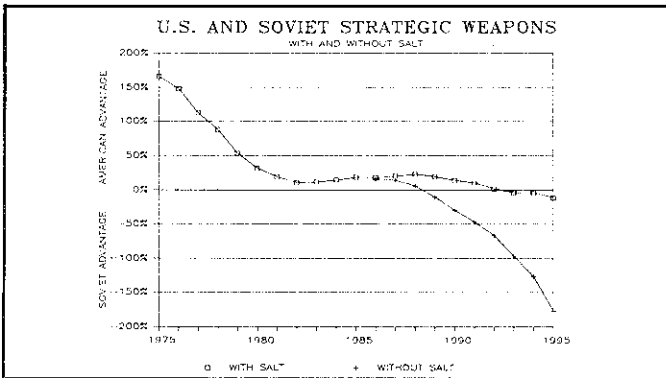
The Soviets could produce the new SS-24 and SS-25 ICBMs at rates of over 100 total missiles a year well into the 1990s. These rates are comparable to those during the height of SS-18 and SS-19 production in the mid-to-late 1970s. In the absence of SALT constraints, Soviet deployment of a force of several hundred SS-X-24 ICBMs could be carried out without any commensurate reduction in existing Soviet MIRVed ICBMs. The deployment of MIRVed missiles (the SS-17 and SS-19) in existing SS-11 silos was only halted due to SALT constraints in 1983. The complete replacement of 520 remaining SS-11s and 60 SS-13s with a force of SS-24 missiles would add over 3,000 counterforce warheads by the early 1990s.

Finally, the Soviets could proceed to test and deploy several new types of liquid- and solid-fuel MIRVed ICBMs, with higher accuracy, reliability and throw-weight than their current missiles. Recent reports indicate that the Soviets, perhaps anticipating the demise of SALT, have begun development of two new land-based MIRVs in addition to the SS-24, which is allowed them under SALT II. On the basis of preliminary reports, the first, the solid-fuel SS-26, will probably be much more capable than the SS-24, with the capacity to carry at least ten highly accurate warheads. The second, the SS-X-27, has been reported as a larger, liquid-fuel follow-on to the SS-18, and could carry as many as 18 warheads.

EFFECTS OF SOVIET SLBM EXPANSION

By the mid-1990s, the Soviets could be in a position to deploy their own version of the Trident II, with sufficient yield and accuracy to threaten hardened American targets. This might allow highly accurate Soviet sea-launched ballistic missiles, with short flight times, to simultaneously threaten U.S. bomber bases and fixed ICBMs. Soviet SLBMs, programmed for "depressed trajectory" flights, could also be capable of destroying a significant portion of the American strategic bomber force. Under SALT, it would be very difficult for the Soviets to deploy counterforce-capable SLBMs in numbers sufficient to permit the destruction of both American ICBMs and bombers. Without SALT, however, the Soviet submarine force would have the warheads and yield to theoretically perform both tasks.

(Continued on page 9)



Under SALT, the present parity in the total number of strategic weapons, including those carried on ballistic missiles and on bombers, could be expected to continue. In the absence of SALT, the Soviets could achieve almost a 3 to 1 margin over the United States in the absence of a U.S. buildup.

(Continued from page 8)

The large force of SS-24s, SS-26s and SS-27s that can be projected to exist by 1995 in the absence of SALT will represent a dramatic improvement, quantitatively and qualitatively, over the existing force of Soviet ICBMs. The sum of these various developments could give the Soviets as many as 11,000 warheads on ICBMs alone by 1990, and over 16,000 warheads by 1995. Essentially all of these would be accurate, high-yield weapons, with significant counterforce potential.

Soviet SLBMs

In the absence of SALT restraints, a significant expansion of sea-based forces is also possible. Without SALT I, the Soviet Union would be able to continue deploying Typhoon submarines at a rate of one a year without retiring YANKEE or DELTA III boats. Without the SALT II limits on MIRVed launchers, this program could continue indefinitely, rather than terminating after seven or eight Typhoon boats. Furthermore, the Soviets probably have the capacity to produce two Typhoons a year. The Soviets could also continue production of DELTA III submarines, which were being introduced at rates of one or more a year until 1982.

The Soviets are likely to eventually introduce a more capable solid-fuel replacement for the SS-N-23 on its DELTA subs, which will not be retired in the absence of SALT. The combination of Typhoon and DELTA deployments could give the Soviet Union as many as 26 additional SSBNs, all carrying MIRVed SLBMs, by 1995. Along with probable upgrades in the number of warheads carried by missiles on DELTA and Typhoon-class submarines, by 1990 the Soviets could more than double the current-force SLBM warheads, to about 4,000. And by 1995, the Soviet Union could field almost 8,000 SLBM warheads. In contrast to the present SLBM force, which has essentially no hard-target kill capability, almost all of these warheads would be accurate, high-yield weapons, with significant counterforce potential.

Soviet Bombers and Cruise Missiles

In the absence of SALT, the Soviets could also undertake a significant deployment of new long-range ALCMs. Without SALT II, the Soviets could be expected to pro-

duce BEAR H bombers, each of which can probably carry up to 10 cruise missiles, at a rate of about 10 per year. Undercutting SALT would also allow the Soviets to modify Backfire bombers to carry a number of long-range cruise missiles; with refueling, these bombers could pose a serious threat to American targets. The new "Blackjack" bomber, projected to reach operational status in 1987, could also carry up to 20 long-range cruise missiles. By 1990, the Soviet Union could field as many as 400 bombers capable of attacking the U.S. mainland with long-range cruise missiles, a number that could increase to over 600 bombers by 1995. By 1995, the Soviets could have more than 400 heavy bombers and 7,000 long-range ALCMs deployed.

RECOMMENDATIONS

The Administration should modify current ALCM and strategic submarine programs in a manner consistent with SALT II. Such actions need not be difficult or irreversible: should Soviet activities or noncompliance with SALT ceilings require an American response, the United States will still have the option of returning to its original programs. In the area of ALCMs, the United States should complete the modification of 99 B-52 Gs to carry cruise missiles on external pylons. Twenty-one B-52 Hs would also be modified to make up a total force of 120 bombers with cruise missiles, as permitted under SALT II. As the B-52 Gs are retired in the early 1990s, the remaining B-52 Hs could also be converted to carry 20 ALCMs on wing racks and internal rotary launchers. By 1995 the United States will be able to deploy 196 B-52H and B-1B bombers carrying cruise missiles, due to the reduction in total American SLBMs that will then arise as Poseidon submarines are phased out.

With the introduction of the seventh Trident submarine in late 1985, the United States should begin to retire Poseidons in order to comply with SALT. Between 1985 and 1993, when the Poseidons are currently projected to begin retirement, the U.S. will be required to retire 12 Poseidon boats.

The Administration should then announce its intention to uphold the crucial SALT II limits and provisions beyond the 1985 expiration date, provided the Soviet Union also maintains compliance. This vital step would provide the United States and the Soviet Union with a grace period during which to conclude a comprehensive arms control agreement. Undercutting the SALT limits is likely to inspire a new round of arms deployments and counter-deployments which will make future agreements even more difficult to achieve.

The Administration should simultaneously pursue the resolution of outstanding compliance issues. Few, if any, of the alleged violations affect American national security; all are cloaked in considerable legal and technical ambiguity. None involves the violation of important SALT subceilings. If, after further investigation and discussion, a Soviet violation is clearly established, the Administration should determine an appropriate political and military response. Such actions should be in keeping with the violation, however, and not automatically threaten to undermine SALT.

BALANCE SHEET: ADHERING TO SALT II

MIRVed ICBMs

The binding constraint on the U.S. deployment of MIRVed ICBMs is likely to be public opposition rather than the SALT II limits. We seriously question whether the American public will be willing to buy MIRVed missiles and install them in vulnerable silos in significant numbers. And no other deployment scheme has emerged.

Thus assuming that MX is defeated, or produced in small numbers, as seems increasingly likely, the U.S. ICBM MIRVed total would remain at or around 550—especially if the new MX missiles were used to replace Minuteman III MIRVed missiles.

Meanwhile, however, the USSR is already at the limit of 820 MIRVed missiles and could easily add hundreds more per year indefinitely. This is something we would be reluctant, or even unwilling, to match.

MIRVed SLBMs

The binding constraint on U.S. deployment of MIRVed SLBMs is the overall limit of 1200 but our plans to go above that limit would leave us at only 1360 by 1992 and then only temporarily as Poseidon phases out.

Meanwhile, the Soviet Union, which is already close to 1200 in land- and sea-based MIRVed missiles together, could exploit the lapsing of this restraint to upgrade, indefinitely, its sea-based MIRVed force. This upgrading would give the Soviet Union, in time, the ability to destroy U.S. land-based missiles and bombers simultaneously from the sea with short warning time.

Put another way, what Trident II is likely to do to the Soviet land-based missile (and bomber force) under SALT II, the Soviets would need a lapsing of the SALT II limits on MIRVed sea-based (and land-based) missiles to do, because they need greater numbers of SLBMs (as well as greater accuracy of SLBMs) to do it.

Bombers

SALT II is not limiting the U.S. deployment of strategic bombers and is having only a marginal effect on the deployment of cruise missiles on them.

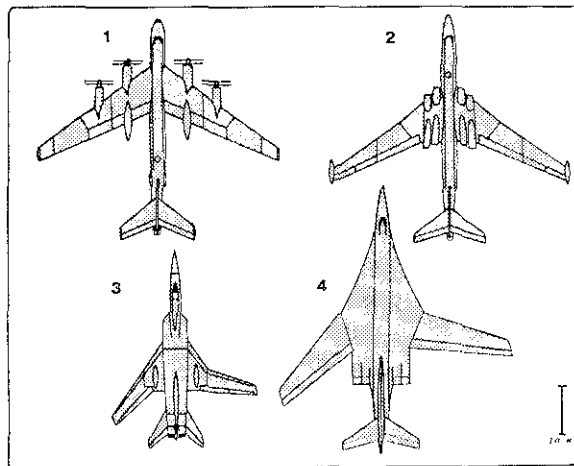
On the other hand, it is preventing the Soviet Union from turning Backfire into a strategic bomber by adding cruise missile to it, as well as discouraging the Soviet Union from deploying the strategic bomber Blackjack in large numbers by requiring it to offset such deployment with missile reductions.

MIDGETMAN (Single-warheaded ICBM)

Only on single-warheaded missiles is the United States contemplating a program that is importantly outside the SALT II limits—by testing a new ICBM in 1987 or 1988 and deploying it in 1992. But it is quite unclear at the moment whether the U.S. will want to build any Midgetman anyway since it may be impossible to design them to be invulnerable without arms control limits on

the Soviet missiles that would otherwise barrage it.

Accordingly, in the only strategic area where the U.S. program seriously suggests leaving SALT II, this area suggests, equally strongly, the need for existing and perhaps new arms control limits on the Soviet force. Thus the most that is indicated by Midgetman is not letting the SALT II agreement lapse, but redesigning it to permit Midgetman, while trying to keep such limits on the Soviet force as would prevent Midgetman from becoming vulnerable. Ironically, Midgetman needs SALT II for its survivability as much as it needs, for its deployment, an exception to SALT II.



Soviet Bombers

- | | |
|-----------------|---------------|
| 1 — BEAR Tu-95 | 3 — BACKFIRE |
| 2 — BISON Mya-4 | 4 — BLACKJACK |

BALANCE SHEET: LETTING SALT II LAPSE

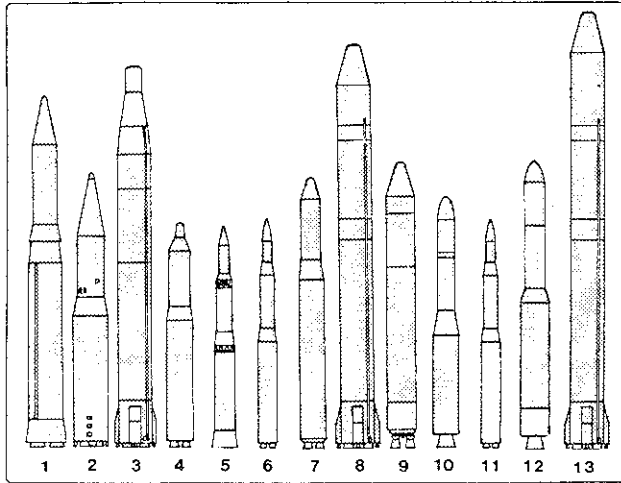
The unprovoked demise of SALT II—so often urged by our own conservatives—could hardly be the occasion for an immediate crash program of U.S. strategic weapons. On the U.S. side, we would have to wait until 1992 to deploy our first new ICBM besides the MX. Moreover, we would face uncertainties of where the Midgetman could be deployed securely or how, in the face of a continuing Soviet buildup. The cost and marginal utility of additional SLBM warheads (where we have over 5,000) and of air-launched cruise missiles (where we have 3,000 already planned) would discourage their procurement. In any case, an immediate expansion in either missile system would be precluded by the long lead time of strategic submarines and equipment to modify bombers to carry a full contingent of cruise missiles.

Meanwhile, the Soviet Union would have open production lines for virtually all of the MIRVed ICBMs of interest (the SS-17, -18, -19 and new SS-24) as well as the new SS-26 and SS-27 ICBMs under development. They would also have two submarines and two new missiles (the Typhoon and Delta submarines with SS-N-20 and SS-N-23 missiles) in or near production. In bombers, it would have the Blackjack near deployment to compare

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with our B-1 and Stealth. The USSR would have no civic restraints and a tendency to doubt the quality of its own weapons that has traditionally driven it to numerical excesses. Most important, it would face the threatening prospect of the development, if not deployment, of the Reagan Administration's Star Wars program.



Soviet ICBMs

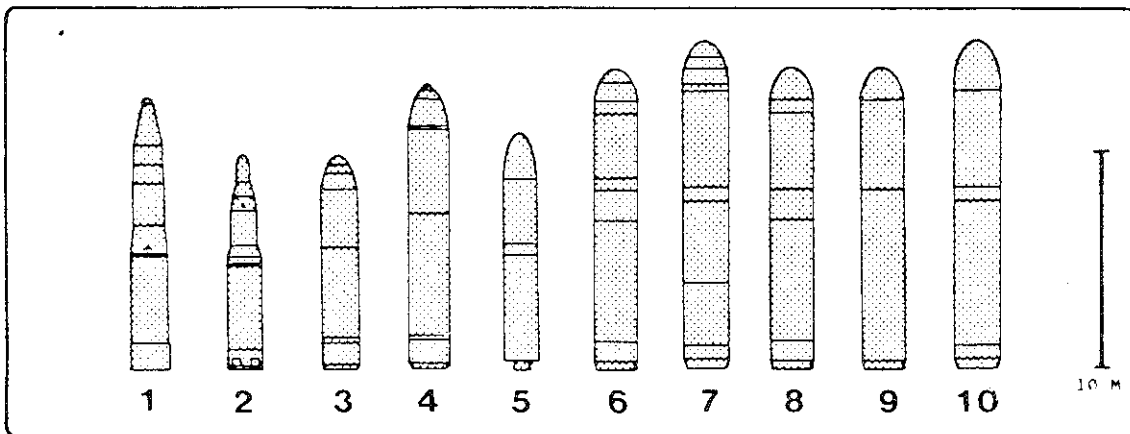
- | | | |
|-----------|------------|------------|
| 1 — SS-7 | 6 — SS-16 | 11 — SS-25 |
| 2 — SS-8 | 7 — SS-17 | 12 — SS-26 |
| 3 — SS-9 | 8 — SS-18 | 13 — SS-27 |
| 4 — SS-11 | 9 — SS-19 | |
| 5 — SS-13 | 10 — SS-24 | |

The Soviets could also be expected to respond to the American Strategic Defense Initiative by accelerating their own development of ABM systems. Faced with the double-barrelled threat of substantial increases in both Soviet offensive and defensive force levels by the mid-to-late 1980s, the United States might feel compelled to respond. Although we are in an era of strategic overkill, when numerical advantages do not necessarily translate into strategic ones, there will remain a symbolic and political need to maintain the status of approximate parity. More pressing, a large-scale Soviet ABM effort could demand more powerful and capable offensive

forces to preserve the penetrability, and therefore credibility, of our retaliatory deterrent.

Faced with this possibility, the United States would certainly have the economic resources to initiate a large offensive expansion. However, it would still be constrained by short-term productive capabilities and the continued political opposition to pursuing an unrestrained arms race it may be perceived as having brought upon itself. In the short-to-medium term, the United States could continue the peak production rates of 32 MX and 48 B-1B bombers per year now projected under current programs. These rates would result in more than 300 B-1 and 150 Stealth bombers by 1995. For the MX, production could conceivably be increased to fifty or seventy-five a year, which would result in a force of between 400-600 missiles by 1995. The production of Trident submarines, now approximately one a year, would be more difficult to increase due to long lead times and the already strained capacity of the submarine's one existing shipyard. By 1990, we could be producing two Tridents a year, while production of an advanced Trident submarine could begin by the early 1990s. These developments would yield approximately 30 new submarines by 1995.

Even in the face of a concrete Soviet threat, such U.S. expansion will inevitably confront political and economic constraints, not the least of which will be the growing, and eventually stupendous, allocations for a complete space-based ABM system. Although the United States has talked most of abandoning SALT, we are the less prepared to engage in an immediate arms race. U.S. developments will thus be retroactive responses to a Soviet buildup we could have easily prevented by remaining in SALT to begin with. And, even assuming high rates of production and deployment for all legs of the strategic Triad, the United States would be left in a less advantageous position than exists now, where we enjoy definite superiority in submarine- and bomber-based missiles. Most important, both the United States and the Soviet Union would be locked into a strategically precarious and economically disastrous cycle of ongoing offensive and defensive weapons deployments.



Soviet SLBMs

- | |
|--------------|
| 1 — SS-N-4 |
| 2 — SS-N-5 |
| 3 — SS-N-6 |
| 4 — SS-N-8 |
| 5 — SS-N-17 |
| 6 — SS-N-17 |
| 7 — SS-N-20 |
| 8 — SS-N-23 |
| 9 — SS-N-26 |
| 10 — SS-N-27 |

SOVIET FORCES					AMERICAN FORCES						
		1985		1995				1985		1995	
				SALT	NO SALT			SALT	NO SALT		
ICBM	warheads	1398	1398	2443							
SS-7	1	0	0	0							
SS-8	1	0	0	0							
SS-9	1-3	0	0	0							
SS-11	1-3	450	0	0							
SS-13	1	0	0	0							
SS-17	1-4	150	10	150							
SS-18	1-14	308	308	308							
SS-19	1-8	360	100	360							
SS-24	6-8	0	400	575							
SS-25	1	130	580	475							
SS-26	10-12	0	0	350							
SS-27	18-22	0	0	325							
SUBMARINES missiles		80	43	67							
Zulu	2	0	0	0							
Golf	3	13	0	0							
Hotel	3	4	0	0							
Yankee	12-16	24	1	1							
Delta	12-16	37	30	46							
Typhoon	20	2	12	20							
SLBM	warheads	991	664	1080							
SS-N-4	1	0	0	0							
SS-N-5	1	51	0	0							
SS-N-6	1-2	368	16	16							
SS-N-8	1	280	280	280							
SS-N-17	1	12	0	0							
SS-N-18	1-7	240	0	0							
SS-N-20	6-10	40	200	160							
SS-N-23	6	0	128	128							
SS-N-26	9	0	0	256							
SS-N-27	12	0	40	240							
BOMBERS	weapons	300	420	745							
Bear	1-8	110	50	95							
Bison	4	34	0	45							
Backfire	3-8	145	250	340							
Blackjack	24	0	120	265							
BOMBER WEAPONS		985	3730	9270							
Bomb		670	980	1240							
AS-3		10	0	0							
AS-4		225	350	100							
AS-15		80	2400	8380							
SLCM		120	870	1120							
TOTAL WEAPONS		10,300	15,500	41,000							
MISSILE WARHEADS		9,200	11,000	30,100							
MEGATONS		5,800	7,200	19,100							
TOTAL CMP/1000*		370	2,500	7,800							
PROMPT CMP/1000		215	840	3,300							
TOTAL PAYLOAD**		7,500	14,500	33,100							
MISSILE PAYLOAD		5,500	5,900	14,500							

		1985		1995		
		SALT	NO SALT	SALT	NO SALT	
ICBM	warheads	1026	950	1800		
Titan II	1	26	0	0		
Minuteman II	1	450	450	450		
Minuteman III	3	550	550	450		
MX	10	0	100	100		
SICBM	1	0	0	800		
SUBMARINES missiles		37	24	28		
Geo Washington	16	0	0	0		
Ethan Allen	16	0	0	0		
Lafayette	16	8	0	2		
James Madison	16	10	0	3		
Ben Franklin	16	12	7	7		
Ohio	24	7	17	17		
SLBM	warheads	648	568	584		
Polaris	3	0	0	0		
Posidon	10	288	48	64		
Trident I	8	360	136	136		
Trident II	8	0	384	384		
BOMBERS	weapons	310	328	328		
FB-111	6	56	0	0		
B-52	6-24	264	96	96		
B-1B	16-24	1	100	100		
B-2	16	0	132	132		
BOMBER WEAPONS		4236	5632	4144		
Bomb		1680	928	1212		
Hound Dog		0	0	0		
SRAM		1176	0	0		
ALCM		1380	800	800		
AASM		0	1984	1984		
ACM		0	1920	1920		
SLCM		107	758	758		
WEAPONS		12,200	13,800	14,800		
MISSILE WARHEADS		7,900	7,400	8,400		
MEGATONS		3,800	5,100	5,500		
TOTAL CMP/1000*		2,200	14,200	14,300		
PROMPT CMP/1000		60	710	825		
TOTAL PAYLOAD**		7,000	10,300	10,600		
MISSILE PAYLOAD		2,050	2,050	2,850		

*Counter Military Potential (hard target kill capability)
**metric tons

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