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THE SALT TREATIES

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1. Introduction

Although the Strategic Arms Limitation Talks and the agreements deriving from them deal with weapon systems, verification, and similar subjects in the realm of military and defence concerns, they have implications extending well beyond these areas. In fact, the significance of SALT for detente between the superpowers, for East-West relations, for the prospects for arms control in broader spheres, and for international relations in general probably exceeds its significance for bilateral strategic stability.

It has been said that there are two different frameworks for arms control - technical and political - and that the West uses the first, the East the second, with consequent failures of communication. This paper adopts the framework of technical, military, and strategic considerations, and will concentrate on those aspects of SALT directly related to the military balance. It will extend to some remarks on the possible developments in nuclear forces in the European theatre, likely to be a subject of SALT III.

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2. The Three Offensive Strategic Nuclear Weapons Systems

The primary subjects of negotiation in SALT I and II, and of Western analysis of the strategic balance, are the three types of offensive nuclear weapons systems often described as the "triad". These are Intercontinental Ballistic Missiles (ICBMs), Submarine-Launched Missiles (SLBMs), and Heavy Bombers.

The effectiveness of offensive systems is, of course, dependent in part on the capabilities of those defensive systems designed to frustrate their purposes. Active Ballistic Missile Defence Systems were limited in the Treaty emerging from SALT I, leaving ICBMs and SLBMs virtually unopposed by active defence, once launched on their trajectory. Some limits were placed on new systems to warn of missile attack, but defensive systems designed to oppose bomber aircraft or submarines have not been affected by either SALT I or SALT II.

Heavy bombers, not covered in SALT I, have been defined in SALT II, in terms of the existing B-52, B-1, Bear, and Bison, to include future aircraft with capabilities similar to these, and aircraft able to launch long-range cruise missiles (ALCMs) or Air-to-Surface Ballistic Missiles

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(ASBMs). Bombers are able to carry very large payloads, hence large numbers of weapons or weapons of very large destructive power. However their ability to penetrate modern air defences are very much in question, which is the chief reason for the plans to equip them with "stand-off" weapons such as ALCMs or ASBMs which could be launched while the aircraft was still far from the intended target. Another vulnerability of bombers is associated with their normal location on major airfields, easily destroyed by SLBM or ICBM attack.

Intercontinental Ballistic Missiles are the most accurate of the strategic weapons, and one missile is now able to deliver several warheads (Multiple Independently Targeted Reentry Vehicles - MIRVs) to different targets (which must in the same general area). As accuracy is increased, the need for a heavy warhead with a large energy yield is decreased, and it would not be exaggerating to say that virtually any installation at an accurately known spot on earth can now be destroyed by an ICBM.

The increasing effectiveness of ICBMs against any type of target implies that ICBMs may themselves be vulnerable to hostile ICBMs. Through the 1960's, the vulnerability

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of ICBMs was reduced by placing them in underground silos, and then hardening the silos in thick concrete armour. However, the combination of high resolution satellite photography and pinpoint accuracy in warhead delivery is advancing too fast and too far to be offset by the capabilities of static physical protection. It seems certain that the only means by which ICBMs (or any other objects) can be protected from missile attack are concealment or mobility. Another means could be by active defence, but its technical feasibility is not certain, and significant deployment is prevented by the ABM treaty.

Submarine-Launched Ballistic Missiles have the advantage of concealment prior to launch. They are somewhat less accurate than land-based systems, and suffer greater limitations on size. They cannot be on station all the time, and reliable constant communication with the submarine can pose difficulties. However, the near invulnerability of the launches (while at sea) provides a very significant advantage.

3. Stable Strategic Nuclear Deterrence

The doctrinal underpinning of Western strategy depends on the concept of mutual and stable nuclear deterrence. It is

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by no means clear that this point of view is shared by the East. According to this concept, both opponents should be quite sure that, no matter what form of surprise attack might be launched against them, enough of their offensive weapons would survive to enable them to retaliate against the aggressor's population to a degree that would inflict unbearable damage. The margin of certainty should be such that it would not be upset by some minor change in intelligence estimates or notice of technical deterioration, should not supply any motivation to react precipitately in times of stress (such as to "launch on warning" before actual damage has been incurred), or to conduct a preemptive first strike. In the language of the trade, the potential victim of aggression should possess an "assured countervalue second strike retaliatory capability", implying that a would-be aggressor is deprived of a "disarming counterforce first-strike capability". Some care needs to be paid to the use of the term "first-strike capability". Obviously any power possessing an offensive weapon has the capability to fire it first. The significant term is "disarming counterforce first-strike capability", which implies that a substantial proportion of the opponent's offensive strategic weapons can be destroyed.

In principle, it should be possible to calculate the

results of a first strike (by either side) against the weapons of the opponent, to know how many of these would escape destruction, to predict how much damage they could do in a retaliatory second strike, and to decide whether this damage exceeded the limit that the original attacker could bear. In practice, there are considerable uncertainties in each stage of such calculations, and planners could not be confident that they had an assured capability unless the calculation allowed for a substantial margin of error in the assumptions.

Starting from this base, further propositions of less fundamental status can be added. The concept of deterrence can be applied to nuclear threats covering territories and countries beyond the borders of the two "central" opponents, and it can be applied to conventional as well as nuclear forces. The question of "coupling" or "linkage" between these three levels arises since, in principle, it should be possible to provide a "seamless web of deterrence" extending in gradual steps from the lower levels of conventional defence up to the ultimate sanction of strategic nuclear attack on the population of the principal opponent.

For the purposes of preserving stable deterrence, the most satisfactory weapon is the SLBM. The submarines' con-

cealment reduces their vulnerability, and the limited accuracy of the current missiles reduces their capability for a disarming counterforce first strike against hard point targets. This latter limitation on accuracy may be removed in future SLBMs such as Trident D5. ICBMs can have a counterforce first-strike capability, depending on the accuracy and size of their warheads, and if they are vulnerable themselves they can have a further destabilizing effect. Heavy bombers do not travel fast enough to be a good first-strike weapon, but their bases are very vulnerable to a surprise attack by missiles. Thus they are more likely to be the victims than the executors of a disarming first strike.

4. Twenty Years of Strategic Nuclear Weapons

Nearly all of the US program in land-based Intercontinental Ballistic Missiles has been in three versions of the comparatively small "Minuteman". The first two versions had single warheads (of about 1 Megaton yield), but Minuteman III has three MIRVs, with yields of about 170 kilotons each and an accuracy (CEP) of about 350 metres, quite sufficient to provide a deadly threat to an airfield, city, or other "soft" point target, but not enough to give a high probability of destroying a small hardened target such as a missile silo. The 54 Titan II missiles, first deployed seventeen years ago,

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have single warheads of very large yield (about 9 Megatons). Titan I and three versions of Atlas were so vulnerable as to invite preemptive attack, and were abandoned in 1964 in favour of missiles in hardened underground silos.

The early Soviet ICBM program included four "light" missiles, of which two have now been terminated (SS-7 and SS-8), and one very heavy one, the SS-9. The large Throw Weight of the SS-9 (about 6000 kg) made it possible to project one enormous warhead (25 Megatons) or several (3) large (4 MT) warheads. However, commencing in 1974 (after the signature of SALT I, but not in contravention of the letter thereof) three new ICBMs were deployed, each with a high Throw Weight and with MIRVs. The most significant is SS-18, the successor to the SS-9, with about 8000 kg Throw Weight and with 10 MIRVs. Under the terms of SALT II, the Soviet Union must restrict itself to 308 "heavy ICBMs", where the term "heavy" signifies that the launch weight or throw weight exceeds those of the SS-19 (Throw Weight 3600 kg). They are converting the aging heavy SS-9 into even heavier SS-18 at a rapid rate, so that they will soon have 3080 MIRV warheads in this one system. They are also allowed by SALT II to replace the obsolescent single-warhead SS-11 by MIRVed SS-19 and SS-17, all categorized as "light ICBMs" but with

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far more throw-weight than any US missiles other than the 1963 vintage Titan II.

As of 1979 it is evident that the Soviets have the greater capability in ICBMs and are rapidly increasing their margin of superiority, especially in terms of large numbers of accurate multiple warheads able to destroy American missiles in their silos.

Turning to Submarine-Launched Ballistic Missiles, the American Polaris A1 and A2, now no longer deployed, carried single warheads. Polaris A3 has three, but these are not independently targetted. Poseidon C3 has ten MIRVs, (on the average, though it can carry fourteen). Trident C4, just now coming into service, will carry 8 MIRVs.

The major Soviet investment in SLBMs is still in the SS-N-6, with a range less than that of the American Poseidon C3 (4600 km), but they are rapidly deploying SS-N-8, whose range (over 7500 km) exceeds that of Poseidon or even the new Trident C4. SS-N-18, the solid-fuel successor to SS-N-8, will have a greater range and at least 3 MIRVs.

On balance, the US has the greater capability at

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sea, and will enhance their margin with the deployment of Trident.

With long-range bomber aircraft the USA still possesses a considerable quantitative and qualitative superiority, but the margin is much less than it was in 1960, when there were over 1000 B-47 bombers and 350 of the older models of B-52. It should be noted that the large Soviet investment in modern air defence has greatly reduced the capability of American bombers to penetrate to their targets, and is not matched by a corresponding strength in the air defence of North America.

5. New Strategic Weapons Currently Under Development: The SALT II Protocol

There are two main areas of developments in the technology of strategic weapons which influence SALT II and SALT III. One, which has been mentioned already, is the increased accuracy of ballistic missiles, and their consequent threat to the hardened silos of opposing land-based missiles. The other is the long-range cruise missile.

Cruise missiles are not new. The German VI, used against London, Antwerp, and other targets in 1944 and 1945,

was an effective strategic cruise missile. The American Matador and Mace, derivatives of the VI but with nuclear warheads and ranges of 1000-2000 km, were deployed in Europe between 1954 and 1969. However, modern technology has provided radical improvements in propulsion (allowing high subsonic speed over long distances), in guidance (allowing evasive routing at low altitude, and accurate terminal homing to the target), and in warheads (allowing a high-yield nuclear explosion from a comparatively small device). A cruise missile can now be designed which offers a small and difficult target, and is likely to have a much better chance of penetrating enemy air defences than does a manned bomber. And, as an important additional advantage, a cruise missile can be launched from the ground, from an aircraft, from a surface ship, or a submerged submarine.

US technology is well in advance of the Soviets in these areas of propulsion and guidance. Moreover, weaknesses in NATO long-range theatre nuclear forces, soon to be exacerbated by the withdrawal from service of the British Vulcan medium bomber, and in contrast to the rapid buildup of the Soviet Backfire bomber and SS-20 mobile IRBM, make cruise missiles attractive as a means of strengthening deterrence in Europe.

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These two developments were very much in evidence during the latter stages of the SALT II negotiations. To preserve strategic stability, it was important to permit a form of deployment of an American ICBM which would not be vulnerable to the new accurate Soviet MIRV. The new system would need some combination of concealment and mobility, although it would be necessary to design this in a way that would not prevent verification by "national technical means". The MX program, representing a new mobile ICBM, is permitted after the expiry of the SALT II protocol, providing that the missile is no larger than the SS-19 and has no more than ten MIRVs.

To prolong the useful life of the heavy bombers (especially after the cancellation of the B1), and to provide an opportunity for NATO for improve its weak in-theatre capability in long-range nuclear deterrence, it was desirable to provide for the introduction of long-range cruise missiles. From the point of view of the USSR, who were rapidly catching up to the US in the design of accurate MIRV, but who are thought to be behind in the technology of cruise missiles, it seems probable that a total ban on both concealment and mobility of ICBMs, and on long-range cruise missiles would have been welcome.

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In the event, these very difficult and important questions regarding mobile ICBMs and land and sea-launched cruise missiles have been relegated to the SALT II Protocol, which expires at the end of 1981. Since most of the relevant American programs (MX, GLCM, SLCM) would not reach the stage of deployment by that date, the Protocol amounts to little more than a postponement of negotiations that could not be concluded in 1979, but are certain to be prominent in SALT III. The long range Air-Launched Cruise Missile is allowed under the SALT II Treaty, although subjected to numerical limits.

The clauses in the SALT II treaty forbidding circumvention through other states are unlikely to cause any problems with intercontinental weapons or prior to the expiry of the protocol. However, provision of cruise missiles to their NATO allies could be claimed by the Soviets to constitute introduction of strategic weapons through third states. Nevertheless, NATO is making plans for the deployment of Ground-Launched Cruise Missiles in Europe, after the expiry of the SALT II protocol.

6. Inequalities in the Strategic Balance

Although the numerical ceilings in SALT II are the

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same for each party, there are several aspects in which the strategic positions are unequal.

SALT II forbids the conversion of light or old heavy ICBMs into modern heavy ICBMs, or the construction of a new heavy ICBM. But it does allow the USSR to convert their heavy SS-9s into heavy SS-18s, each with 10 MIRV. 308 SS-18s, plus 512 MIRVed SS-19s and SS-17s, allowed within the limit of 820 MIRVed ICBMs, would give them about 5600 megaton-sized warheads, almost certainly sufficient to provide a disarming first-strike capability against the current American ICBMs and strategic airfields. On the other hand, the US is prevented from building an ICBM heavier than SS-19, (the heaviest of the light ICBMs), so that a considerable inequality in total Throw Weight is perpetuated in SALT II.

Geography established an inequality for submarine operations which works against the USSR. Two of its four fleets can be bottled up in the Black Sea and the Baltic Sea (unless they have deployed before the outbreak of hostilities), while its Eastern naval bases have their access to the Pacific impeded by ice and by the Japanese Islands. As a result the Soviets are obliged to rely very heavily on the submarine bases in the Kola Peninsula.

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The geographic distribution of population and industry is more concentrated in the USA than in the USSR, which means that an American attack designed to inflict a certain level of damage on the USSR would require more weapons on target than would a Soviet attack designed to do the same amount of damage to the United States.

The nuclear forces of Britain, France, and China weigh against the USSR, although not counted in SALT I or SALT II. Also, nuclear-armed aircraft on US carriers, and airbases in Western Europe or Eastern Asia place nuclear systems (whether operated by US or other NATO allies) much closer to Soviet territory than the distance from Soviet nuclear bases to any American territory other than Alaska. Seen from the other side, the concern of the US over Soviet activities in Cuba, including the appearance of missiles in 1962 and the current focus on Soviet troops ostensibly there for training, show how sensitive these problems can be.

The unequal numerical limits negotiated in SALT I made allowance for these geographical factors and for the existence of the other nuclear powers. The USSR wanted to include the "Forward Based Systems" in the SALT II negotiations, and it is probable that their eventual agreement to omit them

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and still accept equal ceilings was a quid pro quo for the offsetting unequal balance permitted for heavy ICBMs.

The common ceiling of 2250 for the total number of strategic nuclear delivery vehicles, to be attained by 1981, will require a reduction of 254 below the Soviet total announced for June 1979, but only 33 below the US total for the same date. Neither will suffer any significant degradation in capability from these reductions. The USSR will probably achieve it by decreasing the number of SS-11s, an ICBM first deployed in 1966, equipped not with MIRV, but with a single inaccurate megaton warhead, and already reduced by about 400 missiles since 1974. The USA can accommodate their small reduction in earlier models of the B-52 bomber, for which the total of 425 operational in 1958 had already decreased to 75 in 1979, and in the number of B-52s in storage or reserve.

Although SALT I and II were bilateral negotiations, the USA was very conscious of the concerns of its NATO allies. In particular, the definition of what is "strategic", interpreted by the USSR as signifying power to attack the home territory of the USSR or USA, cannot be accepted by the countries of Western Europe. For them a nuclear weapon on their capital city would be distinctly strategic.

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The need for "coupling" or "linkage" between theatre and central (or strategic) deterrence is considered by all members of the Alliance to be crucial. If the central strategic nuclear balance is clearly equal and stable, it may be harder to see direct and close linkage between it and deterrence (both nuclear and conventional) in the European theatre. An isolated "Eurostrategic balance" could become decoupled from the central balance, unlinking the European allies from the American nuclear guarantee.

Consequently it can be seen that even if SALT II should be ratified, it will leave considerable business to be finished if stable deterrence is to be preserved. The USA will need to deploy MX, in a basing mode providing sufficient concealment and mobility to make it invulnerable to a first strike by the MIRVs mounted on the new Soviet ICBMs. The US will not be able to do this before the SS-18 deployment is completed, and it remains to be seen whether the level of verification that can be attained for MX will prove acceptable to the USSR. The other two legs of the American strategic triad need refurbishing too, with Trident to replace the aging submarine missiles, and ALCM to preserve the capability of the aged heavy bombers to strike their targets.

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Looking to the future, NATO is seeking a measure of modernization of its theatre nuclear forces, involving long-range Ground-Launched Cruise Missiles of the type forbidden during the duration of the SALT II Protocol, as well as mobile medium range ballistic missiles (Pershing II) not addressed by SALT, and accompanied by an attempt to initiate some degree of arms control on theatre nuclear forces. These latter developments will enter into SALT III, should such negotiations emerge, although they may be conducted on a bilateral basis between the USA and USSR rather than NATO and the WP.

The NATO Forward Based Systems were excluded from SALT II at the heavy cost of an unequal provision for heavy ICBMs, and therefore weighed in the central strategic balance. There are likely to be problems of "double counting" if they are also weighed in the theatre balance.

7. Verification

The parties to these treaties have too much at stake to rely on unverified assurances. Some form of confirmation is necessary to provide a high degree of confidence that each side knows whether the terms of the agreement are being honoured.

In this regard there is an important inequality between the USA and USSR. The open society of the former, combined with the alert and observant faction always quick to criticize defence activity, make it certain that any significant violation on the part of the United States would be very quickly exposed from within. In contrast, the tight security in the USSR and their refusal to permit any substantial degree of "intrusive inspection" make verification of their activities considerably more difficult.

Fortunately for the prospects for arms control, the "National Technical Means" of verification, based primarily on reconnaissance satellites and on interception of telemetry signals, allow a great deal of information to be gained about the deployment and the testing of weapon systems. Both of these means could be frustrated by intentional concealment and by encryption of telemetry, but SALT II contains provisions to disallow "deliberate concealment" and "deliberate denial of telemetric information". In addition, the Standing Consultative Commission established by SALT I provides a mechanism for rapid clarification of misunderstandings and discussion of concerns.

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Unfortunately for the prospects of arms control, the countermeasures necessary to reduce the vulnerability of land-based systems to a disarming first strike are likely to depend on concealment and mobility. To increase survivability, it is probable that missiles will be made mobile, and placed in canisters which fulfil some of the functions of a launcher. It will then be necessary to place these in locations which will not permit efficient targeting by the opponent. This would be comparatively easy in the absence of a requirement for verification, but if it is necessary to let the other party see the missiles from time to time, to confirm that their numbers and observable characteristics are within the agreed limits, then the system designer has conflicting objectives to meet. Various schemes have been proposed which offer compromises between high survivability and high assurance of verification, one of which has been selected for the MX program. However, there is a fundamental conflict between the measures to reduce vulnerability of land-based missiles and the undertaking "not to use deliberate concealment measures which impede verification by national technical means".

Aside from the problem of concealment, a number of provisions in SALT II, such as those establishing "counting rules", "Functionally Related Observable Differences" (FRODS)

and other externally observable differences, should permit a reasonably effective level of verification, but "FRODS" do depend on cooperation, and the possibility does exist of deliberate contravention. Most of these latter provisions refer to the type of weapons systems carried by aircraft. Quite a lot can be learned by observing the movements of aircraft and the type of missions for which they appear to be training. It is probably now the case that bombers are the least important of the three strategic offensive systems, whether they are carrying Air-Launched Cruise Missiles, Air-to-Surface Ballistic Missiles, or old fashioned bombs.

A number of upgradings to systems, such as increases to the number of multiple warheads on a particular type of missile, to the number of ALCMs or ASBMs carried by a bomber, or lengthening the range of a cruise missile, probably could be made with little or no testing and no externally observable features.

An important feature of the treaty is that its numerical limits are expressed in terms of ICBM and SLBM launchers, reentry vehicles on missiles in launchers, heavy bombers, and Air-Launched Missiles on bombers. It does not forbid the manufacture of additional missiles, although they

are not supposed to be deployed in the launcher area. Specification in terms of number of launchers and bombers was probably all that could be verified, since satellite photography can show silos, submarines, and bombers, but cannot show the contents of storage magazines. It is true, of course, that an important objective of SALT is to prevent a first-strike capability, and that a carefully synchronized counterforce first strike probably would not allow the time for reloading ICBM launchers, or having submarines or bombers return for a second mission. However, some of the strategic calculations involve considerations of residual forces remaining after a first counterforce exchange, and for these purposes reload weapons could make a significant difference.

The difference between counting launchers and counting missiles may become important if mobile ICBM, MRBM, or GLCM systems are deployed, as permitted after expiry of the protocol, and a dispute could arise over the status of a canister containing a missile and playing a role in its launching.

8. Summary

With or without SALT II, there are several strategic imbalances that will cause difficulties in the years ahead.

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Ratification of SALT II will not solve them, but it does allow some to be redressed. Furthermore, SALT II could form a base from which to negotiate agreements in the future, agreements that could reduce the incentive for either side to simply try to solve its problems by extensive and uncontrolled armament.

SALT II legitimizes Soviet superiority in heavy ICBMs. This is being rapidly translated into a disarming first strike capability against American land-based systems. The US counter-measure is to build a new ICBM, the MX, using concealment and mobility. While reducing the vulnerability of the system, this poses problems for the Soviets' ability to verify the numbers of MX deployed.

SALT II permits two other important American programs, Trident to replace obsolescent SLBMs, and ALCM to preserve the striking power of the heavy bombers. As in the case of MX, SALT II is not itself redressing instability, but it is not preventing programs that can redress instability, albeit at considerable cost.

SALT II does nothing to pacify Soviet concerns over Western Forward Based Systems, nor NATO concerns over its

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weakness in long-range theatre nuclear forces. The latter problem may be solved by deployment of cruise missiles and mobile MRBMs in Europe. All the SALT II protocol does is confirm that any form of arms control over cruise missiles was too difficult to complete in 1979.

What with the problems of cruise missiles, European systems threatening the USSR directly, the existence of independent British, French, and Chinese nuclear forces, SS-20, Backfire, and heavy Soviet ICBMs, SALT III offers little hope of easy or early progress.

To fill gaps and reduce vulnerability, the West will be obliged to pursue their programs on MX, Trident, strategic ALCM, and theatre nuclear force modernization. If these steps are taken and SALT II is ratified, they can initiate the difficult process of negotiating some form of arms control likely to include theatre as well as strategic nuclear systems.

In short, while ratification of SALT II would restrain unlimited increase in strategic armaments, it does not establish a stable balance. It does, however, permit a stable balance to be achieved, if the West is prepared to undertake certain steps in modernizing its weapons.